Globalization and the Knowledge Economy: Perspectives for Malaysia

Edited by

Mohamed Ariff and Frank Flatters

Malaysian Institute of Economic Research, Kuala Lumpur
and
Queen's University, Kingston, Canada

Funded by the Canadian International Development Agency
in honour of MIER's fifteenth anniversary

First Published in 2001 by

Malaysian Institute of Economic Research (149064-U)
9th Floor, Menara Dayabumi
Jalan Sultan Hishamuddin
50050 Kuala Lumpur
Malaysia

Tel: (03) 2272 5895, 2272 5896
Fax: (03) 2273 0197

In cooperation with

Queen's University
Kingston, Ontario
Canada K7L 3N6

Tel: (613) 533 2250
Fax: (613) 533 6668

Perpustakaan Negara Malaysia/National Library of Malaysia
Cataloging-in-Production Data

Globalization and the Knowledge Economy:
Perspectives for Malaysia

Edited by Mohamed Ariff and Frank Flatters

The Knowledge-Based Economy: Facts and Theories
Options for the Ringgit
The International Roles of the US Dollar, the Euro and the Japanese Yen in East Asia's Exchange Rate Arrangements
Modern Trade Policies for the Global Economy
The New Economy, Globalization and Regional Trade Agreements
National Tax Policy in an International Economy
Economic Aspects of Foreign Financing
Globalization and Environmental Quality
Globalization, Culture and the WTO
The Services Sector: Malaysia's Next Engine of Growth?

ISBN No. 983-9716-20-4

Cover Design by Malaysian Institute of Economic Research
Layout by Malaysian Institute of Economic Research
Printed in Malaysia by Prinforce (M) Sdn. Bhd.

Preface

This book presents selected papers from two conferences that marked the occasion of both the 15th anniversary of the Malaysian Institute of Economic Research (MIER) and the successful conclusion of the Canadian International Development Agency (CIDA) funded partnership between MIER and John Deutsch International of Queen's University. The annual National Economic Outlook Conference was held on November 20-22, 2000, and the Conference on Globalization and the Knowledge Economy on January 30-31, 2001.

Outline of the Book

The papers chosen for this volume deal with key issues faced by Malaysia in confronting the twin phenomena of globalization and the emergence of the "knowledge-based economy." While these terms can convey many different meanings and connotations, there is no doubt that they are closely related and that the policy challenges they create are of critical importance to Malaysia at this stage in its socio-economic development.

Globalization arises in large part from rapid changes in the speed and in the manner in which ideas and information can be transmitted around the world. These changes have led to quantum leaps in the degree of integration of markets for goods, services, financial capital, and for knowledge itself. This has required rapid adaptations in international institutions and has presented corresponding and arguably even greater challenges for sovereign national governments. The opportunities this has created for individual countries are great, as are the corresponding risks.

Countries like Malaysia that have grasped the opportunities and challenges of participating in rapidly expanding and evolving global markets have brought great developmental benefits to their citizens. Malaysia's growth over the past quarter century of integration with the global economy has been among the highest in the world. Citizens in countries that have been more reluctant to participate have fared more poorly.

In this era of rapid change, the policy challenges are never-ending. For some countries the challenge is to make up ground that has been lost. For those like Malaysia it is to keep up with expectations based on past performance. The papers in this volume deal with some of the challenges faced by Malaysia and other countries.

The papers have been grouped under four main headings. Part I presents an overview of the knowledge-based economy, discussing some of the major economic meanings and implications of the growth of the knowledge-

based economy, setting a background and framework for the particular policy areas that are discussed in subsequent parts.

Part 2 focuses on challenges of macroeconomic management for open economies in a globalized world economy. Both papers in this section deal with issues related to exchange rate management (or choice of exchange rate regimes) and monetary interdependence and cooperation. The issues discussed are of immediate importance to Malaysia and are also relevant to longer-term issues of domestic, regional and global financial architecture. Kawai explores the roles of different currencies in East Asian financial arrangements and the implications and prospects for increased regional monetary cooperation. Ariff looks at the particular case of Malaysia and explores the options available for Malaysian exchange rate policies. It is worth mentioning that the discussions that arose from these papers at the NEOC were particularly helpful in sorting truth from fiction in the vigorous policy debates over Malaysia's macroeconomic management during the recent Asian financial crisis.

Part 3 presents four papers related to the "real" side of trade and tax policies in a global economy. Harris provides some analytical explorations of likely impacts of the spread of new general-purpose technologies that characterize the knowledge-based economy and reviews in particular some of the implications of regional trading arrangements in this context. Flatters and Boadway examine the impacts of globalization on the design of trade and tax policies respectively, concluding that many of the basic lessons of trade and tax policy are not fundamentally altered by globalization, but that the stakes involved in getting policies right (or wrong) have almost certainly increased. Jenkins examines some particular issues related to measuring the economic cost of foreign finance in the face of variable country risk and when foreign supplies of finance are less than perfectly elastic.

Part 4 reviews some of the broader implications of globalization for the environment, for cultural industries and for the more general development of the service sector. Olewiler confronts the contention that globalization is bad for the environment and shows that the hypothesis is not supported by empirical evidence. Maule examines some of the difficult issues that arise, domestically and internationally, in trying to protect cultural industries in a global economy, casting doubts on both the desirability and the possibility of doing so. Syarisa focuses on the key role of service industries in sustaining and supporting growth in an integrated international economy, and argues that a globally competitive service sector will be increasingly important for Malaysia's future growth.

Independent Policy Research and the Knowledge Economy

MIER was set up with the goal of becoming Malaysia's premier think tank in the area of economic policy. In this sense, it was designed to play a key role in Malaysia's "knowledge economy."

Good economic policy must be based on a sound understanding of how the economy operates and how it will respond to changes in the external environment and in available policy instruments. Knowledge can be gained only as the result of investigation, research and experience. To be effective it also must be disseminated and subject to ongoing discussions and debate.

Recognizing the importance of independent policy research and discussion as a foundation for effective governance and for long-term economic development, CIDA offered to support MIER in its initial stages through a partnership with Canadian policy researchers directed by Queen's University. After fifteen years MIER has achieved its goal and has proved its sustainability in the Malaysian community. This has been highlighted by the general respect the institute has gained through its activities during the recent economic crisis. The two conferences on which the papers in this volume are based provide another illustration of the valuable function MIER plays in promoting research and discussion of important policy issues facing Malaysia.

Whether MIER continues to fulfill its mission is now a matter of domestic national interest. It depends on the staff and leadership of the institute and on the support they get from relevant stakeholders in Malaysia. The staff of the institute is clearly committed to its goals of promoting and disseminating the results of research on Malaysian economic policies and medium and long-term development needs. The private and public sectors have shown their confidence in MIER's capabilities through the research projects they have contracted to the institute.

To rely solely on income from contract research, however, would detract from another important mission of the institute, to engage in and promote research, discussion and understanding of broad national issues. For this work to continue, MIER needs freedom of action that will only be available as a result of some funding that is independent of individual contracts.

A number of Malaysian stakeholders have already shown their confidence in MIER's role in this regard by supporting its endowment fund, whose income is critical in underwriting truly independent research and dissemination activities. Unfortunately the recent economic crisis stalled the institute's endowment campaign, at the very time when MIER's value to the country became so apparent. Now that the crisis is ending, it is hoped that renewed public and private sector support of the MIER endowment will permit the institute to fulfill its dreams and its promise for the benefit of all Malaysians.

Acknowledgements

The editors wish to express their appreciation for the behind-the-scenes contributions of Kim Philipps and Elaine Constant of Queen's University and Lee Kim Bian of MIER. Without their efforts in organizing the conferences on

which the book is based and in compiling and editing the resulting manuscript, this book would not have been possible.

Mohamed Ariff, Malaysian Institute of Economic Research

Frank Flatters, Queen's University

February, 2001

Table of Contents

Preface i

Fifteenth Anniversary Tributes to MIER vii

MIER's Legacy xii

MIER, CIDA and Queen's University xiv

Special Address by the Canadian High Commissioner to Malaysia xviii

1. Perspectives on the Knowledge-Economy

The Knowledge-Based Economy: Facts and Theories 1
Richard G. Harris

2. Exchange Rates and Monetary Interdependence

Options for the Ringgit 53
Mohamed Ariff

The International Roles of the US Dollar, the Euro and the Japanese Yen in East Asia's Exchange Rate Arrangements 73
Masahiro Kawai

3. Trade Regimes, Taxes and Finance

Modern Trade Policies for the Global Economy 161
Frank Flatters

The New Economy, Globalization and Regional Trade Agreements 191
Richard G. Harris

National Tax Policy in an International Economy 213
Robin Boadway

Economic Aspects of Foreign Financing 237
Glenn P. Jenkins

4. Environment, Culture and Services

Globalization and Environmental Quality 249
Nancy Olewiler

Globalization, Culture and the WTO 279
Christopher Maule

The Services Sector: Malaysia's Next Engine of Growth? 301
Syarisa Yanti Abubakar

Profiles of Contributors 323

Fifteenth Anniversary Tributes to MIER

Prime Minister of Malaysia

Phenomenal advances in technology are spearheading the world into a new dimension today, the digital dimension. We are witnessing the dawn of a new era and living in revolutionary times, in an age of mutation which presents vast opportunities and harvests. Yet, in a contradictory sense, we are also living in an era of unparalleled volatility and turbulence, seemingly a corollary of the incessant flux. This is particularly so in the international financial arena as we have, unfortunately, witnessed in very recent times.

In this climate of extremes, it is critical to have national institutions with vision and capacity to steer policy recommendations. We were fortunate to have the foresight and vision to set up an independent economic think tank to serve a rapidly developing Malaysia as she was going through an extremely crucial stage in her development. Today, the Malaysian Institute of Economic Research (MIER) celebrates its 15th anniversary. The Institute has come a long way in a short fifteen years, having been through two severe crises and a period of phenomenal growth in between.

I wish to take this opportunity to congratulate MIER for having carried out a job well done since its inception. Through periods of ups and downs, MIER has contributed greatly to both the Government and the corporate sector in terms of research, consultation, policy recommendations and dialogues.

Malaysia needs to fully prepare itself to face the challenging times as we embrace the digital age. I believe that MIER, with its rich experience and expertise, will continue to provide the country with research and consultation, and fuel Malaysia's synergies in her current endeavour to be ranked among the developed economies in the world.

Dr. Mahathir Bin Mohamed

Minister of Finance, Malaysia

As Malaysia embraces the New Economy, it will increasingly progress into the realm of high technology and digitalization. At the same time, globalization will pervade the world economy. In such an environment, the role of economic research becomes pertinent. The availability and fast dissemination of timely and accurate economic data, intelligence and analysis will contribute immensely towards enhancing the responsiveness of the Malaysian economy to changing circumstances. Equipped with such information, both the public and private sectors will be able to make better decisions. It is, therefore, imperative that Malaysia possesses the prowess and capacity to continuously upgrade her skills, knowledge, expertise and technologies to compete in a fast changing global economic environment. Sustained research and development, in particular economic research, will play a crucial role with strong economic research institutions acting as the backbone.

Since its inception on 30 December 1985, the Malaysian Institute of Economic Research (MIER) has complemented the economic research activities of both the public and private sectors of the nation. By undertaking independent research on the country's economy and industry, providing consultancy services and through its involvement in various regional projects and dialogues among the top-league institutions in the region, MIER has contributed towards enriching the wealth of economic research in the country. These will be challenging and interesting times for economic research institutions. In order to remain relevant, MIER will have to garner all its network linkages to provide not only accurate data and information but quality analysis and responses to a wider clientele and disseminate such information speedily through the use of information communications technology (ICT). I am confident that MIER will continue to play this role effectively, and contribute to the further enhancement of economic research in the country as well as internationally.

I would like to take this opportunity to congratulate the Malaysian Institute of Economic Research on the occasion of its 15th anniversary and wish the Institute the very best in its future endeavours.

Daim Zainuddin

Principal and Vice-Chancellor, Queen's University

On behalf of Queen's University I would like to express my warmest congratulations to the Malaysian Institute of Economic Research on the occasion of its fifteenth anniversary.

Queen's has been involved with MIER since its earliest days. JDInternational, the international programs wing of the John Deutsch Institute for the Study of Economic policy at Queen's, has been proud to collaborate with MIER in administering the CIDA-funded Queen's-MIER Project that was inaugurated in 1986. This project was designed to foster MIER's development as Malaysia's premier independent economic policy research institute. John Deutsch, a predecessor of mine as Principal of Queen's, was a policy researcher and advisor with a keen appreciation for the value of the independent policy research and dissemination to which you and your institute are committed. He would be pleased to see the contributions MIER has made to Malaysian policy discussions since 1986. This has never been so clear as during the turbulence surrounding the recent economic crisis.

While CIDA's financial support of MIER and of our collaborative project is now drawing to a close, we expect our friendly relationship to continue. Your mission to pursue high quality independent policy research and to promote free and open discussion of important issues is one that we hold with the highest esteem. We trust that we have been able to make a contribution to your achievement and we hope to continue to collaborate towards this goal in the future.

Congratulations once again on your achievements, and best wishes in your future endeavours.

William C. Leggett

Chairman, Board of Trustees, MIER

When the idea of an independent think tank was first mooted, Malaysia was in the throes of industrialization. This was rudely interrupted by the crisis of the mid-1980s. Looking back, the Malaysian Institute of Economic Research (MIER) has been through two severe crises and experienced a period of tremendous growth in between. In spite of the odds in times of turbulence, the Institute increased its efforts to pursue its objectives and mandate.

Today, the Institute boasts, among its clients, the Government of Malaysia, several state governments in the Federation and the corporate sector as well as several governments in the ASEAN region, international and regional organizations and national institutions of foreign countries, all of which were instrumental in contributing to its overall achievement. Particular mention should also be made of the corporate benefactors and foreign institutions, which have made substantial financial contributions.

In all these years of existence, the Institute has grown, excelled and evolved into a renowned think tank in the Southeast Asian region. Today, fifteen years on, the Institute has come of age. Against this achievement, the Institute has currently moved on to embrace the new challenges of the "Information Age" by immersing itself in research on the "New Economy" besides continuing to carry out projects and policy research on the more traditional domains.

This year, MIER celebrates its 15th anniversary and on this auspicious occasion, I would like to take the opportunity to congratulate the Institute for its impressive track record so far. All these would not have been possible without the cooperation from all concerned parties, the Board of Trustees, Advisory Panel, staff members as well as associates and friends. Particular mention should be made of the corporate benefactors, the Canadian International Development Agency (CIDA) which has given both financial and technical assistance, the Government of Malaysia for its support, and Petroliam Nasional Berhad for providing rental-free office space. Last but not least, my sincere gratitude to Queen's University of Canada for the smooth coordination of the MIER/Queen's Project under the CIDA Phase II Programme Support to MIER.

At the same time, I would also like to wish the Institute all the very best in its future research engagements and hope that it will continue its excellent achievements beyond the future.

Tan Sri Dato' Mohd Sheriff Mohd Kassim

Executive Director, MIER

Fifteen years do not mean a long time in institution building. Nonetheless, the first fifteen years of any organization represent the most critical phase. It is during these initial years that strong foundations, which can ensure continuity, sustainability and viability of the institution, are crafted and put in place. As a non-government, independent think tank and a non-profit organization, the initial difficulties encountered by MIER were particularly severe.

MIER could not have survived, let alone make an impact, had it not been for the strength it has drawn from the corporate donors and the government in the form of generous contributions to its Endowment Fund and the support it has received from its clientele which includes various government agencies and corporate entities. At the behest of all this was the Canadian help, at first in the form of both direct and indirect assistance and subsequently in the form of indirect assistance. No words can adequately express the extent to which MIER is obliged to all its benefactors.

The track record of MIER is testimony to the services it has rendered with the interest of the nation at heart. The macroeconomic monitoring and forecasting activities of the Institute have earned great credit and acclaim not only nationally but also internationally. MIER takes pride in the fact that it was able to handle such important projects as the Second Industrial Master Plan for the Ministry of International Trade and Industry. MIER, as an independent observer, has made views heard through memorandums to the government and through media contributions. What is more, MIER has also served as a sounding board for issues of national concern through seminars and conferences. More recently, MIER has spread its wings regionally by conducting studies and training programs in other ASEAN countries.

While my predecessors, Datuk Dr. Kamal Salih and Datu Dr. Sulaiman Mahbob have made my task easier by laying the strong foundations, they have also made it challenging by setting tough standards. My modest accomplishments, if any, during the last three years as the Executive Director, are really attributable to the team spirit that prevails at the Institute. I wish to take this opportunity to pay tribute to my colleagues who have been working tirelessly and silently behind the scene, driven by a sense of self-esteem, dedication and commitment. Last but not least, MIER is very fortunate to have a Board of Trustees and an Advisory Panel filled up by great people who really care for the Institute.

I am proud to be associated with MIER right from the beginning as a member of the Advisory Panel. I take considerable pride in being a member of the working team at MIER sine June 1997. While I share the credit with my colleagues, I take blame for shortfalls.

Mohamed Ariff

MIER's Legacy

The idea of a private, independent and non-profit economic think tank to serve a fast developing Malaysia was first conceived in the Prime Minister's Economic Panel in the early 1980s. The initiative, subsequently promoted by the Council on Malaysian Invisible Trade (COMIT), came to fruition with the incorporation of the Malaysian Institute of Economic Research, popularly known by its acronym "MIER," on 30 December 1985. The Institute officially began operations as a company limited by guarantee on 2 January 1986.

As an independent economic think tank, the Institute is devoted to research on economic, financial and business issues facing Malaysia, and provides, in addition to well-founded advice on macroeconomic management, development perspectives and economic forecasts or projections. Its incorporation was exceedingly timely, just as the economy was going through a major turbulence brought about by the crisis of the mid-1980s. As the country rode out of the crisis towards the latter half of the decade, the Institute's role continued to expand and evolve beyond being a think tank for the government and the private sector. Bringing together the government, the private sector as well as the country's and region's academia, the Institute progressed to become a focal point for socio-economic, financial and business research in Malaysia. The Institute has been engaged in a variety of activities, ranging from being advisor to the writing up of Malaysia's Second Industrial Master Plan (IMP2), 1996-2005.

Initially organised into three research divisions, namely, Macroeconomic Trends and Forecasting, Policy Studies and Industry Studies, a fourth, the Area Studies Division, was added in the mid-1990s, in response to new demands and challenges, corollaries of the rapidly globalizing regional and international economic environment. In recent years, the Institute has been involved in studies sponsored by regional and international agencies and national institutions. MIER's role and activities, under the auspices of these organisations, in regions as diversified as Indochina and Central Asia, where the Institute offers capacity-building expertise in the training of officials and interns, show how far the Institute has gone since its inception. The 1997-1998 economic crisis that descended on East Asia's emerging economies was a watershed event not just for the region but, ironically, for MIER as well, the Institute being well-placed to study the "why and how" of the crisis. The East Asian debacle has spearheaded MIER into new prominence and has placed the Institute in the leagues of the best in the region. The Institute has since entered a new dimension by moving into the centre stage in national, regional and international dialogues and research on crisis-related issues.

MIER is governed by a Board of Trustees, which sets its policy directions, while an Advisory Panel provides guidance in the planning of its research activities. The Executive Director heads the Institute, supported by a team of full-time research and support staff members. The Institute also engages a number of associate research fellows and consultants, and regularly receives exchange staff from overseas institutions, a manifestation of its extensive networking. Since its establishment, the Institute has witnessed two severe crises, as mentioned, and a period of phenomenal growth in between. This year, MIER celebrates its 15th Anniversary and with its impressive track record, the Institute is all set to confront the challenges of the 21st century and the New Economic Era which will, no doubt, present new opportunities and agendas for the Institute to make itself increasingly relevant, as an independent think tank, both nationally and internationally.

MIER and CIDA

The Canadian International Development Agency (CIDA) has been a supporter of MIER since the institute's inception. CIDA sees the development of strong and independent policy research capabilities, and the promotion of informed policy dialogue and discussions as key features of the economic and social development process, and so was enthusiastic in supporting the vision articulated by MIER.

Dr. Kamal Salih, MIER's first Executive Director, worked closely with senior CIDA officials to determine a mutually agreeable role of and avenue for CIDA's assistance. An early decision was for MIER to ally itself with a Canadian policy research institution as a focal point for technical assistance and for the formation of links to Canadian policy researchers. To that end, CIDA sponsored a tour of possible Canadian partner institutions in early 1986.

Dr. Kamal visited a number of institutions during that time and, in the end, requested CIDA's support in developing a partnership with the John Deutsch Institute for the Study of Economic Policy at Queen's University. The John Deutsch Institute was especially well known for its strong policy research links with Canadian academics and with Canadian policy makers at the Federal and Provincial levels. John Deutsch, a former Principal of Queen's, exemplified these links through both a distinguished academic career and a long record as a government policy advisor and as Chairman of the Economic Council of Canada.

The Government of Canada's first MOU with the Government of Malaysia in respect of its assistance to MIER was signed in 1986, and a corresponding Contribution Agreement was signed between CIDA and Queen's for the administration of CIDA's support of the institute. This agreement was for a period of three years, and involved just under Cdn$1 million of assistance.

The focus of CIDA support in this first phase of assistance was on short training visits to Canada by MIER researchers, policy conferences, and technical assistance in critical areas of policy research. Among the key areas of technical assistance were tax reform, fiscal federalism, and structural adjustment in labour markets. The project also supported a high level meeting of senior Malaysian policy makers and researchers on post-NEP economic policies.

By the conclusion of Phase I of CIDA's assistance, it was clear that MIER was capable of fulfilling its promise to become Malaysia's premier independent economic policy research institute. CIDA was happy, therefore, to agree to continue its support of the institute. As an interim measure, the initial MOU and Contribution Agreement were both extended for a short period, and Cdn$300,000 bridging funding was provided to extend the initial phase of the project.

The second phase of CIDA's support of MIER was announced in Kuala Lumpur by the Honourable Michael Wilson, Canada's Minister of Finance. At the same time, he signed a new MOU with the Government of Malaysia, confirming CIDA's commitment to provide an additional Cdn$4.5 million of financial support.

In addition to a continuation of technical assistance through links with Canadian policy researchers, training interchanges of MIER researchers with Canadian colleagues and institutions, and support of policy conferences, Phase II included a significant amount of direct financial support of core MIER human and physical capital.

As a means of upgrading the core research capabilities of the institute, CIDA support was provided for a number of years towards the salaries of Senior Research Fellows and Research Associates, as well as an institute Editor. This as seen as a means to provide the human resources necessary to meet growing demands on the institute's resources while endowment funds and longer term sources of contractual funding were being built up.

In terms of physical resources, CIDA support provided the core funding for substantial improvements in information technology equipment and library resources. It also provided the funding for a number of key MIER research and conference publications. Technical assistance has covered a wide range of topics, and has involved a number of Canadian experts from research institutes across Canada.

MIER and Queen's University

The John Deutsch Institute for the Study of Economic Policy at Queen's University (JDI) is one of Canada's premier policy research institutions. Building on Queen's long-established reputation for the training of policy makers in the private and public sectors, the JDI was established to promote policy research and policy dialogue in Canada. It is named after Professor John Deutsch, a distinguished Canadian policy advisor, public servant, former Chairman of the Economic Council of Canada, and former Principal of Queen's University.

Queen's was introduced to MIER during the CIDA-sponsored tour of Canadian research institutes undertaken by Dr. Kamal Salih, MIER's founding Executive Director. It was pleased to be invited by CIDA and MIER to be MIER's partner under the CIDA-funded program of assistance in the establishment of the institute, and signed an initial three-year contract with CIDA for this purpose in 1986.

Queen's has played a multi-faceted role in CIDA's assistance to MIER. It has played a technical/managerial role in executing the overall project and in coordinating with MIER and CIDA. It has acted in a direct advisory capacity to MIER, making the policy research and training resources of Queen's available to the institute, advising, and providing technical assistance in policy research and project planning, as well as strategies for institutional development. And it has served as a link between MIER and a network of Canadian policy experts in areas related to MIER's own activities. Professor Frank Flatters has acted as Project Director and Senior Advisor to MIER, and Professor Robin Boadway has served as Associate Advisor.

During Phase I of the project, Queen's provided several experts from its own faculty and elsewhere to work on the MIER Tax Reform Project. In the course of this activity, several MIER researchers visited Queen's for collaborative work and training in methods of tax policy analysis. Assistance was provided as well in several other major projects, including labour market adjustment policies, issues of fiscal federalism, incentives for forest plantations, and international trade in services. Training was provided in these and other areas, including methods of economic forecasting, survey design, and macroeconomic modeling. Experts from Queen's and other Canadian institutions participated and presented papers at National Outlook Conferences and at a number of thematic conferences and seminars at MIER. Senior researchers and associates of MIER attended joint seminars and workshops at Queen's and the University of British Columbia in Canada.

CIDA provided significantly more resources during Phase II, and Queen's was happy to continue its partnership with MIER in managing the

project, including the provision of technical assistance and training, and participating in collaborative research activities. One noteworthy feature of the second phase has been a major increase in the level and scope of training activities for staff and associates of MIER.

Queen's has assisted MIER in a variety of ways. Direct assistance has been provided for improvement of research facilities and training of the institute's research personnel. Indirect support has been given in the form of technical assistance with research, and help with publications and conferences. These are all aimed at providing timely analysis of important policy issues and disseminating the results to promote open and informed discussion in the Malaysian policy community. The technical assistance has been implemented through JDI's network of experts at Queen's and throughout the rest of Canada, involving a number of Canadian universities and research institutes.

Major activities have included workshops and conferences on corporate governance, the future of social services in Malaysia, internationalization of markets and deregulation, macroeconomic crisis and recovery, Malaysia's public sector in the 21st century, managing biodiversity, and project appraisal and environment. From these, major publications included *Competition and Regulation: Implications of Globalization for Malaysia and Thailand* and *Malaysia's Public Sector in the 21st Century: Planning for 2000 and Beyond.*

Training workshops and seminars have been an important component of assistance, including courses on survey methods and statistical analysis in cooperation with Statistics Canada, data analysis, applied quantitative policy analysis, and investment appraisal and markets.

In addition, technical assistance has been provided on policy issues including competition, economic indicators, energy, environment, financial services, fiscal relations, health, international trade, market structure, migration and labour, post-industrial master plans, revenue, social programs, and taxation.

Financial and technical support has been provided for the acquisition of computer facilities and research resources. A major part of the direct financial support is being used to establish a Canada-MIER Information Centre that will provide essential research resources and facilities for the dissemination of research and policy recommendations. This comprises upgraded computer hardware and software systems, seminar/media facilities, and library resources. MIER's computer facilities are now supporting the institute's research and dissemination efforts effectively, with potential for greater uses in the future.

Special Address by the Canadian High Commissioner to Malaysia

Let me first congratulate the Malaysian Institute of Economic Research on its 15th anniversary. I would also like to thank them for inviting me to speak today.

Canada has had a longstanding relationship with MIER. In 1985, Canada's Foreign Minister, Joe Clark, expressed an interest in providing support to the MIER by creating linkages with Canadian universities. This led in 1987 to the beginning of MIER's long cooperation with Queen's University in Kingston, Ontario – a project that was renewed in 1990 and again in 1997.

I would like to think that this cooperation has contributed, in some part, to the great success of MIER. Although this is the last year of our financial support for the MIER's cooperation with Queen's, we look forward to a continued close connection with the Institute in future.

Economics is supposed to be the dismal science. I always find this surprising, however, given how excited people get over economic issues. Globalization is one of the hottest of these issues. There is a great debate going on today between the demonstrators on the streets of Seattle and elsewhere and the economists on whether it is good or bad.

In all this talk about globalization, governments are seen as being helpless in the face of an irresistible force. Nothing, in fact, could be further from the truth. Governments have an enormous impact on the pace of globalization; but they are not particularly skilled at communicating this.

Take, for example, the two Koreas. South Korea's government has decided not to fight globalization, while North Korea has resisted it, very effectively. Of course, the North Korean model is not to everyone's tastes.

So, short of outright autarky, what policy options do governments have with respect to the challenges and opportunities of globalization?

In answering this, I would like to draw on Canada's experience with globalization and government. Until recently, Canadians had a rather ambivalent approach to globalization, which could be summarized, with apologies to our American neighbours, as "globalization is good as long as it doesn't come from the United States."

As far back as 1971, Campbell Hughes, a Canadian book publisher, complained that:

"A Canadian is someone who drinks Brazilian coffee from an English teacup, and munches a French pastry while sitting on his Danish furniture, having just come home from an Italian movie in his German car. He picks up his Japanese pen and writes to his Member of Parliament to complain about the American takeover of the Canadian publishing business."

This dualism represented a way of thinking as old as Canada itself. In fact, Canada was formed partly in reaction to events in the United States, and our first approach to trade was to protect our economy from American competition, while embracing trade with Britain and the rest of the Empire. This was an early example of how our government altered the course of globalization in Canada.

After the Second World War, Canada was a participant in the Bretton Woods process. Like others, we decided to join an international rules-based organization called the General Agreement on Tariffs and Trade (the precursor to the WTO).

By the 1970s, concern over growing investment from the United States led to the pendulum swinging the other way, and the Canadian government moved to reduce the inflow of foreign direct investment into Canada in order to maintain national control over our own economy. Fortunately, we were pragmatic in our approach, and our economy continued to grow.

By the 1980s, however, attitudes in Canada started to shift. Canadians began to realize that much of our prosperity came from trade and investment. At the same time, the US seemed to be worrying more about the economic influence of other countries such as Japan and the European Community, and protectionist sentiment there started to grow.

As a result, we decided that we needed to guarantee our access to US markets. The GATT was a good mechanism, but it was too broad and too slow to change. Accordingly, we decided to press for a free trade agreement, or FTA, with the United States.

At the time, most Canadians were opposed to the FTA. However, given the evidence of increasing unilateral trade actions by the US, Canada needed this agreement. Accordingly, the government of the day in Ottawa proceeded to negotiate and sign it in 1989. This, then, was an example of a government showing leadership in order to advance the pace of globalization.

Similarly, we transformed our foreign investment review agency into an investment promotion group, with minor control functions. And in 1993, we folded this group into our Department of Industry.

Needless to say, signing the FTA and its successor, NAFTA, was an acrimonious decision. An election was fought over it, the government fell, but its successor realized that there really were few alternatives.

Was it, however, the right decision? Since 1989, when the FTA was signed, Canada-US two-way trade grew at an average annual pace of 10.2 percent, and after 10 years the level of two-way trade in goods and services had almost tripled. Canada's economy has shared in the long economic boom of the US, and is forecast to grow by 5 percent this year. This is below the forecast for Malaysia, but it is a large figure for a developed country.

Predictably, the FTA also increased the relative share of Canada's trade with the US. I have noticed that sometimes Malaysian economists will

worry about their export dependence on the United States. In Canada, the US accounted for 87 percent of our exports in 1999, which is up from 75 percent when the FTA was signed. Yes, we are concerned about this figure, which is why we are trying hard to diversify our trade around the globe, including with Malaysia. In the meantime, however, I think we can all agree that if you had to be dependent on exports to one country over the past ten years, the US was a good choice.

And so what do Canadians think about the FTA now? As I noted, there was real resistance to the idea in 1989. Ten years later, polling revealed that 80 percent of Canadians supported it. Since we signed the FTA and later NAFTA, which includes Mexico, we have gone on to sign bilateral free trade agreements with Chile, Costa Rica and Israel. We are now negotiating a free trade agreement with Singapore. At the same time, we are continuing to press for progress in the WTO and in APEC on questions of free trade.

Over 40 percent of Canada's GNP comes from exports, which is not much compared to Malaysia's 106 percent, but is quite a lot for a developed country. Canadians realize this. But we now know that we are more than capable of competing with and in the United States. This new awareness and confidence exists today because our government was willing to go against the tide of public opinion and do what was right in the long term.

As you can see from Canada's example, government can have an impact on globalization. It can stop it, it can hinder it, or it can encourage it. One thing government does less well, however, is to explain it. All too often, governments tend to talk to their citizens about the potential costs of globalization without focusing on the benefits. I think they do this for three reasons.

Firstly, I believe that governments often incorrectly blame globalization for the rapid social and economic changes taking place as a result of information technology and the Internet. They confuse the challenges of trade with technological challenges.

Even if we were to shut down world trade tomorrow, IT would continue to change our economies and societies, in some cases painfully.

What IT does to globalization is to accelerate it, just as it accelerates other parts of our lives. The criticisms of IT, that, for example, it creates a "digital divide" in the world, have nothing to do with globalization. In fact, freer trade should make it easier for IT to spread around the globe, thus giving all countries the potential of equal access to its benefits.

Secondly, the pace of globalization is at least partially set in multilateral negotiations under the World Trade Organization. The large number of member countries and the influence of major players such as the United States and the European Union means that individual middle powers such as Canada and Malaysia have only a limited influence on the outcome of these negotiations. Thus, to a certain extent, the pace of globalization is out of our

hands, so we tend to focus on what we can change, namely, the impact of the costs.

Thirdly, I think that governments also tend to focus on the costs in order to deflect criticism that it is pursuing some sort of multinational corporate agenda. This dire prediction detracts from what should be the government's main message on globalization.

And what is that message? First, that globalization means freer trade in goods and services, and that freer trade means higher growth and more prosperity and less poverty. Second, that governments and the people that elect them still have the final say, at any time, over the pace and nature of globalization in their countries. Third, that the benefits of globalization, in the long run, outweigh the costs.

Finally, the governments of both developed and developing countries will have to attack the main argument of the anti-globalizers, namely that globalization keeps the Third World poor. We do not have to look any farther than Malaysia to see that this is not true. Years ago, Malaysia's government decided that Malaysia would open itself to trade and investment, to globalization (although the g-word had not yet come into vogue), and the result was an astounding economic success story.

Malaysia's government made the right decision at a time when the governments of many other countries made a different decision, and today Malaysians are enjoying the rewards. Do we really want to stop globalization and prevent other countries from making a positive choice?

This is an important question, because, as governments, we can stop globalization by again erecting barriers. But, if nothing else, for the sake of the disadvantaged in both our countries and elsewhere, I hope we will choose growth.

H.E. Jean C. McCloskey, High Commissioner for Canada

Perspectives on the Knowledge-Economy

The Knowledge-Based Economy: Facts and Theories*

Richard G. Harris

"The OECD economies are increasingly based on knowledge and information. Knowledge is now recognized as the driver of productivity and economic growth, leading to a new focus on the role of information, technology and learning in economic performance. The term "knowledge-based economy" stems from this fuller recognition of the place of knowledge and technology in modern OECD economies" (Paris: OECD, 1996).

I. INTRODUCTION

Let's start with a confession. The knowledge-based economy (KBE) is mostly wishful thinking on the part of academics, bureaucrats, technocrats and other visionaries. But the idea that knowledge creation should prove to be the most important determinant of growth in living standards and new job creation has

---

* For presentation at the MIER National Economic Outlook Conference, Kuala Lumpur, November 20-22, 2001, under the auspices of the CIDA-funded Queen's-MIER Project. This presentation is based on a paper originally prepared for the Queens' Management Research Centre for Knowledge-Based Enterprises. I am grateful to my CIAR colleagues for numerous discussions on these issues. The views expressed herein are mine alone.

certainly attracted an enormous amount of attention on academia. The purpose of this paper is to explain why the knowledge-based economy is attracting so much attention, what it is about, how it differs from other paradigms of growth and development, and what the broader economic implications of its rapid growth might be.

The knowledge-based economy concept appears to have emerged in the depths of the early 1980s recession as traditional industries struggled with brutal problems of excess capacity, and falling profitability, and as governments wrestled with ballooning deficits and declining real incomes.[1] The notion began to circulate that this recession also marked the beginnings of a great new era, the *third industrial revolution*, founded on new technologies rooted in computers and the potential of new information technologies.[2] There was certainly little evidence that the new technologies were having a major payoff in terms of economic growth. And in many ways the trends of the 1980s were more or less the trends of the entire post-war period. An increase in the share of economic output and employment in services, a mirror image decrease in agriculture and manufacturing, the continued and unrelenting fall in commodity prices (which had been going on for a century with a brief upward move in the mid-1970s), and increased growth in international trade and investment. Corporations continued to get larger, employees continued to get smarter at least as measured by the number of degrees, and Japanese trade surpluses never ended. The pessimists in the US fixated on the de-industrialization of the American economy, and what appeared to many as the irrevocable decline of the American economic system.[3]

The KBE was a more optimistic and intellectually durable version of post-industrial economy themes. Earlier post-industrial themes had relied largely on the notion that the age of the smart machine, and in the mid-1980s that meant industrial robots, was going to lead to an ever larger service economy with employment and income generation dominated by sectors such as tourism, house cleaning, insurance companies, and airlines. As Baumol (1973), Fuchs (1968) and others had pointed out, service-led growth in the post-industrial era had one

---

[1] Knowledge economics has been around for much longer. For an early treatise see Machlup (1962).

[2] The first industrial revolution was the period associated with the steam engine and the railroad. The second industrial revolution is associated with electricity, the automobile and Fordism production systems.

[3] Looking back, there was an endless stream of books, popular and academic, which attempted to diagnose the "problem" with the American economic system, and by association the Canadian economic system. For one overview of the debate from a Canadian perspective as it stood towards the end of the decade see Harris and Watson (1993).

unfortunate consequence – productivity growth was doomed to slow and thus the growth rate in the standard of living was doomed to slow. Many services by definition do not experience productivity increases. Baumol's example was a string quartet. Once the quartet reaches a certain degree of perfection in playing, further "productivity increases" measured in terms of the listening experience of their audience were unlikely. Once 90 percent of the economy was employed in services productivity, growth seemed destined to hit zero. At that point real economic growth was doomed to stall. Most of the evidence beginning with the OPEC oil shock in 1974 seemed to confirm this grim view, as the great productivity slowdown set in. Per capita income growth slowed to well under one percent after more than two decades of growth of roughly 2.5 percent per annum. Things looked bad.

A number of observers who were particularly interested in the potential of the silicon chip and digital technology began to look beyond the robot as the quintessential smart machine, and took note of the rapid intrusion of this new technology in a wide range of applications. Also compelling about the new software and personal computer industry was the rather small scale at which new firms entered and appeared to flourish. This gave rise to a renewed enthusiasm among some economists for the Schumpeterian vision of capitalist creative destruction. A new vision of the growth process began to percolate through the psyche of the US intellectual class, and heroes such as Bill Gates and Steve Jobs emerged as the new generation of American entrepreneurial heroes. For a long time there was no single analytical framework that effectively articulated the essential characteristics of the emergent technologies and the forces they were beginning to unleash on the economy at large.

Over time, however, the idea that appears to have stuck is the concept of the "knowledge-based economy" – the KBE. There have been various versions offered but in the simplest terms it is the notion that economic wealth is created through the creation, production, distribution, and consumption of knowledge and knowledge-based products. The economy of bricks and mortar was being replaced with software, CDs, and digitized DNA codes. The metaphor was completed with the emergence of the Internet. Just as the railroad and the interstate highway system facilitated the full realization of the era of industrial Fordism, the Internet was seen as the physical infrastructure on which the knowledge-based economy would flourish. There are other visions of the knowledge-based economy. Two popular ones are the "weightless economy" and the "information economy." The first notes that economic value seems to be increasingly concentrated in non-material objects.[4] The second focuses on the important role that information and communication has come to play in the modern economy. The KBE concept embraces both of these but tends to be more general. Weightlessness does not seem to be the most important

[4] Quah (1997) is one of the proponents of the weightless economy paradigm.

characteristic of the current wave of economic growth. A lot of heavy objects can still have a lot of knowledge embodied in them – Boeing 747s and hospitals for example. The "information economy" on the other hand, misses a lot of knowledge created by individuals and organizations that is disseminated by means other than the information highway. Other examples include university lectures, advice from your accountant and/or doctor, and the experience of a trip to a foreign country. This may be splitting hairs but you get the point.

The great virtue of the knowledge-based, post-industrial vision was its firm rejection of the economic law of diminishing returns, and its corollary – slowing productivity growth. A new piece of knowledge (a) could be applied an infinite number of times with no deterioration in its value due to repeated use, (b) was infinitely durable through both time and space, and (c) could be stored at low to zero cost in the new digital mediums. This in turn led to entirely new visions of economic growth based on the creation of new knowledge and its applications. It offered an enormously optimistic view of the future. While a service-led post industrial economy was doomed to ever higher restaurant prices and dead-end jobs, a shift to knowledge-based growth promised ever increasing wealth based on the emergence of entirely new goods and activities. In a way, it was Baumol's string quartet metaphor turned on its head. A string quartet could never get better at playing a given piece of music; hence the natural limits to its productivity. But the value of playing that particular piece could be replicated an infinite number of times once embodied in a digital recording, and furthermore the cost of that replication was extremely small. The new economy seemed to throw out numerous examples of products that displayed similar properties – software being the most visible example – but there have been many others.

Economic activity based on knowledge production, consumption or distribution is not a new idea. It has played an important but not overwhelming role in economic analysis since Adam Smith's day. What was "new" was the vision that it was about to become the major or even the most important aspect of the economy. The KBE is that part of the economy where new jobs, and new wealth were being created and thus had a definite appeal to the younger generation. The KBE paradigm is also essentially a judgement about the quantitative importance of knowledge in the economy. It has not been without its critics.[5] One critique has been that the knowledge-based economy is really just another part of the service economy. The service economy continues to grow as technological change in the production of physical goods releases resources and human creativity to be applied elsewhere. According to this line of thinking, the real story is post-industrialism. We owe it all to robots and the green revolution.

---

[5] The critics of the knowledge-based economy usually make the simple point that the share of the economy devoted to what many people think of as knowledge creation, i.e., research and development in both public and private sectors, still account for a relatively small part of the economy. We shall review some of this evidence in Section IV.

Another set of critics points out that the measured productivity gains from all this "knowledge" are barely perceptible.[6] Measured real income growth has continued to move along at its historic pace in the 1 to 1.5 percent per annum range and therefore the idea does not yet pass the test of aggregate economic significance.

I am not going to focus on the critics however. Rather, the purpose is to see just where the knowledge-based economy paradigm has taken us thus far and its potential as an intellectual framework in which to understand the structural changes the industrial economies are now going through.

There are three areas that the paper will focus on. First, a discussion of the new analytical paradigms that are emerging regarding the production, distribution, and consumption of knowledge. It appears that knowledge is definitely a different object than steel, wheat, or haircuts and traditional theories of the market system based on notions of physical commodities or services, established property rights, prices, and freedom to buy and sell, needs some substantial re-thinking. With this comes reformulation about some fairly traditional ideas such as (a) the market always delivers the most efficient allocation of resources, and (b) factors of production are rewarded approximately by the value they add at the margin to productive activity. In Section II of the paper, I will discuss some of the major analytical contributions that have been made with regard to how a knowledge-based economy differs from the traditional economy.

Perhaps the most important application of the concept of the KBE is to economic growth. In Section III, knowledge-based growth will be reviewed. The theme of endogenous growth has been a major pre-occupation of economists for over a decade and a half now. Probably the most enduring aspects of that literature relate to the notion that long-term economic growth is ultimately both constrained and driven by knowledge creation. We are beginning to get some hard evidence and the paper will review what we know. Along the way, I also review the evidence on some of other key empirical relationships which distinguish the KBE – in particular, the quantitative significance of knowledge spillovers, and the role of intellectual property rights in creating incentives for private sector knowledge creation. The prospect of better understanding the question of "The Wealth of Nations" has been a major motivation for much of the economic research on the KBE.

Virtually all new and successful analytical paradigms in economics are accompanied by new schema for categorization and measurement. The KBE is just beginning to have an impact in this dimension. The national statistical agencies have not re-organized their entire collection of economic data yet, but they and others are beginning to look at the old data in new ways. The last part

---

[6] This is the debate about whether the US "new economy" productivity boom is happening or not. See my discussion in Harris (1999).

of the paper attempts to see just how successful they have been and asks the question "Is the KBE for real?" Ultimately for the majority of economists this is where the "rubber hits the road" – if you can't see it in the numbers then it's probably not worth worrying about.

II. THE NEW ECONOMICS OF KNOWLEDGE

It is generally recognized that knowledge fits poorly into the economist's tool-kit. There have been a number of attempts to push knowledge into a conventional economic framework of commodities, prices and production functions with varying degrees of success. More radical theorizing is underway, but we are no doubt in the early stages of an intellectual paradigm shift.[7] The KBE has yet to seriously challenge the market system as the fundamental mechanism for resource allocation. Economists are, however, re-thinking some of the ways they model markets and the potential for the KBE to enhance the effectiveness of markets. Salient examples such as Internet auctions and amazon.com abound. Management theorists are re-designing the corporation and new business models are being tried and discarded with great rapidity. Keeping up is difficult. In this section, we review how economists are thinking about the KBE.

Knowledge as Factor Inputs

Probably the first and most conventional of the economic approaches has been to treat "knowledge" as another input to the production process, the same way that capital and labour are treated. At the same time it is recognized that knowledge is produced using scarce economic resources so it is more like capital than it is like land, or even labour. This apparently innocuous change to conventional neo-classical theory, pioneered in the "new" growth literature, has three important implications. First, knowledge is costly to produce and therefore "more knowledge today" requires the economy produce reduced quantities of other goods and services. That is, knowledge creation is an investment and is subject to all the economic calculations one would apply to any other type of investment. Second, knowledge once created contributes to the productivity of other factor inputs such as capital. This is yet another way around the law of diminishing returns. With enough new knowledge, the marginal returns to additional investment do not decline – something that fits well with observed data on long-run historical rates of return in the advanced economies, for

[7] See the entertaining discussion by Brad DeLong and Michael Froomkin on "The Next Economy" available at http://econ.161.Berkeley.EDU/Econ_Articles/newecon.ht.

example.[8] Third, knowledge accumulates. This seems trite but true. The libraries store the collective wisdom of the ages. For most societies this knowledge both grows and accumulates over time much the same way that capital does. There have been a couple of instances in history were knowledge stocks seem to have been lost but these appear to be rare.[9]

With accumulating knowledge and non-diminishing returns one quickly gets to a theory of endogenous growth as postulated by Lucas and Romer. High rates of knowledge acquisition lead to higher rates of investment; moreover, these investments have non-diminishing returns. This in turns leads to either sustained or accelerated economic growth. This type of economic model has certainly changed the mindset of economists on "engines of growth." The evidence remains mixed, however, on the details of this engine.[10]

Knowledge as a factor input has led to variants of the above theme in which knowledge is embodied in some other material factor input. These have included stocks of research and development (R&D) and human capital.[11] In the first case, "knowledge" is represented as the cumulative spending on R&D over a number of years and is now used in statistical studies of economic growth. It has the accounting dimension of other forms of intangible capital and therefore fits the economic framework well. It, however, has some obvious problems. First, much knowledge is created in places other than the R&D labs of business and government. R&D is perhaps more usefully thought of as an indicator of innovative activity at the level of commercial application rather than as a useful proxy for the creation of new knowledge. It can, however, be measured.

Modern growth theory relies heavily on human capital as a metaphor for knowledge. Human capital as a proxy for knowledge makes sense because humans create and transfer most knowledge. More human capital in the form of higher levels of education and skills of a given labour force would certainly be correlated with more knowledge. It is not, however, the only means by which knowledge affects the economy. Most economists agree that human capital is an essential complementary factor to both the creation of new knowledge and the

---

[8] Neoclassical economics is pretty much a failure on this score. Robert Solow observed a long time ago that 90 percent of long-term growth cannot be explained by capital accumulation. He dubbed the 90 percent residual "technical change." It is also the major determinant of long-run rates of return on investment in physical capital and education.

[9] Richard Lipsey discusses some of these cases in his forthcoming book *Time, Technology and Markets: Explorations in Economic Growth and Restructuring*.

[10] Jones (1999) and Temple (1999) contain useful discussions of the evidence on endogenous growth.

[11] These are the two most popular. In open economies foreign direct investment has also been used as a growth driver based on the idea that foreign knowledge comes packaged with FDI.

application of knowledge in economic processes. Beyond that, however, human capital as knowledge seems to be only part of the story.

Knowledge as Information Objects

The classic information object is a bit string of 0s and 1s stored on a computer disk. Thinking about such objects can get you a long ways inside the heads of economists who have been writing on this subject. For years "knowledge" was treated the same as "information." Arrow (1962) in a justifiably famous article pointed out that information had certain properties quite unlike other economic goods. He made a number of points that have been thoroughly adopted by modern economists. Arrow drew upon the literature of the day that was concerned with identifying under what circumstances, markets would operate effectively or not – the "market failures" literature. The information object analogy is clearly subject to limitations. Knowledge is a much broader concept than information. Information is the *know-what* and *know-why* components of knowledge or "codified" knowledge. You can think of codifiable knowledge as anything that can be stored as a bit string and thus sent along the information highway. Knowledge as a commodity on the information highway is probably the most popular vision of the KBE. A lot of non-codifiable knowledge is *tacit*; it is embedded in people and in particular contexts. Tacit knowledge is usually learned first-hand or by doing and cannot be easily transferred across individuals or firms. Tacit knowledge does not fit well into the information object box. Looking at knowledge as information, however, creates an interesting set of resource allocation problems.

Infinite Expansibility or Non-Rivalry

Arrow observed that in many cases a piece of information once created could be made available to all at low or zero cost. Conventional economic goods have a direct private opportunity cost – an apple consumed by you is an apple not consumed by someone else. Information on the other hand has the characteristic of being *non-rival* or capable of *infinite expansibility*. In theory, making a piece of information available to Tom can be done at zero cost once it has been made available to Jane. In some instances, disseminating information does have significant costs. When we think of knowledge instead of information, these costs becomes more obvious. Newton invented calculus, and those ideas are freely available in books. However, the real resource cost of teaching students calculus is far from zero as I can personally attest. Moreover, what people do with that "knowledge" is quite another matter.

Excludability

Most private economic goods are "excludable." This is a natural property of the goods which serves to define and enforce property rights. A seller can naturally *exclude* if the act of production and sale allows her to "naturally" prevent others from consuming the same good or service. This in turn allows the seller to collect a price for selling the good when she chooses to transfer the "rights of ownership" of that good. A lot of information and knowledge is naturally not excludable, or at least only at some significant cost such as the enforcement and creation of intellectual property rights. The digitization of knowledge leads to excludability problems. One can easily copy software, even though it may be illegal to do so: an excludability problem. The problem is not trivial. The software industry in the US estimates it loses as much as 25 percent of annual revenues due to illegal copying.

Transparency

Arrow noted that information is often less than transparent. You don't know what you know until you know it! An apple is a fairly "transparent" object and therefore it is easy to decide when an apple has been produced, delivered, sold, consumed, etc. For complex information objects, this is far from the case. Verification of what such an object contains is often impossible. Elsewhere, the discovery of information only comes about with considerable experience in use – sometimes known as tacit knowledge. Moreover, consumption of the knowledge object cannot, in many instances, be separated from the act of production. Think of a song sung by a great vocal artist. In the absence of codification, the "knowledge object" must be enjoyed by physical proximity between the producer (the singer) and the consumer (the audience).

The joint problems of non-rivalry, lack of excludability and transparency have led economic theorists to draw analogies between the knowledge economy and the information economy. We cannot rely on private markets to efficiently produce and allocate information objects for these reasons.

In a conventional market, prices do many things. First, they signal scarcity and convince producers to invest in additional production to meet demand. Second, prices serve to ration available supply amongst competing users; supply is allocated to those who attach the highest value, resulting in the greatest total surplus. This leads to the famous invisible hand proposition that a free functioning market with well-defined property rights leads to an "efficient allocation of resources." There is nothing morally or ethically virtuous about this outcome, however, as who gets what reflects the distribution of wealth in society. Nevertheless, the market has proven to be one of the most effective institutions in terms of contributing to human well-being.

Classical markets, however, do not work so well with information objects. On the supply side in the face of non-rivalry or infinite expansibility, efficiency requires that all users who value the information at anything greater than zero be allowed to access or "consume" that knowledge. Thus, producers collect no revenues and have no incentives to produce valuable knowledge. Lack of excludability exacerbates this problem further. If it is impossible to prevent illegal copies of the information, producers cannot collect returns on their investments in producing new knowledge. The lack of transparency further complicates efficient contracting between interested parties. If you are a provider of complex software code, how do we verify that the contract has been met? Deliberate obfuscation on the part of sellers creates moral hazard problems for buyers. Even without seller opportunism, buyers may not be able to distinguish good sellers from bad sellers leading to inefficient statistical discrimination (adverse selection) which in turn destroys the depth of the market.

Intellectual property rights have been one response to the problems of information supply. Either patents or copyright protection provide producers with some protection that allows them to recover their costs of investment in knowledge creation. Much of the existing work in economics simply assumes these property rights exist and are completely enforced.

The actual production of knowledge has another characteristic that also creates problems for markets. Much knowledge production is characterized by fixed costs which create increasing returns to scale; the average cost per user of a piece of information declines dramatically as the number of users increases. By themselves, increasing returns, or economies of scale, tend to induce natural monopolies or oligopolies, where market power abuses are prevalent. The history of capitalism is a saga of tension over the desire to promote efficiency through the realization of scale economies and at the same time curb the abuse of market power that may be created by large scale enterprises. Knowledge creation is no different. Using patent protection as a "model," the organization of the production of knowledge implies a willingness to accept limited periods of temporary monopoly in return for assurances that market forces will provide sufficient investments in knowledge creation to solve the fixed cost problem. This corresponds to the old Schumpeterian notion that dynamic monopolists are a visible and important feature of an innovative economy. Knowledge creation is characterized by many of the structural conditions that would normally lead to market failure, a problem in this instance effectively solved by limited monopolization.

Even a bit of competition, however, can be problematic. Markets with very low marginal costs and sunk, high fixed costs are prone to price competition that can be ruinous.[12] (Canadian airlines come to mind?) Firms have strong incentives to avoid this type of destructive competition. Possible solutions

[12] A sunk cost is one, which once incurred, is non-recoverable

include collusion among rivals, or the eventual emergence of a dominant firm. In either case, profitability is restored but at the cost to the consumer of higher prices. Knowledge industries, therefore, are precisely those where perfectly competitive markets are not likely to work as well as we would wish. The current anti-trust case against Microsoft may well be indicative of the type of policy problems the KBE is going to create with increasing frequency.

Monopolization of a knowledge industry can lead to two types of social losses. First, consumers lose from prices set above the incremental cost of production. Secondly, monopoly can in some instances slow down the pace of innovation. A monopolist whose dominant position cannot be threatened will lose the incentive to innovate, depriving consumers and society of the appropriate level of investment in knowledge creation. The bottom line is clear – some competition is almost certainly better than none. The major argument against competition with large economies of scale is the costs associated with unnecessary duplication. Why have two labs if one can do it more efficiently? In knowledge industries, the major argument against this is that there is usually some value in multiple attempts to create new knowledge given the vast amount of uncertainty surrounding the whole process.

Worries about the social losses, due to the restrictions on knowledge that monopolization leads to, may suggest other institutions for organizing the production of knowledge. In many realms, particularly basic science, knowledge is created as a public good. The state, or other institutions such as private patrons, sponsor research scientists whose results are made freely available for all concerned. This is the "open science" model most of us are familiar with, and is the basis for most university organized research in Anglo-Saxon countries. The model suffers from its own problems: there is no assurance the scientific community will allocate resources to the objectives which are most useful from a social point of view; there is no assurance that the absolute size of resources allocated to knowledge creation is in any sense optimal. Recently, critics have challenged this model in a number of countries including Canada. They have called for a move from "open science" towards commercially applicable science, resulting in rewards that are potentially appropriable by the institutions involved. It is not clear whether this is a short-term problem which has occurred due to problems in the public financing of universities, or whether it represents a longer-term shift in response to structural change in the economics of knowledge production. The earlier model emphasized the benefits that flow from public availability of new knowledge. The new model stresses supply-side incentives for knowledge production that protected rent appropriation creates.

Knowledge Products

Pure knowledge goods such as those produced in research labs and think tanks may only be a tip of the full measure of the knowledge economy. Much of the writing on the information or digital economy invokes other images. We can think of knowledge products as goods or services that *embody* knowledge. Examples include software, digital media and storage devices, databases, entertainment products such as computer games and DVD videos, instructional material, and a host of Internet provided services. For example, multimedia services sometimes called the "new media" combine digitized text, data, audio and still (but increasingly also moving) visual content distributed via physical media such as CD-ROM or the Internet.

For the proponents of the knowledge economy, these goods are often thought of as embodying the demand and supply characteristics of knowledge itself high fixed costs of production, low marginal costs of dissemination, increasing costs to exclusion, and in the case of many digital media, relatively low costs to illegal copying, and lastly product complexity or lack of transparency which makes customer-supplier interaction valuable. There is another characteristic of these markets, however, in particular areas that has contributed to the market power problem. Network externalities have raised the return to product standardization and created a "winner-takes-all" environment. Microsoft's Windows operating system is the best known example. Fifteen years ago there was considerable optimism in the network literature that competition would work so dominant firms and technologies would not emerge. It now appears that optimism may not be justified in industries with strong network effects. How pervasive these examples are in the knowledge economy remains to be seen. Certainly, large chunks of the knowledge-based economy appear to be quite competitive.

The experience of the software industry parallels, in part, some of the developments in the early broadcast media such as radio and telephone, and suggests that the conventional model of a business selling a product for a set price will not work. The knowledge-based industries characterized by large fixed costs and low marginal costs have a difficult time recovering costs through price competition. The business model that appears most common in these sectors is one of *product bundling*. The firm gives away low cost basic product, say a word processing suite, and then bundles with that product a set of services or ancillary products which it charges. This model is now cited as the most common model for Web-based business. Some economists have labelled this the "gift exchange" model. The seller gives away a "gift" in return for another gift from the consumer – say, loyalty or willingness to read the advertising on the web site. Perhaps much of the angst surrounding the business model for digital products will vanish when full encryption and digital watermarking technology arrive. Full encryption will ensure an effective payment mechanism that is

secure and invokes mutual trust in both the buyer and seller. Digital watermarking promises to eliminate illegal duplication effectively creating unique digital products to which well-defined property rights can be assigned. Under these circumstances, a knowledge-base industry producing codified digital products will be left with the basic problem of scale economies and transparency issues. These are hardly novel and it would be reasonable to expect that market structures of the monopolistically competitive variety will naturally emerge. Firms will compete on price, product quality and variety. The type of competition that occurred in the automobile industry as it matured in the middle of this century may not be all that different from what will happen in the knowledge product sectors.

Knowledge as Spillovers and Localization

Much of the early information analogies stressed the idea that knowledge once created was easily assimilated by potential users; these users essentially appropriated the benefits of the knowledge at little private cost to themselves. New views on knowledge emphasized the non-intentional "spillovers" of knowledge from one sector, firm or government, to another sector, firm or government. These spillovers have all the characteristics of an externality. Conventional economic analysis suggests that producers of activities that create positive spillovers should receive a subsidy to encourage the appropriate level of activity. Knowledge was thus viewed in the same vein. Since knowledge spills over, usually with positive effects on the recipient, it too should be subsidized. This particular metaphor has received a great deal of attention, and fortunately has received considerable amount of empirical testing about which more will be said later.

That knowledge creation produces spillovers is hardly questionable. At issue is the extent of the spillovers and just how pervasive they are. The economist's typical response to the spillover argument in other contexts is twofold. First, they are notoriously difficult to measure and therefore "policy" recommendations based on vaguely measurable spillovers have always been difficult to defend. Second, we know that both the agents initiating the spillover generating activity and those on the receiving end are often fully cognizant of what is going on. This immediately creates Coasian bargaining incentives to solve or internalize the spillover. Why wouldn't this happen in the case of knowledge spillovers?

Part of the answer was precisely formulated in Romer's early models of knowledge spillovers. It also turned out this was an essential feature of the theory that generated endogenous growth. Knowledge is special in that it serves as the basis upon which future knowledge is created. We characterize this by saying that the creator of an idea today "Stands on the Shoulders of the Giants" that preceded. Ideas created in the past serve as the basis upon which ideas today

depend. In almost any area of commercial or scientific research, this principle is so obvious that it is immediate to any school child and certainly to any knowledge producer. The implication, however, is that the important spillover in knowledge production is the one which occurs through time. A producer today cannot bargain with all the potential users of that knowledge in the future. This inability to contract with future beneficiaries creates a natural form of spillover. The existence of this spillover will imply that generally the resources devoted to knowledge by competitive, unregulated markets will be too low relative to some social optimum. More importantly, this type of spillover creates a form of increasing returns that can sustain growth in an economy otherwise facing diminishing returns. This is essentially Romer's argument as to why growth has not slowed in the last 200 years.

Knowledge can spillover in other ways, however. Many of the observations about the knowledge economy relate to the importance of *geographic-based* spillovers. The fact that economic clustering seems to be occurring in knowledge-intensive sectors such as biotechnology, software, and IT hardware suggests that such spillovers are commonplace. What explains the geographic proximity? Face-to-face interactions amongst employees and researchers with similar interests are the principal mechanism by which knowledge is transferred. Other accounts stress that the exchange of goods and services facilitates interactions that also lead to knowledge transfers. Note these transfers are inadvertent and confer benefits that are not fully appropriated by the original creator of the knowledge. Nevertheless, they tend to be self-reinforcing and can set up a virtuous cycle of knowledge spillovers that tends to "lift all boats."

It is probably fair to say that the "spillover" view of knowledge has been one of its most durable themes and has led to the emergence of much related literature in the areas of the organization and emergence of firms, the structure of labour markets, international trade and foreign direct investment, as well as public policy toward high technology sectors. Some critics are worried, however, that spillovers can be used to justify government subsidies to industry. On this score, they have reasons to be worried; public support for research-intensive industries is high in the industrial countries. Whether these subsidies (or tax expenditures) are justified remains one of the most contentious areas in economics.

Knowledge and Income Distribution

One of the most important economic developments of the last two decades has been the continued deterioration in the wages of unskilled workers relative to skilled workers. The percentage gap between the average wage earned by the upper quartile (above the seventy-fifth percentile) and the average wage earned by the lower quartile (the twenty-fifth percentile and below) remained roughly

constant between 1959 and 1970. From 1970 to 1988, this gap increased 22 percentage points; the 53 percent gap in wage income that existed between the two groups in 1970 had widened to 75 percent by 1988.[13] The now standard explanation for this change has been what is termed skilled biased technological change. During 1979–1998, real wages increased 8 percent for male college graduates but fell 18 percent for high school graduates. For women, the weekly wage gap between college and high school graduates increased from 43 percent in 1979 to 79 percent in 1998. The emergence of new technologies beginning approximately in 1974 – the accepted date for the beginning of the great productivity slowdown – led to increased demands for skilled workers relative to unskilled workers. This reversed the previous long-term trend of rising wages for all skill groups.

The emergence of the skill gap suggests little about the knowledge-based economy except that if the KBE is growing relative to other parts of the economy it suggests that the demands for skills should rise. "Knowledge workers" are certainly the employees most in demand in a wide range of activities, from computer technicians, through physical therapists to marketing specialists. The use of new technologies generally improves the "*skills base*" of the labour force in both manufacturing and services and lead to higher wages. These new technologies are usually complementary to the activities of knowledge workers.

There is a more direct link, however, between the KBE and income distribution. This is what is known as the "superstar" phenomena first noted by Rosen (1981). What is startling about the US income distribution is the emergence of extremely highly paid individuals in a number of fields – sometimes referred to as *superstars*. Often their compensation is based on stock options and many of these individuals are in the new high technology sectors. Of the world's wealthiest people in 1997, four worked in software, two in computer hardware, and two in media. In a series of studies on the US biotechnology sector, Darby and Zucker (1994) identified the role of the key superstar scientist, most often located in a university lab, or the successful biotechnology firms. They find that the scientist superstars managed to appropriate about 80 percent of the total economic rents created by their discoveries. This is a remarkable reversal of the general view on the social versus private returns to innovation. One hypothesis is that the structural shift towards the KBE is responsible for this development throughout the economy.

The argument goes as follows. As knowledge creation has gained relative importance in total economic activity, the economic rents to new knowledge have risen. Furthermore much of this knowledge is embedded in individuals. In the past, the benefits of a new industry or technology were shared amongst the innovator, shareholders, workers, and consumers. Recently,

[13] See Juhn *et al.* (1993).

however, the innovators themselves have been extremely successful at capturing a great deal of the economic surplus. The key here is the distinction between hardware and software. The first and second industrial revolutions were all about hardware – the ability of a machine to substitute for human muscle. The machine or hardware was the essential embodiment of the innovation. Innovators could not appropriate a lot of the surplus created by these innovations independent of the industry producing and supplying the machine. Diffusion was slow and costly. Scale loomed large in the background. Large industrial production plants were necessary to produce the machines on a scale that made them widely available. Capitalists were initially able to extract much of the surplus, and then with the emergence of competition, consumers subsequently gained.

The other aspect of the distribution mechanisms is what Rosen referred to as the "winner-takes-all." Individuals working in these sectors most of the time earn relatively normal wages, but every now and then there is an idea developed which proves to be an enormous success. Participating in the knowledge creation industry is therefore like buying a lottery ticket. Rosen asked why it wouldn't be more sensible for people to get together and pool their claims, with some form of sharing of the returns to the winning idea. This is after all what has often occurred in the past in research organizations, in universities, and the defense sector. One answer might be that the new knowledge industries are subject to much greater competition than they used to be. Sharing rules won't work if the lucky winner goes off and sets up his own firm, before the full potential of the technology is realized. This seems to be exactly what has happened in the US biotechnology sector.[14]

The knowledge-based economy has also brought the producer of knowledge much closer to the consumer in many instances. Many of these industries are not capital intensive and competition amongst potential *capitalists* who wish to market and distribute a given piece of knowledge is intense. Many of the *knowledge products* are also not protected by patent law. The bottleneck in the supply chain becomes the individual creator. Therefore we tend to see *expost* successful knowledge creators earning what appear to be huge sums. These are simply the KBE equivalent of the industrial fortunes created late in the 19th century and early in the 20th century.

The implications of this development are not yet fully understood. Social concerns about the income distribution in society are certainly one possible longer-term political consequence. Thus far the labour movement does not, however, perceive itself to be particularly disadvantaged by the high technology sectors, so it has been relatively silent. In the long-term, however, there are likely to be political and social ramifications if the benefits to the KBE do not shift to the rest of the economy. I think there are reasons to be optimistic

[14] See Darby and Zucker (1994).

though. Certainly consumers on the information technology side have been major beneficiaries of technological advances in that sector. The price of a new computer has plummeted over the post-war period at an average annual rate of about 19 percent. Hence, a new computer costing $5,000 in 1987 would have been priced at $2 million in 1955. The phenomenal rise of IT investment as a fraction of total equipment investment (less than seven percent in 1954 compared with 50 percent now) implies that these price reductions have become very significant at the aggregate level in terms of increasing real incomes. Communications has also experienced real price declines, although only by a relatively modest, but still spectacular, eight percent per year for the last 70 years.

Just how far the "superstar" phenomena will go is not at all clear. There are a couple of reasons that suggest it may not be as pervasive as imagined. First, outside the US the trend is not nearly as strong. Second, the shift to superstar compensation mechanisms has coincided with the US stock market boom. Corey Rosen, executive director of the National Centre for Employee Ownership, estimates that option plans for non-management employees now have as much as $1 trillion in them, and that, in total, at least six to ten percent of corporate equity is held by, or on behalf of, non-management employees.[15] Blair and Kochan (1999) predict that by 2000 more than one-quarter of all publicly traded companies would have at least 15 percent of their stock in employees' hands.[16] Indeed, anecdotal evidence suggests that many firms that have grown to substantial size since 1991 compensate employees, in part, with stock options and are now substantially employee-owned; Starbucks and Home Depot in retailing and Microsoft and Intel in the high-tech sectors are salient examples. One reason stock options have become such a popular way to compensate management and employees in recent years is that taxes are deferred on compensation received in that form. But in a declining market, employee morale could suffer, and stock options could lose their appeal (unless companies are willing to "reprice" the options, a move that could trigger opposition from shareholders). Employees who were happy to share the rewards of equity participation in good times may suddenly decide they prefer higher wages. A major reversal in both the stock market trend and the popularity of options may change our view as to how pervasive the "superstar" phenomena is in the KBE. At the moment, it remains an intriguing and potentially important development.

---

[15] Reported in the Brookings Policy Review (1999) Fall.

[16] See Blair and Kochan (1999).

Knowledge Networks

There is an enormous emergent literature, most of it theoretical, on "networks." The Economides (1996) web site is a standard source. The OECD has placed considerable emphasis on the concept influenced by the work of economic historian Paul David.[17] Some accounts of the KBE place great emphasis on the role of networks of firms or networks of individuals. It is also closely related to the information economy view, with "networks" being analogous to Internet based electronic networks. One has to be careful about the use of the term though – it is supposed to be something different, for example, than a "road network" where use could be priced and value is independent of other users. In the KBE use of the term networks are valuable because they facilitate interactions of people. Elsewhere, networks are thought of more generally as linkages between firms that facilitate the transfer and diffusion of knowledge. Tacit knowledge, in particular, is supposed to be facilitated by these linkages. As an analytical concept, a "network" is also thought of as technological or socially based, as opposed to a purely market based arms-length linkages between economic agents. In some accounts, transactions between individuals on the same network are governed by social convention, long term contracting, and repeated interactions.

Networks are assumed to be characterized by "network externalities" which are very close to the idea of knowledge spillovers, but different in that network spillovers are reciprocal and related to the number of users. My value of being on a network is both dependent on, and often enhanced by, other people being on the network. Within the KBE, networks are thought to be particularly important in the process of knowledge creation. The networks promote tacit knowledge production via learning from outside partners and access to complementary assets. These relationships help firms to spread the costs and risks associated with innovation among a greater number of organizations, to gain access to new research results, to acquire key technological components of a new product or process, and to share assets in manufacturing, marketing and distribution. In a network-based KBE, innovation is thus the result of numerous interactions among related parties. These can include private individuals, corporations, universities, government agencies, and non-governmental organizations. Networks are also thought to be important in creating technological *lock in* effects and path dependency.[18] The QWERTY typewriter is often given as the classic example of a technology that was claimed to be inferior to alternatives, but was universally adopted due to network lock-in effects. So, if a group of people start to use a given technology, there are very

[17] See David and Foray (1995) for one account.

[18] See Arthur (1989).

strong incentives for others to use it; consequently if you make a "bad choice" early on it can be very difficult reverse the decision. In the KBE context, a network of knowledge creators might end up promoting technology that would then be *locked in* within the network.

There are two problems with the network-based conception of the KBE. The first is simply that, other than case studies, economists do not have conventional databases that document the significance or existence of these types of knowledge-based networks.[19] Physical networks are another matter; there are now many sources on Internet statistics, for example. The second major problem is that some economists are somewhat doubtful about the generic significance of these interactions and the potential for lock-in or market failures due to network effects. Liebowitz and Margolis have been particularly critical of the concept and suggest it has been vastly overstated as empirically significant, and useful.[20] If network effects are over a sufficiently small number of firms or other organizations, then we would expect efficient bargaining between them to internalize any of the spillovers, including learning spillovers. A network therefore is not much different from a firm or other organizational structure. It may mean we have to think a bit more carefully as to what defines the efficient boundary of an organization, but for most purposes in economic analysis, it may not be of great consequence.

I admit to being agnostic on the concept. It is possible that it will turn out to be one of the critical underpinnings of the KBE framework, but it is still too early to tell.

III. EMPIRICAL RESEARCH IN KNOWLEDGE ECONOMICS

The last decade has seen a great deal of research on some of the central issues of the KBE, in particular, the role of knowledge in driving productivity growth. This work is rooted in the specialized fields of productivity measurement, growth analysis and R&D economics, and is directed at the possible linkages between knowledge and other economic variables. The studies suffer from data limitations, as the concept of "knowledge" is, by its very nature, inherently difficult to quantify. But there has been substantial progress on a number of questions and the empirical foundations for knowledge-based endogenous growth are now much clearer.

---

[19] There are some studies that are interesting. Evidence of biotechnology networks is provided by Audretsch and Stephan (1995). See also Smith (1995) for a favourable view of networks in the KBE context.

[20] These papers are available at the website http://wwwpub.utdallas.edu/~liebowit/netpage.html.

At the risk of simplification, there are five main hypotheses or questions which researchers have addressed.

1. Do increases in knowledge, measured as either inputs or outputs, lead to increases in rates of economic growth, or equivalently, do investments in knowledge have social rates of return above private rates of return?
2. Is there is a reasonably stable production function for knowledge? Do knowledge inputs lead to knowledge outputs in some identifiable form?
3. Do knowledge spillovers occur between firms, between regions and between countries? Are knowledge spillovers geographically or industrially localized?
4. How important are patents and copyright protection for the private sector creation of knowledge?
5. How important is the public sector as a knowledge creator relative to the private sector?

Researchers have used a variety of statistics on R&D spending and patent data, including patent citations, as proxies for knowledge inputs and outputs. There are obvious difficulties with these data as will soon become clear.

Knowledge as an Engine of Growth

The endogenous growth literature pointed to a link between knowledge and economic growth through mechanisms such as learning-by-doing (Romer, 1986); human capital (Lucas, 1988); R&D (Romer, 1990a, and Aghion and Howitt, 1992). This basic hypothesis has been tested in a variety of ways, but by far the most popular has been the search for a link running from some measure of knowledge to growth in productivity. Long-term economic growth, measured for example, by growth in real per capita GDP, can only be sustained by growth in productivity.

Economists measure productivity most often by what they call Total Factor Productivity (TFP) – this is the increase in the efficiency with which a given bundle of factor inputs, capital, labour and materials, can be transformed into output. At the firm level with fairly simple products the concept is fairly clear, but becomes less so as both input and output complexity rises.

At the level of the enterprise, TFP can increase for a number of reasons including a) better process technology, b) improvements in product quality or product mix including customer service, c) improved management practices, d) employees with improved skills and adapted to new technology, and e) other firm specific attributes that may lead to efficiency increases. At the level of the industry and the economy, increases in TFP reflect the allocation of resources across firms and industries, knowledge spillovers between firms, government policy, social and economic infrastructure, and the relative efficiency of market

mechanisms. Knowledge can, of course, impinge on all of these factors. The course of history after the industrial revolution has been one in which measures of output have consistently grown faster than physical measures of inputs; and this has corresponded to the large increases in the standard of living over time. Because we now have standardized measures of TFP, it is natural to look at statistical relationships between this variable and knowledge creation. The latter is usually measured by either some measure of R&D or patent activity; both used as proxies for innovation.

In practice, estimates of the effect of innovation on total factor productivity can be obtained in two ways. One is to use a measure of the stock of R&D capital in a regression with the level of total factor productivity as the dependent variable. The second is to use a measure of R&D intensity (relative to output) in a regression explaining the change in total factor productivity. These are referred to as the *levels* versus the *growth rate* approach. The former reports a number which is the elasticity of output with respect to the R&D input,[21] and the latter reports a number that can be interpreted as a social rate of return. The majority of these "innovation-augmented growth accounting studies" have found a strong link between R&D capital and output. A recent summary of this literature by Cameron (1996) examined over 22 studies. The estimates of the output elasticities with R&D levels range from a low of zero to numbers as high as 50 percent, although most estimates are in the 10 to 20 percent range. This means that an increase in the R&D stock of 10 percent will increase output by one to two percent. Given that R&D stocks are quite small relative to output, this implies relatively high marginal returns to incremental investments in R&D. There are even larger numbers of rate-of-return studies, of which Mansfield (1980) is a famous example. These studies have also tended to find a strong and significant link between R&D and productivity growth, with the social gross (excess) rate of return to R&D ranging between 0 and 100 percent, but with the bulk of the estimates ranging between 20 percent and 50 percent.[22] The high rates of return to R&D are broadly consistent with the view that knowledge, measured as innovation inputs, appear to be strongly related to economic growth. There remains an active debate, however, as to whether these high rates of return are indicative of market failures or not, given the large amount of uncertainty that accompany most innovation projects.

Knowledge Inputs and Outputs

It is difficult to measure the innovative output of an industry. A variety of data is available, such as R&D spending, patenting, technological balance of payments,

[21] The elasticity of output is the percentage change in output due to a percentage change in R&D inputs holding other variables such as capital and labour inputs fixed.

[22] See Cameron (1996), Tables 3a and 3b.

machinery imports, and diffusion. Most researchers have chosen to use R&D spending as their measure of inputs, often for reasons of data availability and reliability, rather than on theoretical grounds. Outputs are measured either by patents, or in some cases successful innovations. There has been a great deal of work directed at trying to find a "knowledge production function" which appears to be empirically stable. If such a relationship exists, it could be used in a variety of ways, including the formulation of public policy.

At the most basic level, there are tests of the relation between knowledge inputs proxied by R&D and outputs proxied by patents. A huge empirical literature was developed in the 1980s on the relation between patents, R&D, and individual firm performance (Griliches, 1990 is a useful survey). Three main results emerge from this literature. First, private sector patents and R&D are strongly related only contemporaneously (Griliches, Hall and Hausman, 1986; 1984). Second, patents help explain a firm's market valuation and productivity, and R&D effects tend to be much larger and therefore more important for firm performance than for the aggregate economy (Megna and Klock, 1993). Third, many patents turn out to be worthless while a few are extremely valuable.

In the United States, the patent/R&D ratio declined over the 1960-1990 period and of course productivity growth slowed.[23] At least three explanations have been given for this: (i) exhaustion of research potential (Evenson, 1993, 1984); (ii) expansion of markets leading to increased R&D competition and activity (Kortum, 1993); and (iii) decrease in the propensity to patent (Griliches, 1989) and Kortum, 1993). Moreover, the patent/R&D correlation has been recently negative without conclusive corroborating evidence that innovation productivity has fallen. Thus, some analysts suggest that patents do not do a good job of proxying the knowledge outputs from the innovation process, but disagreement persists. In recent years, there has been an acceleration of patenting and some have used this to buttress the argument of "new economy" productivity change.

Knowledge Spillovers

A substantial part of the literature has devoted itself to the question of whether knowledge creates genuine positive externalities or spillovers. This has been

[23] The 1990's have seen a reversal of this trend as discussed in Section IV below.

done in a variety of ways, and more recently attention has turned to the issue of the geographic or spatial dimension of spillovers.[24]

In one of the earliest studies, Mansfield (1985) surveyed how rapidly industrial technology leaks out, with a survey of 100 American firms chosen at random from all US firms with R&D spending over $1 million in 1981. The survey was in two parts: firstly, to see how quickly a firm's decision to develop a new product was known to its rivals; and secondly, to see how quickly after development, the nature and operation of the new product or process was known to its rivals. The sample suggests that, on average, the information concerning the decision to develop was in the hands of rivals within 12 to 18 months after it was made, with process innovations leaking out somewhat slower than product innovations. Once the innovation has been developed, information concerning its operation is quickly known to rival firms. For product innovations the lag is six to 12 months, and for process innovations it is 12 to 18 months. This work supports the argument of Mansfield, Schwartz and Wagner (1981) that about 60 percent of innovations were imitated within four years.

Localization and Cluster Effects

Many studies have argued that spillovers are likely to be geographically concentrated or localized. Further light has been shed on the effect of geography on spillovers by recent work by Jaffe *et al.*, (1993), Acs *et al.*, (1993), and Audretsch *et al.*, (1994). Their work suggests that technologically-intensive industries tend to be more localized than other industries, and that information flows more easily locally than at a distance. This suggests that personal contacts, whether at conferences, trade fairs, seminars or sales meetings, are a significant transmission mechanism.

Jaffe, Trajtenberg and Henderson (1993) compare the geographic location of patent citations in the US with that of the cited patents. They find that citations to domestic patents are more likely to be domestic and more likely to come from the same state and metropolitan area as the cited patents, compared with a "control frequency" calculated from the pre-existing concentration of research activity in the area. They reach a number of interesting conclusions. First, citations are localized. Second, localization fades over time (the 1980 citations are more localized than the 1975 citations). Third, they find little evidence that particular patent classes are more localized than others. Fourth, they find that 40 percent of citations do not come from the same primary patent

[24] An example of knowledge spillovers applied at the macroeconomic level is Caballero and Jaffe (1993) who use US patent and citation data to calibrate a model of creative destruction and endogenous technological obsolescence and diffusion. They estimate that diffusion of knowledge from patents occurs with a mean lag of 1-2 years, but that the decrease over the 20th century in patent citation rate indicates a fall in the strength of those spillovers. The result is a decline in growth rate of the public knowledge stock.

class, which is consistent with Jaffe's (1986) conclusion that a significant proportion of spillovers arise from firms outside the receiving firm's technological area. Acs, Audretsch and Feldman (1993) use the US Small Business Administration (SBA) database on innovations in US manufacturing industry in 1982. Forty-six states plus the District of Columbia were the source of some innovative activity, with significant concentrations of innovative activity in eleven states, which accounted for 81 percent of the 4,200 innovations. The innovative output of all firms is found to be positively influenced by R&D expenditures within the state by private industry and by universities. Large firm innovations are particularly influenced by corporate R&D, while small firm innovations are particularly influenced by university R&D. Acs *et al.*, argue that small firms are able to generate significant numbers of innovations through exploiting knowledge created by R&D in university laboratories and large corporations. Audretsch and Feldman (1994) also examine the SBA innovation database and attempt to determine whether innovative activity is more localized than productive activity. They calculate Gini coefficients for the geographic concentration of innovative activity and manufacturing value-added in each industry, and estimate regressions to explain the concentration of innovation using the concentration of value-added, spending on corporate and university R&D within the state, and the proportion of skilled labour in the industry. After controlling for the effect of concentration of production, their results suggest that there is considerable evidence that industries where spillovers are most important (that is, where industrial and university R&D, and skilled labour are most important) are more clustered than industries where spillovers are less important. These three studies taken together suggest that there are important geographic aspects to knowledge spillovers.

International spillovers

One of the main benefits of international trade is that it creates personal contacts with other countries. The evidence, thus far, suggests that international technological spillovers are important, but cannot account for most productivity growth especially in the large countries. In the case of the smaller, more open economies the evidence for spillovers seems to be much stronger. Coe and Helpman (1995) and Bayoumi, Coe and Helpman (1998), find that small countries tend to benefit more from R&D undertaken abroad. They estimate, for example, that if the US were to increase the share of GDP devoted to R&D by half of a percent, this would have a 9 percent increase on US potential output and a 6.8 percent increase on Canadian output. The results clearly indicate that Canada is a major beneficiary of US innovation spillovers. This has been confirmed in a study by Bernstein (1997) of intra- and inter-industry spillovers between Canada and the US. For seven of the manufacturing industries Bernstein examined, US intra-industry R&D spillovers were the major reason

for productivity growth in Canada. The percentage contributions range from around 58 percent in transportation equipment to 100 percent in petroleum products. Bernstein concludes that over time, productivity growth in Canada is relatively more affected by US spillovers, than by spillovers within and between Canadian industries. The Canadian observation accords well with Coe and Helpman who argue that the countries that gain the most from foreign R&D are those whose economies are most open to foreign trade. Canada, of course, trades heavily with the United States.

Other studies find similar results but with some twists. Lichtenberg (1992) uses the Summers-Heston comparative international data set and extends it to include the effect of private and government-funded R&D as well as fixed and human capital. For a cross-section of 53 countries, he finds that labour productivity growth between 1960 and 1985 is positively influenced by the ratio of private R&D to GNP. The estimated social rate of return to private R&D investment is about seven times as large as the return to physical investment, with an elasticity of output with respect to private R&D of around seven percent. The social marginal product of government-funded R&D is found to be much lower than that of private R&D. Lichtenberg also argues that his findings suggest that international spillovers of technical knowledge are neither complete nor instantaneous.

Effectiveness of Patents and Intellectual Property Rights in Creating Private Incentives for Knowledge Creation

The empirical evidence is decidedly weak on the effectiveness of the patent system in creating incentives for knowledge creation. The knowledge stock that matters for rent appropriation is the aggregate of patented outputs from private-sector R&D. Levin, Klevorick, Nelson, and Winter (1987) conducted a survey on the effectiveness of patents. They were found to be a significant form of rent appropriation in only a few industries: drugs, plastic materials, inorganic chemicals, organic chemicals, and petroleum refining. Overall, however, product and process patents were found to be less effective than any other form of protection or appropriation. Those alternative forms were identified to be secrecy, lead time, moving down the learning curve, and sales or service. Deemed most important were the second and third of these, most usefully viewed, perhaps, as simply learning effects. The results from this survey cast doubt on the usefulness of the private R&D patenting as the dominant mechanism for protecting rents on privately created knowledge assets.

Public Sector Knowledge Creation

A significant fraction of R&D is carried out by other than profit-seeking private agents. In 1996, government-funded R&D accounted for between one-third and

one-half of total R&D expenditures in the US and Europe: in the US, 34 percent; UK, 32 percent; Germany, 37 percent; and for France and Italy, approximately 45 percent in each. This type of R&D is sometimes called "basic research" although it is likely not research content that differs so much as the incentives of the scientists involved. Most academic and government scientists do not work for profit-maximizing firms. Their incentives will not be to patent innovations for appropriating rent, but rather to disclose new knowledge in order to receive the prestige associated with priority of discovery. There are a number of possible arguments for the public support of R&D. It is risky and subject to uncertain lags; it has public goods qualities; and there may be market failures in financing. Assessing the payoffs from such projects is likely to be difficult simply because they are unlikely to have quick and direct effects on productivity.

The available evidence suggests that there are spillovers from government-funded R&D and from academic R&D. Adams (1990) finds that the output of the academic science base is a major contributor to productivity growth, but that there is lag in effect of roughly twenty years! The invention and application of the laser provides an example. The basic science underlying the laser was formulated by Einstein in 1916, but the first industrial uses occurred in the 1960s. Jaffe (1989) and Acs, Audretsch and Feldman (1992, 1993) find that university R&D can have significant spillovers, with an elasticity of corporate patents with respect to university R&D of around 10 percent. Nadiri and Mamuneas (1991) also find that government-financed R&D can have an impact on the productivity of manufacturing industry.[25] Their results suggest a social rate of return to public R&D investment of around 10 percent for US. Small firms (especially high-technology start-ups) may benefit more from these spillovers (Acs, Audretsch and Feldman, 1993). On the other hand, there may be crowding out of private R&D because the government funding displaces private efforts (the extent of crowding out depends on whether the government funds applied or basic R&D).

IV. MEASURING THE KNOWLEDGE-BASED ECONOMY

The search for economic indicators of the KBE economy is an area of research that has just begun. Most of this work is being undertaken by government agencies and national statistical agencies. The OECD, the European Commission and the US Commerce Department have begun research programs to measure various pieces of the "information-based economy." Some of this research will

[25] Other studies finding spillovers from academic and government research to private firms include Cockburn and Henderson (1997), Jaffe and Trajtenberg (1996) and Zucker, Darby, and Brewer (1994).

be discussed here. The broader aspects of the KBE economy are not measured at the aggregate level, probably because of a lack of any agreed upon framework and general problems with collecting good proxies for knowledge inputs and outputs. The whole issue of which sectors constitute knowledge sectors is something upon which there is little agreement, for example, is education and medicine part of the KBE or not? Other data that is available and internationally comparable are patent data and spending data on R&D. We also look at some recent efforts to classify industrial data by knowledge intensity and its implications for the measured size and growth rate of the KBE in Canada. All of this work can be thought of as an attempt to judge the quantitative significance of the KBE in the economy as a whole.

Measuring the Digital Economy

One view of the economic dimensions of the KBE can be had by looking at the measurement work performed on the "digital economy," also known as the "information highway." The OECD and the US government have devoted a lot of attention to work in this area for a number of policy reasons. I shall focus my comments on the US economy for which the best data are available. The growth in the digital economy is at this point, the most visible and rapidly growing part of the KBE. The data as collected does not focus on the Internet specifically. The national accounts do not yet specifically collect data on the Internet as an industry. A number of efforts are underway to "measure the Internet" but most of them are not conventional economic measures of value but rather statistics on number connected, number of servers, number of web sites, etc. With this qualification, the US Commerce Department data is the fruit of the best effort thus far to document the importance of the new KBE sector.

Table 4.1 lists a set of IT industries distinguished by the hardware-software categorization. This list is used with the standard industrial data collected by the US Commerce Department to construct various snapshots of the size of the information economy. Various ways of looking at this are possible. In Figure 4.1, we see that the share of the Information technology producing sectors has gone from around six percent to over eight percent of the economy measured by the real value-added produced in that part of the economy. This does not seem like an enormous change. However, viewed through other lenses the picture is different. For a number of sectors, IT equipment accounts for a large share of the total capital stock measured on a stock basis as of 1996. For industries such as telecommunications, health care, motion pictures, and a number of service industries, IT equipment accounts for 50 to 90 percent of the total capital stock of the industry as shown in Figure 4.2. A similar picture emerges when you look at the flows – IT equipment investment per worker – a measure of the relative importance to employees of the new technologies by industry. In Table 4.3, we see that IT equipment per worker ranges from over

$29,000 in telecommunications to $3,500 in the "electronic and other" industry. The pace of investment in new IT is apparently furious.

These effects go beyond a few sectors. If one looks at aggregate capital formation in the economy, IT is accounting for an increasing share of total real capital investment in the economy. Table 4.2 presents growth rates of capital equipment used in the entire economy. From 1993 to 1998, the IT share went from 33 to 58 percent. Almost 60 percent of the economy's total investment in real capital is now accounted for by IT investments.

In Figure 4.4, we see employment in both the IT producing and IT using sectors. What is evident is that in the IT producing sectors, employment is growing rapidly from 36 million in 1989 to a projected 51 million by 2006. The size of the IT using employment is smaller but growing rapidly. This classification, however, depends heavily on how workers are classified as to whether or not they are "users" of IT technology. Using broader definitions almost the entire service industry could be viewed as IT using. With respect to wages (Figure 4.5), we see strong evidence that in this rapidly growing sector wages are higher, much higher than in the rest of the economy. This is particularly true in the IT producing sectors with wages about 80 percent higher than average wages in all industries. This is a remarkable intersectoral difference.

Also remarkable are the productivity statistics for the IT producing sectors. Average labour productivity for the economy as a whole grew at an annualized rate of 2.15 percent from 1995 through the first quarter of 1999 after growing at just over one percent from 1972 to 1995. Robert Gordon of Northwestern University notes that most of the pickup in productivity is predicated on one remarkable fact – the significant drop in computer prices over the last few years.[26] Growth in IT producing sectors productivity proceeded at an astounding rate of 42 percent over the 1995Q4-1999Q1 period. This one sector managed to account for all of the increase in the aggregate growth rate even though computer manufacturing *accounts for just 1.2 percent of total output* in America. Productivity growth for non-computer manufacturing (durable and non-durable) actually declined in 1995–1999 relative to 1972–1995. Although these growth rates may not be sustainable, they are indicative of profound changes occurring in the economy.

In summary, the IT producing and using sectors, as one proxy for the digital economy, suggest that this is one sector of the KBE which is beginning to have important aggregate effects.

---

[26] See Gordon (1999).

National Knowledge Indicators

Much of the measurement debate has focused on international comparisons of innovative inputs and outputs. The rise of the KBE is assumed to be coincident with a greater importance of knowledge production in the economy. The OECD has been particularly involved in promoting the measurement issues in this area. There are two broad sets of data, which are internationally comparable: spending on R&D, and patent statistics. In both cases, there are obvious problems, as discussed in Section III, in the use of these indicators as either knowledge outputs or inputs. Nevertheless, they are widely used. Globalization has also meant that national boundaries are less relevant than they once were for the compartmentalization of the knowledge creation process. However, the simple fact is that the boundaries of the nation state also serve as the major organizational boundary for the collection of data.

In Figure 4.6, spending on R&D as a percentage of GDP for the OECD countries is presented. As is well known, there is substantial variation in this data across countries, with Canada standing well down the scale in the range of 1.6 percent of GDP spent on R&D. As an indicator of knowledge-based growth, however, R&D spending does not appear at the aggregate level to be that important. Looked at over time, the pattern is somewhat different. In the US, the number of scientists and engineers engaged in R&D increased from 0.25 percent of the labour force in 1950 to 0.75 percent of the labour force in 1990. While the share of knowledge producers is still small, it has been steadily growing over the entire post war period.

Patent data is another primary statistical indicator of innovative activity, although an imperfect one since, as noted, much knowledge creation is not patented. In Figure 4.7, the patent intensity is plotted over time for a number of countries. We correct for country size by indicating patents normalized by population. The pattern is quite variable across the OECD countries. For many countries, the indicator appears quite flat with little change over the 1970-1996 period. However, two countries stand out. These are the United States and Japan, both who have shown a substantial increase in the propensity to patent since the mid-1980s; some have argued this reflects the emergence of the new high growth sectors such as software, telecommunications, and computers which have played important roles in both these economies.

The Canadian record does not look very impressive thus far. However, when one looks at it slightly differently, the view that Canada is shifting towards a larger KBE and innovation-based sector can be made. One way to do this is to focus on Canadian patents in the US. Several reasons account for that. First, according to Rafiquzzaman and Whewell (1998, p. 5), "Canada has one of the lowest propensities to file patents at home of any of the major industrialized countries, with only 6.6 percent of national patent applications originating from residents in 1992." Thus, a natural place to look for the outcomes of innovative

activity in Canada is in the patenting abroad by Canadians. The lion share of patent applications abroad has traditionally gone to the US due primarily to the high level of economic integration between Canada and the US. From the mid-1960s through 1997, Canada-based inventors received over 45,000 patents in the US. This is a large (absolute) number, and it placed Canada as the 5th largest foreign recipient of US patents.

Canadian patents in the US were essentially flat for many years, but began to increase in the 1980s. Civilian non-defence R&D spending is a primary input to innovative activity, which result in successful patented innovations. Using lagged R&D, we can see there appears to be a high degree of correlation over time between patents and R&D spending indicated in Figure 4.8. Although Canada does not directly appear to be among the leaders in innovative activity, there appears to be acceleration in that direction more recently as integration with the US has accelerated.

Classifying the Knowledge-Based Industries

A third area of interest in terms of measuring the KBE, has been a number of efforts to develop classification criteria so as to identify those industries, which are somehow knowledge-based industries. This usually involves the identification of certain criteria of knowledge intensity on either the input or output side and then matching these to detailed Standard Industrial Classifications in order to construct other statistics such as employment or output which can be used to measure the growth and size of the KBE. A number of the industrial countries have undertaken such exercises on their own, and the OECD has done similar work on their member countries. In this section, I review the work undertaken by Industry Canada on the Canadian KBE.

At this point, there is no general agreement on which knowledge criteria should be used, and how they should be weighted in classification of industries. No standard definition of high-knowledge intensity exists. Most researchers have attempted to classify industries according to their knowledge intensity based on a single characteristic for measuring knowledge. Beck (1992) calculates a knowledge ratio for US industries by assessing the proportion of professional, engineering, technical, scientific, and senior management staff engaged primarily in innovation. In looking at Canada, he found Canadian knowledge industries are the same as those in the United States. This indicator is fairly narrow and misses much of what could be construed as knowledge-based activity. The Department of Finance (1992) identifies high-knowledge industries by measuring the employment of so-called high-knowledge workers. The study uses the proportion of total weeks worked in an industry by workers with a university degree as an indicator of knowledge intensity (calculated from Statistics Canada's 1988 Labour Market Activity Survey). Each industry is then ranked by this "knowledge ratio." The Department of Finance methodology

places a heavy emphasis on the labour input perspective and may overstate the knowledge-intensity of service industries with a high proportion of highly educated young employees, particularly during the early 1990s when the job market was quite weak.

A more recent study by Lee and Has (1996) refines these previous attempts at measuring industrial knowledge-intensity by combining several knowledge indicators based on R&D activity and human capital content of an industry. Three indicators of R&D activity are considered: 1) R&D expenditures by industry (an input measure of innovation activity); 2) the proportion of R&D personnel in total employment; and 3) the proportion of professional R&D personnel (R&D personnel with a university-level degree) in total employment. The measurement of human capital content uses three indicators: 1) the ratio of workers with post-secondary education to total employment; 2) the ratio of knowledge workers to total employment; and 3) the ratio of the number of employed scientists and engineers to total employment. Lee and Has rank industries by each of the six indicators and divide 55 industries into three knowledge groups. The industries are classified on the basis of the following rules.

An industry is classified as high-knowledge if at least two of its three R&D indicators belong to the top third of all industries and at least two of its three human-capital indicators also belong to the top third.

An industry is defined as low-knowledge if at least two of its three R&D indicators belong to the bottom third of all industries and at least two of its three human-capital indicators also belong to the bottom third.

All remaining industries are classified as medium-knowledge industries. The Lee and Has methodology has been updated and applied at a much more detailed industrial level to 155 industries by Gera and Mang (1997). Their analysis is the most comprehensive available in Canada using an industry classification approach to measuring the KBE. In Table 4.3, the Gera-Mang classification results for Canadian industries are presented. Gera and Mang (1997, p. 24) conclude:

> "The high-knowledge industries identified by this classification scheme tend to be among the past decade's fastest growing, such as electronic products, health services, and business services. Medium-knowledge manufacturing industries tend to be large, mature sectors, whose output is mass-produced and often heavily traded (e.g., motor vehicles, transportation equipment). Few service industries are found in this group. Low-knowledge industries include labour-intensive manufacturing and traditional service industries (e.g., clothing, retail trade)."

Growth rates by knowledge-intensity are shown in Table 4-4. The output of high-knowledge industries clearly expanded over the 1970s and 1980s while that of medium- and low-knowledge industries declined. The period 1981-86, however, saw the medium-knowledge group outpace both its low- and high-knowledge counterparts. This resulted largely from the rapid growth of the motor vehicle industry in those years (averaging about 10.7 percent annually). Surprisingly, the gain in relative output share recorded by high-knowledge industries was greatest during the 1970s. This may be because many started from a modest base and grew very rapidly in their first few years of existence. The high-knowledge group rebounded strongly in the 1986-91 period, more than doubling the average growth rate of the medium-knowledge sector and of the business sector as a whole. While the relative importance of the output of high-knowledge industries has increased over the past 20 years, not all of these industries have experienced rapid growth. Similarly, not all industries within the medium- and low-knowledge groups have experienced weak growth. Industries such as fishing and trapping, and personal services – both low-knowledge industries – recorded above-average output growth over the period 1986-91 as indicated in Table 4-5. Nonetheless, seven of the top ten fastest growing industries were knowledge-intensive.

Despite the superior strong growth performance of the high-knowledge industries, the majority of the Canadian business sector is still comprised of low- and medium-knowledge industries. From 1971 to 1991, the high-knowledge industries share of total business sector output went from 16.5 percent of the economy to 18.3 percent of the economy – not a mind-shaking change. The studies we have are heavily reliant on input-output tables which are updated at a detailed level relatively infrequently, so we do not yet know what the data from the late 1990s will reveal. It is probably safe to conclude that the KBE is "for real," its dimensions are still small relative to the aggregate economy, but they appear to be growing rapidly and account for a major portion of industrial structural change. The Canadian economy is moving up the knowledge scale, and this has been occurring with increased intensity since the early 1970s. International exports have generally supplanted domestic demand as the main growth factor. The KBE has become synonymous with globalization for the smaller high-income countries and Canada is no exception.

V. CONCLUSION

The knowledge-based economy is clearly an idea that is here to stay. In the last two decades, but in particular over the last decade, economists have begun to systematically theorize, measure and test hypotheses on the Knowledge-Based Economy (KBE). The pervasive features of knowledge are to be seen

everywhere in the economy. It is visibly evident in terms of jobs, new wealth, new products, new industries, and new trading links. This paper reviews three main areas of research on the KBE.

First, the new economic theories focus on knowledge creation. This includes recent theories of endogenous growth, new perspectives on the market for knowledge, the changing nature of income distribution in knowledge societies, and the role of networks. Many of these have yet to be fully incorporated into mainstream economics but are beginning to have a greater influence.

The second major area of research is empirical testing of some of the central hypotheses on knowledge creation using industry, national and firm-level data to proxy both knowledge inputs and outputs. A major part of this work has been tests of the central hypotheses about knowledge as a major source of economic growth. The initial results are encouraging and have led to a major shift in emphasis toward the economic analysis of knowledge assets produced by both public and private sectors. There is also substantial evidence that knowledge is fluid and "spills over" both geographically and in time from its original point of production. These spillovers determine the fortunes of firms, workers and regions in ways that we are just now beginning to understand.

The third major area of research, mostly by government and statistical agencies, is the measurement of the knowledge-based economy. This involves the creation of various classification schemes of what constitutes knowledge-based activity, and then attempts to measure the economic flows both into and out of those sectors. Most of the work thus far has been related to the information economy, a subset of the KBE. The early work suggests that the KBE is growing rapidly, but that Canada seems to be lagging the US.

Where does this leave us? There is need for additional work in all three areas. In the area of theory, probably one of the most pressing needs is a better theory of market structure for knowledge-based products. Very basic concepts such as how to define a market and a firm need to be rethought. On the hypothesis testing side, data availability is the major constraint. Knowledge measures other than R&D spending and patent counts are necessary if progress is to be made on this front. Lastly, the national statistical agencies have in some ways made the most progress charting where the economy has been. However, more work is needed to think about the KBE beyond the information highway concept and the crude measures of knowledge-intensity that have been used thus far. Biotechnology, education, medicine, and a host of other areas can legitimately claim to part be of the KBE.

REFERENCES

Acs, Z., D. Audretsch, and M. Feldman (1992), "Real Effects of Academic Research: Comment," *American Economic Review* 81.

_____ (1993), "Innovation and R&D Spillovers," *Centre for Economic Policy Research*, Discussion Paper no. 865.

Adams, James D. (1990), "Fundamental Stocks of Knowledge and Productivity Growth," *Journal of Political Economy* 98 (4), 673-702.

Aghion, Philippe and Peter Howitt (1992), "A Model of Growth Through Creative Destruction," *Econometrica* 60 (2), March, 323-351.

Arrow, Kenneth J. (1962), "The Economic Implications of Learning by Doing," *Review of Economic Studies* 29 (1), June, 155-173.

_____ (1962), "Economic Welfare and the Allocation of Resources for Inventions," in Richard R. Nelson (ed.) *The Rate and Direction of Inventive Activity* (Princeton: Princeton University Press and NBER).

Arthur, W. (1989), "Competing Technologies, Increasing Returns, and Lock-in by Historical Events," *Economic Journal* 99, 116-131.

Audretsch, D. and M. Feldman (1994), "Knowledge Spillovers and the Geography of Innovation and Production," *Centre for Economic Policy Research*, Discussion Paper no. 953.

Audretsch, D. and P. Stephan (1995), "How and Why Does Knowledge Spill Over: The Case of Biotechnology," *Centre for Economic Policy Research*, Discussion Paper no. 1991 (London: CEPR).

Audretsch, David B. and Maryann P. Feldman (1996), "R&D Spillovers and the Geography of Innovation and Production," *American Economic Review* 86 (3), 630-640.

Baumol, W.J. (1973), "The Macroeconomics of Unbalanced Growth," *American Economic Review* 57, 941-973.

Bayoumi, Tamim, David T. Coe, and Elhanan Helpman (1998), "R&D Spillovers and Global Growth," *Journal of International Economics*, forthcoming.

Beck, N. (1992), *Shifting Gears: Thriving in the New Economy* (Toronto: Harper Collins Publishers Ltd.).

Bernstein, Jeffrey I. (1997), "Inter-Industry and US R&D Spillovers, Canadian Industrial Production and Productivity Growth," Industry Canada Discussion Paper no. 19 (Ottawa: Industry Canada, Microeconomic Analysis Division).

Blair, Margaret M. and Thomas A. Kochan (eds.) (1999), *The New Relationship: Human Capital in the American Corporation* (Brookings Institute). See especially, chapters by Blair, Kruse, and Joseph Blasi, "Is Employee Ownership an Unstable Form? Or a Stabilizing Force?" and Avner Ben-Ner, W. Allen Burns, Greg Dow, and Louis Putterman, "Employee Participation in Ownership: An Empirical Exploration."

Caballero, Ricardo J. and Adam B. Jaffe (1993), "How High are the Giants' Shoulders: An empirical assessment of knowledge spillovers and creative destruction in a model of economic growth," in Olivier Blanchard and Stanley Fischer (eds.), *NBER Macroeconomics Annual 1993* (Cambridge, MA: The MIT Press).

Cameron, G. (1996), "Innovation and Economic Growth," LSE Centre for Economic Performance, Discussion Paper no. 277, February.

Cockburn, Iain and Rebecca Henderson (1997), "Public-Private Interaction and the Productivity of Pharmaceutical Research," *National Bureau for Economic Research*, Working Paper no. 6018.

Coe, David T. and Elhanan Helpman (1995), "International R&D Spillovers," *European Economic Review* 39, 859-887.

Coe, David T., Elhanan Helpman, and Alexander W. Hoffmaister (1997), "North-South R&D Spillovers," *Economic Journal* 107, January, 134-149.

David, P. and D. Foray (1995), *Accessing and Expanding the Science and Technology* (Paris: OECD).

Department of Finance (1992), "Employment Growth in High-Tech and Knowledge Industries," mimeo (Ottawa: Department of Finance).

Economides, Nicholas (1996), "The Economics of Networks," reproduced from *International Journal of Industrial Organization*, October, see website http://www.stern.nyu.edu/networks/top.html.

Evenson, Robert (1984), "International Invention: Implications for Technology Market Analysis," in Zvi Griliches (ed.), *R&D, Patents, and Productivity* (Chicago: University of Chicago Press).

_____ (1993), "Patents, R&D and Invention Potential: International Evidence," *American Economic Review* 83, May.

Fuchs, V. (1968), *The Service Economy* (New York: Columbia University Press).

Gera, S. and Kurt Mang (1997), "The Knowledge-Based Economy: Shifts in Industrial Output," *Industry Canada*, Working Paper no. 15.

Gordon, Robert J. (1999), "Has the 'New Economy' Rendered the Productivity Slowdown Obsolete?," Northwestern University and NBER (revised version, June 14, 1999) available on the web at: http://faculty-web.at.nwu.edu/economics/gordon

Griliches, Z. (1989), "Patents: Recent Trends and Puzzles," *Brookings Papers: Microeconomics*, 291-300.

_____ (1990), "Patent Statistics as Economic Indicators: A Survey," *Journal of Economic Literature* 28, 1661-1707.

Hall, Bronwyn H., Zvi Griliches, and Jerry Hausman (1986), "Patents and R&D: Is there a lag?," *International Economic Review* 27 (2) 265-283.

Harris, R.G. and W. Watson (1993), "Three Visions of Competitiveness: Porter, Reich and Thurow on Economic Growth," in T. Courchene and D. Purvis (eds.), Bell Economic Papers (Kingston: John Deutsch Institute, Queen's University).

Harris, Richard G. (1999), "Determinants of Canadian Productivity Growth: Issues and Prospects," presented at CSLS-Industry Canada conference Canada in the 21st Century: A Time for Vision in Ottawa, September 17, 1999, to be published as an Industry Canada Vision Series paper.

Hausman, Jerry, Bronwyn H. Hall, and Zvi Griliches (1984), "Econometric Models for Count Data with an Application to the Patents-R&D relationship," *Econometrica* 52 (4), 909-936.

Jaffe, A. (1986), "Technological Opportunity and Spillovers of R&D: Evidence from Firms' Patents, Profits and Market Value," *American Economic Review* 76, 984-1000.

_____ (1989), "Real Effect of Academic Research," *American Economic Review* 79, 957-970.

Jaffe, Adam B. and Manuel Trajtenberg (1996), "Flows of Knowledge from Universities and Federal Labs: Modeling the Flow of Patent Citations Over Time and Across Institutional Geographic Boundaries," *National Bureau of Economic Research*, Working Paper no. 5712.

Jaffe, Adam B., Manuel Trajtenberg, and Rebecca Henderson (1993), "Geographic Localization of Knowledge Spillovers as Evidenced in Patent Citations," *Quarterly Journal of Economics* 108 (3), 577-598.

Jones, Charles I. (1995), "R&D-Based Models of Economic Growth," *Journal of Political Economy* 103 (3), August, 759-784.

_____ (1999), *Introduction to Economic Growth* (New York: W.W. Norton).

Jones, Charles I. and John C. Williams (1998), "Measuring the Social Return to R&D," *Quarterly Journal of Economics*, forthcoming.

Juhn, Chinhui, Kevin M. Murphy, and Brooks Pierce (1993), "Wage Inequality and the Rise in Returns to Skill," *Journal of Political Economy* 101 (3), June, 410–442.

Kortum, Samuel S. (1993), "Equilibrium R&D and the Patent-R&D Ratio: US Evidence," *American Economic Association Papers and Proceedings* 83 (2), 450-457.

Lee, F. and H. Has (1996), "A Quantitative Assessment of High-Knowledge Industries versus Low-Knowledge Industries," in P. Howitt (ed.), *The Implications of Knowledge-Based Growth* (Calgary: University of Calgary Press).

Levin, Richard C., Alvin K. Klevorick, Richard R. Nelson, and Sidney G. Winter (1987), "Appropriating the Returns from Industrial Research and Development," *Brookings Papers on Economic Activity* 3, 783-820.

Lichtenberg, F. (1992), "R&D Investment and International Productivity Differences," *National Bureau of Economic Research*, Working Paper no. 4161.

Lucas, Robert E., Jr. (1988), "On the Mechanics of Economic Development," *Journal of Monetary Economics* 22 (3), June, 3-42.

Machlup, F. (1962), *The Production and Distribution of Knowledge in the United States* (Princeton, NJ: Princeton University Press).

Mansfield, E. (1980), "Basic Research and Productivity Increase in Manufacturing," *American Economic Review* 70, 863-873.

_____ (1985), "How Rapidly Does Industrial Technology Leak Out?," *Journal of Industrial Economics* 34 (2), 217-223.

Mansfield, E., M. Schwartz, and S. Wagner (1981), "Imitation Costs and Patents: An Empirical Study," *Economic Journal* 91, 907-918.

Megna, Pamela and Mark Klock (1993), "The Impact of Intangible Capital on Tobin's q in the Semiconductor Industry," *American Economic Association Papers and Proceedings* 83 (2), May, 265-269.

Nadiri, M. and T. Mamuneas (1991), "The Effects of Public Infrastructure and R&D Capital on the Cost Structure and Performance of US Manufacturing Industries," paper presented at NBER Summer Institute.

Organization for Economic Corporation and Development (1996), "The Knowledge-Based Economy," in *1996 Science, Technology and Industry Outlook* (Paris: OECD).

_____ 1996), *Technology, Productivity and Job Creation* (Paris: OECD).

Quah, Danny (1998), "Superstar Knowledge-Products in a Model of Growth," LSE Working paper (London: London School of Economics), March.

_____ (1997), "Increasingly Weightless Economies," *Bank of England Quarterly Bulletin* 37 (1), February, 49-56.

Rafiquzzaman, Mohammed and Lori Whewell (1988), "Recent Jumps in Patenting Activities: Comparative Innovative Performance of Major Industrial Countries, Patterns and Explanations," *Industry Canada Research Publications Program*, Working Paper no. 27, December.

Romer, Paul M. (1994), "The Origins of Endogenous Growth," *Journal of Economic Perspectives* 8 (1), Winter, 3-22.

_____ (1986), "Increasing Returns and Long-Run Growth," *Journal of Political Economy* 94 (5), October, 1002-1037.

_____ (1990), "Endogenous Technological Change," *Journal of Political Economy* 98 (5), October, Part 2: S71-S102.

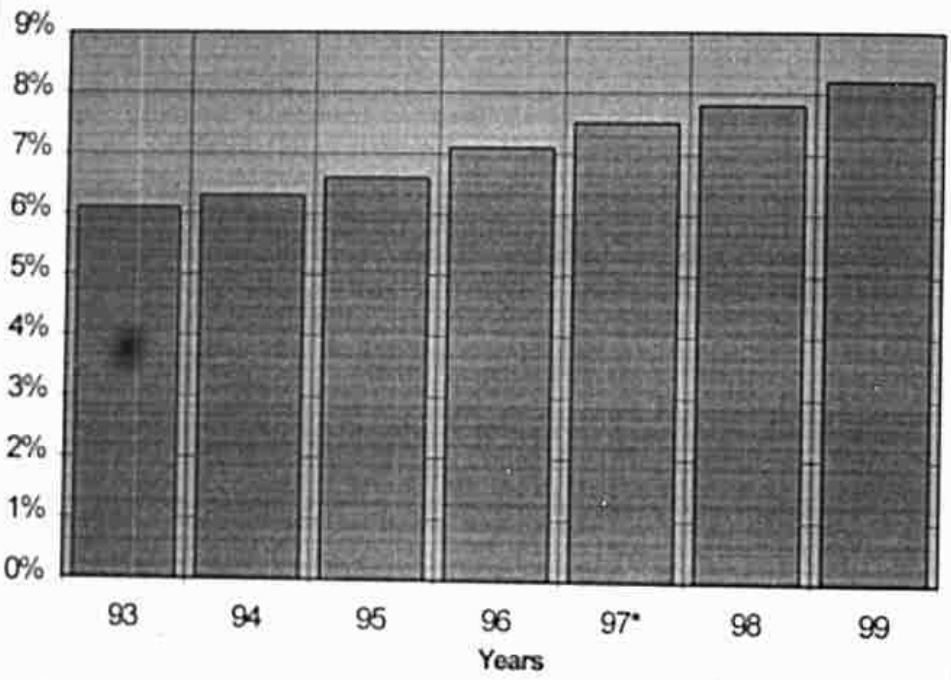
Rosen, Sherwin (1981), "The Economics of Superstars," *American Economic Review* 71 (5), December, 845-858.

Smith, K. (1995), "Interactions in Knowledge Systems: Foundations, Policy Implications and Empirical Methods," *STI Review*, no. 16 (Paris: OECD).

Temple, J. (1999), "The New Growth Evidence," *Journal of Economic Literature* 37, 112-156.

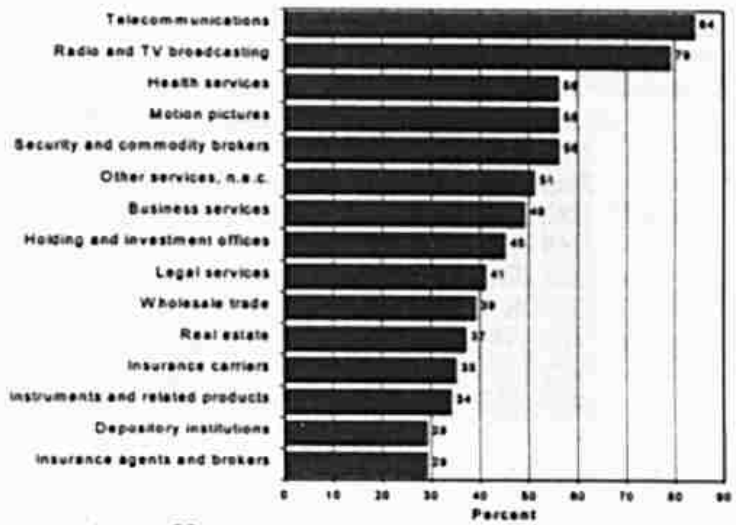
Zucker, L., M. Darby, and M. Brewer (1994), "Intellectual Capital and the Birth of U.S Biotechnology Enterprises," *American Economic Review* 88 (1), 290-306.

Figure 4.1 IT-Producing Industries' Share of the Economy



Source: ESA estimates from BEA and Census data for 1993-1996
ESA estimates for 1997-1999 derived using DOC's "Industry and Trade Outlook'98"
*97 data are estimates since the Census has not yet released detailed industry data for 1997 which are needed for these calculations

Figure 4.2
IT Net Capital Stock Top 15 US Industries'
IT Equipment Share of Total Equipment
in 1996



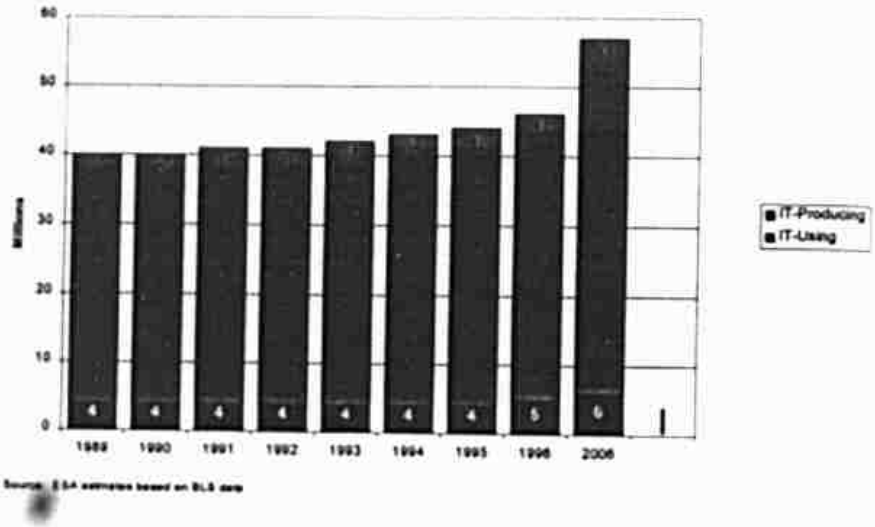
Source ESA calculations based on BEA data

Figure 4.3
IT Investment Top 15 US Industries'
IT Investment Per Worker
in 1996

Source ESA calculations based on BEA data

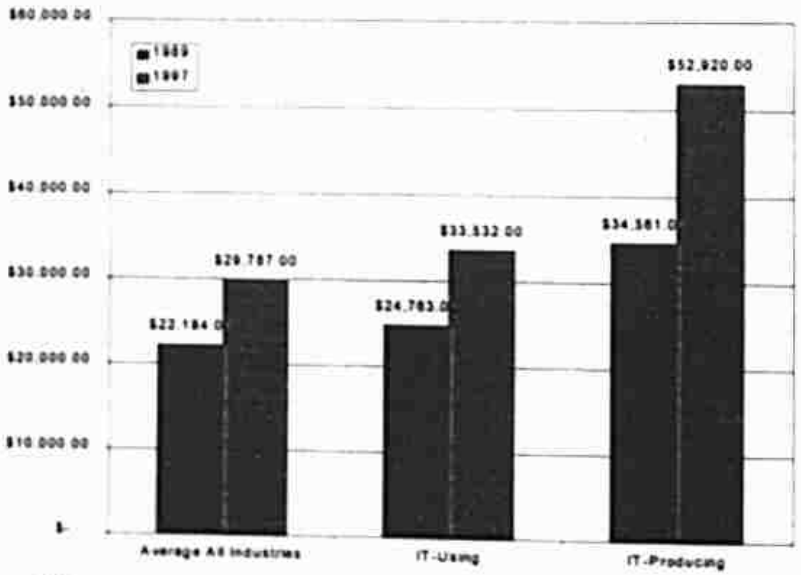
Figure 4.4

Employment in IT-Producing and IT-Using US Industries
(1989 to 1996 and 2006 projection)



Source: ESA estimates based on BLS data

Figure 4.5
IT Industries Pay Higher Than Average Wages in U.S.



Source: ESA estimates based on BLS data

Figure 4.6
Civilian R&D as % of GDP in 1996
OECD Countries

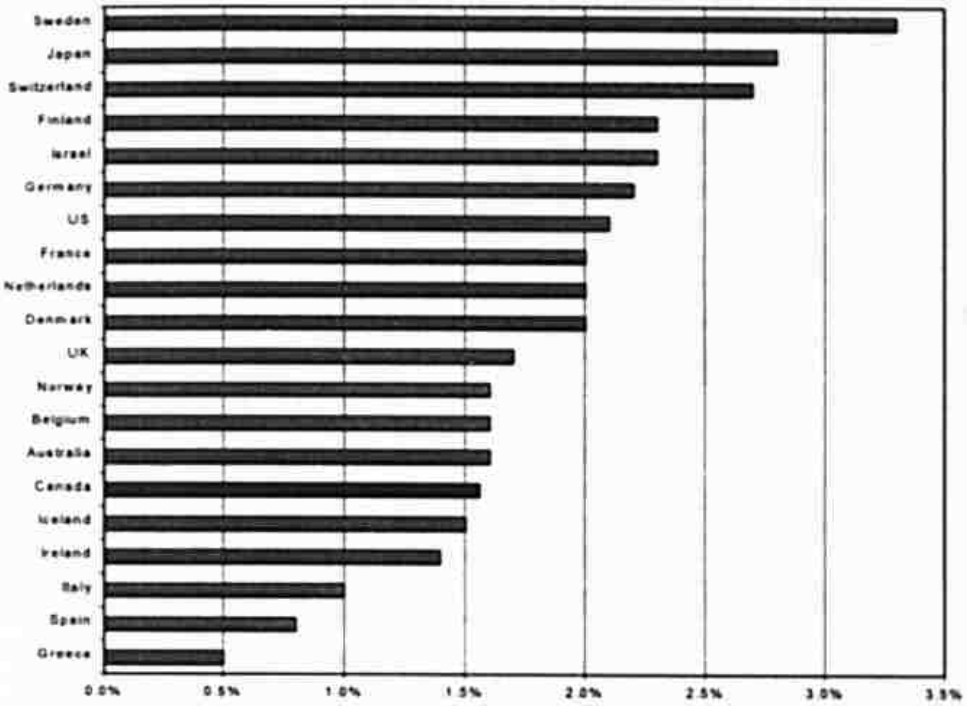


Figure 4.7
Patents per Capita: Canada vs. the G 7
(patents per 100,000)

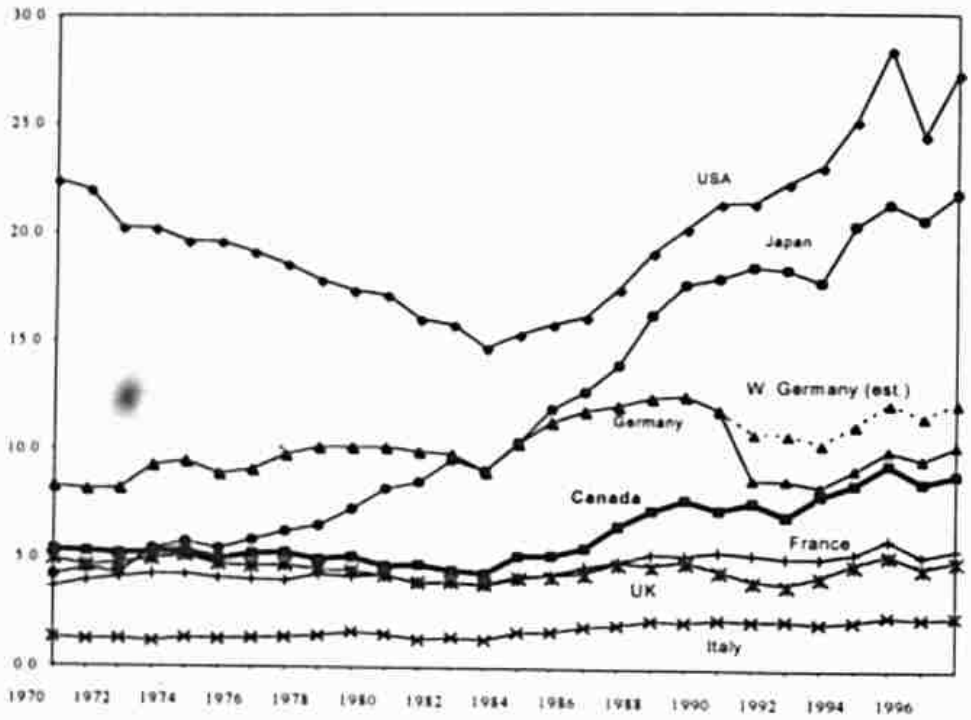


Figure 4.8
Canadian Patents and Civilian R&D Expenditure
in billions of1992 dollars (3-year lag)

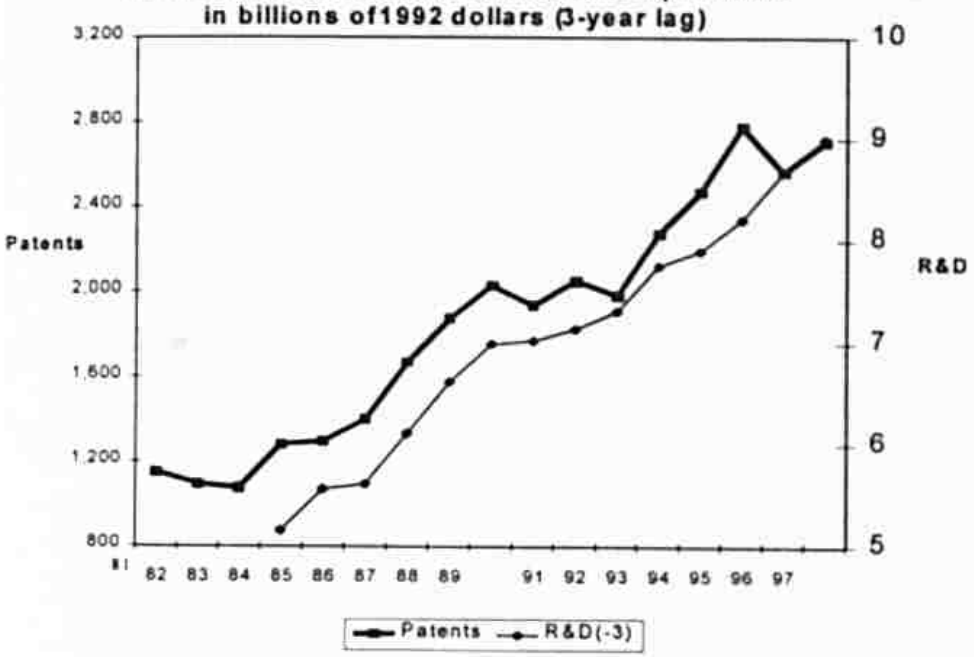


Table 4.1 Information Technology Producing Industries	
Hardware Industries	**Software/Services Industries**
Computers and equipment	Computing Programming Services
Wholesale trade of computers and equip.	Prepackaged software
Retail trade of computers and equipment	Wholesale trade of software
Calculating and office machines, nec	Retail trade of software
Magnetic and optical recording media	Computer integrated systems design
Electron tubes	Computer processing, data preparation
Printed circuit boards	Information retrieval services
Semiconductors	Computer services management
Passive electronic components	Computer rental and leasing
Industrial instruments for measurement	Computer maintenance and repair
Instruments for measuring electricity	Computer related services, nec.
Communications Equipment Industries	**Communications Services Industries**
Household audio and video equipment	Telephone and telegraph communications
Telephone and telegraph equipment	Radio and TV broadcasting
Radio and TV and communications equip.	Cable and other pay TV services

Table 4.2
Contribution of IT Equipment to Growth in Capital Equipment

Year	93	94	95	96	97	98
				(Percent)		
1. Changes in real spending for all capital equipment	10.5	11.0	11.5	10.9	12.1	16.5
2. Contribution of real spending for IT equipment	3.5	3.8	6.9	6.9	6.8	9.6
3. Contribution of real spending for all other types of capital equipment	7.0	7.2	4.6	4.0	5.3	6.9
4. IT's contribution to change in real capital stock	33	35	60	63	56	58

Source: Commerce Department.

Table 4-3
Knowledge Intensity Groups

High-Knowledge	Medium-Knowledge	Low-Knowledge
Scientific & Professional Equip	Other Transportation Equip	Fishing & Trapping
Communication & Other Elect Equipment	Other Electrical & Electronic Products	Other Manufacturing Products
Aircraft & Parts	Non-Ferrous Primary Metals	Wood
Computer & Related Services	Textiles	Furniture & Fixtures
Business Machines	Communications	Logging & Forestry
Engineering & Sci. Services	Paper & Allied Products	Transportation
Pharmaceutical & Med. Prod.	Mining	Storage & Warehousing
Electrical Power	Rubber	Agriculture
Other Chemical Products	Plastics	Retail Trade
Machinery	Primary Ferrous Metals	Personal Services
Refined Petroleum & Coal	Non-Metallic Mineral Prod.	Quarries & Sand Pits
Mgmt. Consulting Services	Wholesale Trade	Accommod., Food & Beverages
Educational Services	Crude Petroleum & Nat. Gas	Clothing
Health & Social Services	Fabricated Metal Products	Leather
Pipeline Transportation	Motor Vehicles & Parts	
Other Business Services	Food	

Source: Gera and Wu, Industry Canada(1997)

Table 4-4
Industrial Output Growth, by Level of Knowledge Intensity, 1971[1]

Level of Knowledge Intensity	1971-89	1981-86	1986-91
High	6.68	1.99	4.08
Medium	3.78	2.57	1.68
Low	3.54	2.41	1.18
Overall Business Sector	4.13	2.43	1.97

[1] Average annual percentages, based on data expresses in 1971 prices (1971-81), 1981 prices (1981-86) and 1986 prices (1986-91).

Source: Gera and Wu, Industry Canada (1997).

Table 4-5
Output Growth in the Top 20 Business Sector Industries, by Level of Knowledge Intensity, 1986-91[1]

Industries	Knowledge Level	1986-91
Office, Store & Business Machines	High	21.76
Communication & Other Elec. Equipment	High	13.54
Aircraft & Aircraft Parts	High	7.24
Communications	Medium	7.09
Pipeline Transportation	High	6.55
Other Business Services	High	6.09
Personal Services	Low	6.02
Health & Social Services	High	4.07
Pharmaceutical & Medical Products	High	3.79
Fishing & Trapping	Low	3.61
Crude Petroleum & Natural Gas	Medium	3.58
Wholesale Trade1	Medium	3.52
Educational Services	High	3.44
Non-Metal Mines	Medium	3.14
Amusement & Recreational Services	Medium	2.90
Electrical Power	High	2.84
Finance, Insurance & Real Estate	Medium	2.84
Mining (Metals)	Medium	2.62
Plastics	Medium	2.27
Non-Ferrous Primary Metals	Medium	2.27

[1] Compound average annual growth rates, based on a 55-industry aggregation.

Source: Gera and Wu, Industry Canada (1997).

Exchange Rates and Monetary Interdependence

Options for the RINGGIT

Mohamed Ariff

I. INTRODUCTION

The July 1997 currency turmoil emanating from Thailand had spread swiftly to other countries in the region. Malaysia, despite being one of the better economies in the region, could not insulate itself from the crisis. The impact on Malaysia turned out to be more than a contagion effect. Malaysia, like other crisis-hit countries, became mired in difficulties of sorts. No one would now argue that Malaysia's macroeconomic management and governance were so impeccable prior to the crisis that it did not deserve the beating unleashed by market forces.

The market has always been mean and ruthless. The fact, however, remains that the market is also admittedly imperfect. The market is not always guided by fundamentals, as sentiments sometimes override objectivity. Arguably, speculators are often driven by greed when the going is good or by fear when things apparently begin to sour. And combine this tendency with herd behaviour, we get a recipe that would only accentuate the amplitude of market fluctuations. Explosive expectations, where speculators continue to buy when prices are rising and rush to sell when prices are falling, are extremely destabilizing, quite unlike text-book speculations where speculators buy when prices fall and sell when prices rise thus contributing to market stability.

Events that began to unfold in the second half of 1997 were due as much to systemic flaws as to market excesses. It was estimated that the ringgit was overvalued by roughly 25 percent and that the stocks were overpriced by about 30 percent before the crisis, suggesting a major market correction was around the corner. The market clearly overshot when the panic button was pushed, with the ringgit plunging by over 50 percent and the stock market shrinking by over 60 percent. Although neither the timing nor the magnitude of the crisis was predictable, there were unmistakable signs of an impending crisis such as persistent current-account deficits in the balance of payments, increased dependence on short-term capital inflows, high domestic debts, rapid growth of bank loans and money supply, falling total factor productivity, and rising reverse investments, to mention a few (Ariff *et al.*, 1998).

The rest is history. Malaysia imposed capital and exchange controls, touted as "unorthodox measures," in September 1998. Exchange controls were seen as unorthodox or heretical, not because it was unheard of or unthinkable before, but because it ran counter to the IMF prescriptions adopted by other crisis-hit countries. The external value of the ringgit was fixed at 3.80 ringgit to the US dollar. Currency trading of the ringgit was forbidden. Travelers were not allowed to carry more than RM1,000 or foreign currencies exceeding in value RM10,000. All these are still in vogue, although currency declaration forms are no longer required for sums within the above limits.

The main purpose of this paper is to examine the various options available for the ringgit and to suggest "least-cost" solutions. The paper is structured as follows. The next section outlines the exchange rate regime prior to the crisis. This is followed by an analysis of the ringgit movements vis-à-vis other major regional and international currencies since the imposition of exchange controls, in Section III. The near-term prospects for the currency are examined in Section IV. Several policy options are discussed in Section V. Finally, the concluding section zeros in on what may be termed as a "practical" solution.

II. EXCHANGE RATE REGIME

Before Independence, the Malaysian currency, then known as the Malaysian dollar, was tied rigidly to the British sterling with a fixed exchange rate. After Independence until mid-1972, Malaysia was pegging the ringgit, under the Bretten Woods system, using the sterling as the intervention currency with a margin of 0.3448 to 1.0 percent on either side of the par. It was only in June 1972 that Malaysia adopted the US dollar as the intervention currency with a support margin of 2.25 percent, in the aftermath of the floating of the sterling and the dismantling of the sterling area. The parity of the ringgit was then set at

RM2.81955 to the US dollar. Following the 10 percent devaluation of the dollar in February 1973, the ringgit-dollar parity was reduced to 2.5376, with the support rates being set at RM2.4805 and RM.2.5947, which represent the new ceiling and the floor, respectively. However, in June 1973, the Central Bank allowed the ringgit to float upward vis-à-vis the dollar.

In September 1975, the Malaysian authorities adopted a new foreign exchange rate regime which determined the external value of the ringgit in terms of a basket of representative currencies. Thus, the exchange rate of the ringgit was no longer determined in terms of the dollar only, although the dollar continued to be intervention currency. The composition of the currency basket was not specified. In fact, the composite basket, believed to be weighted on the basis of the key currencies of settlement as well as those of the major trading partners of Malaysia, was only known to the Central Bank. There was a somewhat strong adherence to the US dollar and the Singapore dollar (the former, being an international heavy weight, and the latter, given its historical-cum-psychological importance). This norm was broken towards the end of 1984 when the authorities opted for a more flexible exchange-rate management policy in the face of an economic downturn and overvalued exchange rate.

All this, however, did not mean that the ringgit was pegged strictly to the composite currency basket up to the end of 1984. Thus, for example, the composite index had deviated during 1981-84 from the September 1975 baseline of 100 to a range of 103.5 to 109.5 which amounted to an appreciation of up to 5 percent a year (Lin, 1989). The appreciation of the ringgit during the sluggish years of 1980-84 was partly due to the massive inflow of long-term capital and partly to the periodic central bank interventions to shore up the ringgit in the face of the growing strength of the US dollar.

Until the end of 1984, there was apparently a policy bias in favour of benchmarking against the Singapore dollar as well, in addition to a close alignment with the US dollar. Consequently, during 1980-83, the premium of the Singapore dollar was checked at about 9 percent and the depreciation of the ringgit against the US dollar was kept at 4.3 percent. Concern over the growing debt burden and inflationary fears were also among the considerations which could explain the Central Bank's stance then against any sharp ringgit depreciation (Ariff, 1993). In fact, the policy preference for strong ringgit was seen as an anti-inflationary device that would keep tabs on the domestic prices of imports.

In August 1984, the composite index of the ringgit peaked at 110.7 against the basket, appreciating 67 percent against the sterling, 34 percent against the Deutschmark, and 14 percent against the Japanese yen. It was estimated that the ringgit had been overvalued to the tune of about 20 percent by the end of 1984 (Semudram, 1985), while the real effective exchange rate had

appreciated by 10 percent from the first quarter of 1981 to the fourth quarter of 1984 (Ariff and Semudram, 1987).

During 1975-84, the real effective rate of the ringgit had been appreciating, as a result of the boom conditions and rising commodity prices. During 1981-83, both the real and nominal exchange rates had appreciated significantly. Since 1985, the ringgit was depreciating against all major currencies except the US dollar, as the latter itself was still depreciating. The real effective exchange rate of the ringgit began to depreciate marginally in early 1985, leading to an effective depreciation of nearly 9 percent by the second quarter of 1986 (Ariff and Semudram, 1987). The ringgit continued to depreciate until end-March 1989, followed by a period of exchange rate stability.

With the economy growing at near double-digit rates in the first half of the 1990s, the ringgit was appreciating all over again. Current account deficits were financed by FDI inflows and short-term capital inflows, which led to the strengthening of the ringgit in the foreign exchange market. Interestingly, the exchange rate for the ringgit had been affected more by capital account than by current account transactions in the balance of payments. Thus, the ringgit was appreciating at times when the current account balance was worsening and depreciating at times when the current account balance was strengthening, quite contrary to text-book expectations. This can be easily explained: the strength of the ringgit during 1981-84 and 1993-96 stemmed mainly from the substantial inflow of official capital and private capital, respectively, while the weakness of the ringgit in the late 1980s was associated largely with the sizable repayment of external debts.

The ringgit was a high flyer until the crunch came in July 1997. Large inflows of foreign direct investments and portfolio investments provided the fuel for the ringgit to fly high, despite the widening trade and current account deficits. It is no secret that the Central Bank was constantly aligning the ringgit to the US dollar at around RM2.50 to the US dollar through its interventions. As the US dollar was concurrently appreciating against major currencies, this *de facto* pegging meant that the ringgit, too, grew stronger against other currencies. The outbreak of the financial crisis in Thailand in July 1997 led to a panic withdrawal of foreign short-term capital from the region, causing regional currencies, including the ringgit, to plummet.

III. THE NEW PEG REGIME

Well ahead of the currency crisis, as early as March 1997, there were already symptoms that the ringgit was undergoing a gradual downward correction, with the exchange rate against the US dollar softening from 2.48 in March to 2.52 in

June. In July 1997, the ringgit depreciated to an average of 2.57 before plunging to an all-time low of 4.88 in the first week of January 1998. The ringgit subsequently strengthened to an average of RM3.73 to the US dollar in April 1998, but this somewhat jerky upward adjustment was derailed by another round of volatility which sent the ringgit again on a downward spiral to a 4.23 level in late August 1998 when the government decided to tie the ringgit to the US dollar at RM3.80.

It is not difficult to say many things in praise of the new peg regime. For starters, it brought an abrupt end to exchange rate uncertainties. The business community was more than pleased. It has been quite easy for the authorities to manage the new regime, thanks primarily to the fact that the ringgit has remained significantly undervalued. Weak ringgit has apparently helped strengthen the current account of the balance of payments and external reserves by redirecting resources from imports to exports and import substitutes. Undervalued exchange rate serves to reduce domestic labour costs and to promote the production of tradable goods. Besides, Malaysian exporters of primary commodities, the prices of which are determined in US dollars, like palm oil, petroleum and gas, in particular, have benefited much from the undervalued ringgit, as it meant additional export earnings in ringgit terms. Undervalued fixed exchange rate was also a boon to the stock market as foreigners found the Malaysian stocks attractive without foreign exchange risks.

To be sure, all these benefits are not without costs in the form of distortions in resource allocations. It introduced a bias in favour of trade denominated in US dollars at the expense of other currencies. It also meant that Malaysians are shortchanged through unfavourable terms of trade. If it is not corrected, it may even lead to brain drain, as it would make working in strong currency areas financially more rewarding. By the same token, cheap ringgit will not help Malaysia attract skilled guest workers for the emerging K-economy. What is more, undervalued ringgit with strong revaluation prospects tends to discourage greenfield foreign direct investment to the extent that it makes imports of machinery and equipment more costly at the current exchange rate, while the output may have to be exported at a revalued exchange rate when the project comes on stream. The chances are that foreign investors would delay the implementation of approved investments in anticipation of exchange rate adjustments. A fixed exchange rate system also means that burden of macroeconomic adjustments will fall heavily on fiscal and monetary policy instruments.

Another word of caution is also in order. The positive impact of undervalued ringgit on manufactured exports may well be considerably smaller than assumed. This is not to deny that weak ringgit has rendered resource-based manufactures with little import content (e.g., wood products and rubber manufactures) more competitive abroad. But this advantage of cheap ringgit is

partially offset by high cost of imported intermediate inputs for other manufactures with a high import content. The risk in this case is that manufacturers will rely on the cheap ringgit for export competitiveness rather than on productivity improvements that would cut unit cost. In the case of multinational corporations, transfer pricing practices may render any exchange rate advantage somewhat redundant. Thus, the sharp increase in exports that Malaysia has experienced in recent times may have little to do with the peg regime, as other countries in the region have also posted similar export growth which is largely due to favourable external demand conditions, especially in the electronics sector.

Much, of course, would depend critically on the magnitude or the extent of undervaluation or overvaluation present in the system. The higher this magnitude, the greater the distortions. It is fairly obvious that the ringgit is currently undervalued, although estimates of this undervaluation would vary considerably depending on the yardstick used and the base year adopted.

Table 1
The Ringgit versus Major Currencies, 1990-Sept 2000

(+Appreciate/-Depreciate)	1990	Sep-00	% change
RM/US$	2.7044	3.8000	*-28.8*
RM/100yen	1.8762	3.5583	*-47.3*
RM/Sing$	1.4938	2.1865	*-31.7*
RM/Pound	4.8253	5.4481	*-11.4*
RM/DMark	1.6772	1.6929	*-0.9*
Trade-weighted (1990 = 100)	100.00	66.37	-33.6

Arguably, the year 1990 may be taken as a "normal" year for the ringgit without serious distortions as there was no severe BOP problem. Between 1990 and August 2000, the ringgit has depreciated by a trade-weighted average of 33.6 percent against four major currencies (Table 1). It is remarkable that between June 1997 (prior to the crisis) and January 1998 (when the currency had hit the bottom) the extent of depreciation on a trade-weighted average scale was 36.5 percent (Table 2). If the ringgit was overvalued by an estimated 25 percent prior to the crisis, this would mean that the ringgit is currently undervalued by roughly 11 percent.

Table 2
The Ringgit versus Major Currencies, June 1997-January 1998

	Jun-97	Jan-98	% change
RM/US$	2.5158	4.3985	-42.8
RM/100yen	2.2020	3.3796	-34.8
RM/Sing$	1.7630	2.5076	-29.7
RM/Pound	4.1373	7.1902	-42.5
RM/DMark	1.4585	2.4212	-39.8
Trade-weighted (1990=100)	94.08	59.73	-36.5

The nominal effective exchange rate (NEER) had depreciated by 8.1 percent between 1990 and 1996, by 28.8 percent between 1996 and August 2000, and by 34.6 percent between 1990 and August 2000, with 1990 as the base year (Table 3). The use of 1995 as the base year yields results that are only marginally different (Table 4). Given an estimated 25 percent overvaluation of the ringgit prior to the crisis, all this means that the ringgit is currently undervalued by about 10 percent. In terms of real effective exchange rate (REER), however, the extent of undervaluation is considerably smaller.

Table 3
The Ringgit: Nominal and Real Effective Exchange Rates, 1990-August 2000 (1990 = 100)

Base 1990 = 100	Arithmatic REER	Geometric REER	Arithmatic REER	Geometric NEER	Arithmatic REER %	Geometric REER %	Arithmatic NEER %	Geometric NEER %
(+ Appreciate/-Depreciate)								
1990	100	100	100	100				
1991	95.74	95.66	95.07	95.00	-4.3	-4.3	-4.9	-5.0
1992	101.66	101.45	98.83	98.62	6.2	6.1	3.9	3.8
1993	99.75	98.85	95.74	94.88	-1.9	-2.6	-3.1	-3.8
1994	96.61	95.33	90.23	89.04	-3.1	-3.6	-5.8	-6.2
1995	98.17	96.37	89.46	87.83	1.6	1.1	-0.8	-1.4
1996	103.92	102.81	92.88	91.89	5.9	6.7	3.8	4.6
1997	99.87	99.23	88.74	88.17	-3.9	-3.5	-4.5	-4.0
1998	77.82	77.64	66.23	66.07	-22.1	-21.8	-25.4	-25.1
1999	79.34	78.73	66.23	65.72	1.9	1.4	0.0	-0.5
Jan-Aug 2000	79.61	78.54	66.31	65.42	0.3	-0.2	0.1	-0.5
(+ Appreciate/-Depreciate)	REER %	REER %	NEER %	NEER %				
1990-1996	3.9	2.8	-7.1	-8.1				
1996-2000 (Jan-Aug)	-23.4	-23.6	-28.6	-28.8				
1990-2000 (Jan-Aug)	-20.4	-21.4	-33.7	-34.6				

Table 4
The Ringgit: Nominal and Real Effective Exchange Rates, 1990-August 2000 (1995=100)

Base 1995=100	Arithmatic REER	Geometric REER	Arithmatic NEER	Geometric NEER	Arithmatic NEER%	Geometric REER%	Arithmatic NEER%	Geometric NEER%
(+Appreciate/-Depreciate)								
1990	105.73	103.83	115.99	113.90				
1991	100.60	99.35	109.62	108.26	-4.9	-4.3	-5.5	-5.0
1992	106.41	105.46	113.51	112.49	5.8	6.1	3.6	3.9
1993	102.55	102.27	108.01	107.70	-3.6	3.0	4.9	-4.3
1994	98.79	98.70	101.24	101.15	-3.7	-3.5	-6.3	-6.1
1995	100.00	100.00	100.00	100.00	1.2	1.3	-1.2	-1.2
1996	107.13	106.86	105.06	104.80	7.1	6.9	5.1	4.9
1997	103.93	103.23	101.33	100.65	-3.0	-3.4	-3.6	-4.0
1998	81.40	80.57	76.01	75.24	-21.7	-21.9	-25.0	-25.2
1999	81.85	81.46	74.97	74.61	0.6	1.1	-1.4	-0.8
Jan-Aug 2000	81.49	81.08	74.48	74.10	-0.4	0.5	-0.7	-0.7
(+Appreciate/-Depreciate)	REER%	REER%	NEER%	NEER%				
1990-1996	1.3	2.9	-9.4	-8.0				
1996-2000 (Jan-Aug)	-23.9	-24.1	-29.1	-29.3				
1990-2000 (Jan-Aug)	-22.9	-21.9	-35.8	-34.9				

Interestingly, since the fixing of the ringgit on 2 September 1998 until end-September 2000, the ringgit depreciated against major currencies by only 3.6 percent on a trade-weighted basis (Table 5). It is quite obvious that this ringgit depreciation against other major currencies is attributable to the depreciation of the US dollar itself, given the currency's fixed exchange rate vis-à-vis the US dollar. In other words, the ringgit is more undervalued than that suggested by the depreciation of the ringgit vis-à-vis major currencies.

Table 5
The Ringgit versus Major Currencies, 2nd Sept 1998-Sept 2000

	2-Sep-98	Sep-00	% change
RM/US$	3.8000	3.8000	0.0
RM/100yen	2.7742	3.5583	-22.0
RM/Sing$	2.1998	2.1865	0.6
RM/Pound	6.3708	5.4481	16.9
RM/Dmark	2.1743	1.6929	28.4
Trade-weighted (1990=100)	68.87	66.37	-3.6

Against the regional currencies, too, the ringgit has been sliding since the imposition of the currency peg. It has depreciated against regional currencies by a weighted average of 7.9 percent until end-September 2000 (Table 6). This is because these regional currencies have been appreciating against the greenback, while the ringgit–dollar exchange rate has remained constant. As the regional currencies themselves have remained largely undervalued due to political and other uncertainties, it can be surmised that the magnitude of undervaluation of the ringgit is considerably larger than the depreciation of the ringgit vis-à-vis regional currencies.

Table 6
The Ringgit versus Regional Currencies, 2nd Sept 1998-Sept 2000

	2-Sep-98	Sep-00	% change
RM/100 Korean won	0.2827	0.3406	-17.0
RM/100 Thai baht	9.3713	9.0767	3.2
RM/100 Indo rupiah	0.0354	0.0442	-19.9
RM/100 Philip peso	8.8302	8.2981	6.4
Trade-weighted (1990 = 100)	73.10	67.35	-7.9

The ringgit has exhibited considerable volatility vis-à-vis major currencies other than the US dollar, with the exception of perhaps the Singapore dollar (Figures 1 and 2) which is not surprising, as the latter too has been aligned closely to the US dollar through market inventions by the Monetary Authority of Singapore. Although the ringgit has depreciated generally against crisis-hit regional currencies after the introduction of the currency peg, there has been considerable fluctuations in the exchange rates of the ringgit against these currencies (Figure 3). However, the regional currencies have been fairly stable against the US dollar, with the notable exception of the Indonesian rupiah (Figure 4).

IV. THE RINGGIT OUTLOOK

All indications are that the ringgit peg will not be revised anytime soon, despite the fact that the ringgit is clearly undervalued with implicit costs. The chances of any major revision or review in the near term are slim, not only because there is no strong market pressure for change, but also because the ringgit peg is politically viewed as a symbol of prestige that distinguishes Malaysia from other crisis-hit regimes.

It is quite easy to manage an undervalued fixed exchange rate. At the current rate, the supply of foreign exchange exceeds the demand for it. The Central Bank is thus in a position to meet the demand for foreign exchange. Reserves have risen since August 1998 by US$12.1billion. With reserves of

US$32.3 billion (end-September 2000) which is equivalent to 5.2 months of retained imports, 6.3 times the short-term external debt, the Central Bank can breathe very comfortably. The fixed exchange regime would have fallen apart had the ringgit been overvalued, in which case a parallel market would have emerged. An overvalued ringgit peg would be more vulnerable to downward pressures than an undervalued one to upward pressures.

The country's BOP situation is likely to remain fairly healthy, given the strong global demand for electronics and the buoyant oil prices, although surging imports may continue to reduce trade and current account surpluses. BOP difficulties, which seem remote, will only narrow the margin of undervaluation and thus reduce, not increase, the pressure for change unless the pendulum swings to the other extreme with the ringgit getting overvalued.

There will be no pressure for change so long as the costs of undervalued exchange rates remain implicit rather than explicit. Thus, the lack of FDI inflows and the inability to lure back Malaysian brainpower staying abroad or to entice foreign knowledge workers at the current exchange rate would only impinge on future, not current, growth. Inflation is also likely to remain benign, even though it is likely to edge up in the near term. This means that government will not be forced to use the exchange rate instrument to contain the inflationary pressure by bringing down the price of imports in ringgit terms, unless high world oil price persists for some time with threats of imported inflation. Besides, private consumption in Malaysia is yet to return to its pre-crisis heights. Consequently, the subdued consumer demand for imports also tends to keep the spectre of imported inflation at bay which would otherwise compel the authorities to reconsider the peg. In any case, an increase in inflation would only serve to weaken the ringgit in the purchasing power parity (PPP) sense and thus downsize the margin of undervaluation. The irony of all this is that there will be reduced rather than increased pressure emanating from inflation for any revaluation of the ringgit.

Recent unsettling trends in regional currencies also do not bode well for a review of the currency peg by the Malaysian authorities. For one thing, the ringgit now seems less undervalued than earlier vis-à-vis regional currencies, with growing concerns over the erosion of export competitiveness. For another, the volatility of regional currencies in recent times has apparently strengthened Malaysia's resolve to hang on to the peg. While it is true that the regional currencies have appreciated since September 1998, the magnitude of appreciation is not large enough to induce a policy review of the ringgit peg.

The margin of undervaluation appears to have narrowed somewhat, if the reserve position is any indicator. In fact, reserves have been falling from US$34.5 billion in April 2000 to US$32.3 billion in September 2000. The fact that reserves are not rising with current account surpluses may mean that there is no rush to bring home export proceeds. If imports overtake exports, the situation

may reverse itself with the ringgit becoming overvalued. Besides, low interest rates in Malaysia juxtaposed with high interest rates in the US may not support the current peg for long. One cannot, therefore, rule out the chances of the ringgit becoming overvalued again in the near term. Risks associated with an overvalued currency are more worrisome than that of an undervalued one. Revaluation or devaluation by arbitrarily adjusting the peg upward or downward cannot be the right solutions as such adjustments are likely to be either excessive or inadequate.

V. POLICY CHOICES

It is easier to get into a fixed exchange rate regime than to get out of it. The fixing of the ringgit worked very effectively and very smoothly mainly due to perfect timing. By end-August 1998 the Malaysian authorities had sufficient market information that enabled them to fix the external value of the ringgit realistically at RM3.80 to the dollar. For the ringgit had swung from RM2.498 on July 11, 1997 to RM4.725 (intra-day RM4.88) on January 7, 1998 before it climbed back to RM3.460 on February 11, 1998, sliding thereafter to RM4.232 on August 24, 1998 when the authorities thought enough was enough. Intuitively, then, at 3.46 the ringgit was overvalued and at 4.23 it was undervalued. The mid-point around 3.80 would thus appear to be not too far off the mark. Besides, it would be safer to have the ringgit artificially undervalued than overvalued. At the beginning of the crisis, such information was not, of course, available and if the authorities had decided to fix the ringgit at the outbreak of the crisis, the ringgit would probably have been fixed at a much higher level around RM3.00, in which case the exchange rate regime would have got into serious trouble.

Arguably, the timing does matter for undoing it as well. The weak ringgit has been a boon for primary commodities, the prices of which are quoted in US dollar, which has enabled the producers to obtain more export earnings in ringgit terms at the current exchange rate. Any revaluation or appreciation of the ringgit at the present juncture would cause considerable pain, now that the prices of primary commodities, especially palm oil, remain depressed. This line of reasoning suggests that it would be opportune to de-peg the ringgit when primary commodities are performing reasonably well. Petroleum prices have reached a 10-year high and the windfall could more than offset any adverse effect of an exchange rate correction on export earnings. But then it looks like a Catch-22 situation with Petronas being a major player in corporate restructuring exercises. Seen in these terms, it is unlikely for any time to be a good time for a revaluation or appreciation of the ringgit.

A policy option that the government has is to maintain the status-quo and do nothing until pressures build up to have it changed. Such a decision will, however, represent a reactive, not a proactive action mode that cannot augur well for the medium or long-term. One should not wait until all implicit costs, alluded to above, become explicit before corrections are made. Notwithstanding this, one must also be wary of a sudden de-pegging, as it may cause a shock to the system. Besides, it is also somewhat risky to de-link the ringgit from the dollar at a time when regional currencies are still experiencing some turbulence. Considerations such as these would call for a gradual phasing out of the current peg regime.

What is referred to as a "crawling peg" in the literature can be a useful implement. Instead of de-pegging the ringgit in one stroke, the ringgit can be re-pegged in small steps a number of times over a short period so that it gets closer to the perceived equilibrium level. The primary objective of this exercise is to ensure a smooth transition from the peg regime to a floating one. There are many unanswered questions about the latter. The options available include free float, managed float and narrow band. To these one may add currency board.

Free float would mean clean float with no government interventions. Such a system, however, is fraught with risks for the national currencies of emerging economies. Only countries with strong institutions can withstand the rigour imposed by market forces, where the economies are subject to harsh international discipline. The market is merciless and unforgiving when it decides to punish. But, the market is by no means perfect. It tends to overshoot in both upward and downward directions, often driven by either greed or fear. Nor are currency traders subject to rules or regulations with any transparency or accountability. Under such circumstances, free floating can be very hazardous.

Under managed floating, the central banks intervene, from time to time, to iron out fluctuations caused by destabilizing speculations, by buying or selling the national currencies in the foreign exchange market. To do this, the monetary authorities should have a fairly clear idea of the equilibrium exchange rate. Central bank interventions, strictly speaking, are aimed not at influencing the trend but minimizing fluctuations around the trend. How successful such interventions are depends critically on how realistic the targeted exchange rate is and how large the reserves are.

The monetary authorities may opt to impose a ceiling and a floor within which exchange rate is allowed to fluctuate freely. Under this mode, central bank interventions take place whenever the ceiling or the floor is breached by the market rate. The band within which market rate floats freely can be narrow or wide. A narrow band would require more frequent interventions than a wider band. It is in this sense that it is a lot easier to manage a wider band than a narrower one. Currency speculations can destabilize the market if currency traders doubt the ability or the willingness of the authorities to defend the ceiling

or the floor, regardless of the width of the band. The inherent danger in all this is that the Central Bank can lose its reserves in its attempt to defend a currency that cannot or should not be defended.

Pegging is not a bad idea if it is meant to be purely a benchmarking tool. Strictly speaking, pegged exchange rate is not the same thing as fixed exchange rate. In the past, the Singapore dollar and the US dollar had been used as benchmarks for the ringgit without clearly defined thresholds which would mandate central bank interventions. The main problem with single currency pegging is that the national currency would tend to move in tandem appreciating or depreciating with the benchmark currency, instead of reflecting its own relative strength or weakness. This problem can be overcome if the currency is pegged to a composite currency basket. As a matter of fact, Bank Negara Malaysia had used such a composite currency basket prior to the crisis, although there was no transparency about the composition of the basket or the weights attached to various currencies.

Given the present international financial architecture, a sensible long-run option for the ringgit is to have it pegged against a trade-weighted composite basket of 4-5 currencies of major trading partners such as the US dollar, Japanese yen, British sterling, Singapore dollar, and the euro with total transparency. This can ensure exchange rate stability not just against one currency, as under the single currency pegging case, but against all the major ones. The establishment of a band, within which the exchange rate can fluctuate, may create more problems than it can possibly solve. The thresholds represent boundaries that currency traders are warned not to cross, which is tantamount to drawing the battle lines. Instead of being a deterrent, the ceilings and floors may entice currency speculators to step up pressure to test the nerves of the Central Bank, forcing it to intervene and even making profits at the latter's expense.

It is wrong to assume that exchange rates will fluctuate wildly in the absence of a band. Free float does not necessarily mean free fall for a currency during a downslide. The adjustments in either direction tend to be gradual in a flexible exchange rate system except under extremely abnormal circumstances as in the case of a contagion. Flexible rates will not lead to wide fluctuations so long as sound monetary and fiscal policies are constantly in place. What is more, continuous adjustments serve to preclude the adverse effects of prolonged periods of disequilibrium associated with fixed rates. It is also pertinent to note that flexible exchange rates permit a certain independence from BOP considerations in determining domestic policies (Friedman, 1953). A major advantage of flexible rates is that it reinforces the effectiveness of monetary policy through corresponding changes in BOP (Sohmen, 1961; Mundell, 1962).

The currency board option does not appear to be the right choice for Malaysia. The currency board system is not new to Malaysia as it was practiced by the colonial regime. A number of countries have adopted such systems,

including Hong Kong since 1983 and Argentina since 1991. A main drawback of the currency board system is that any reserve loss gets translated into a deflationary impact on the domestic economy (Williamson, 1997), but it imposes fiscal discipline because expenditures cannot be financed by printing money (Perry, 1997) and reins in inflation (Corden, 1997).

VI. CONCLUSION

Malaysia took a seemingly big gamble on September 2, 1998 when it decided to fix its exchange rate against the US dollar. There were rumours earlier that the authorities were even thinking of fixing the ringgit against the yen. Fixing the ringgit against any currency, especially yen, seemed such a bad idea. Yen has been very unstable and yen movements apparently have accentuated the pressure on the regional currencies in the run up to the currency crisis, not to mention the fact that very little trade is denominated in yen.

The hindsight seems to suggest that the fixing of the ringgit against the US dollar was not such a bad thing after all. But, then, Malaysia was lucky and the timing turned out to be perfect. It would have been a shot in the dark, if the authorities had tried to fix the ringgit in July 1997 itself. Malaysia took a calculated risk in September 1998 by settling for a mean between an observed high and a subsequent low. And it worked and was aided by the electronics boom in the export market. As an emergency measure, it has made enormous sense. Its continued existence, however, raises serious concerns about the hidden costs to the economy which may manifest themselves in the near future.

It is argued in this paper that the ringgit should be allowed to find its own equilibrium. A currency float can help it gravitate towards, but cannot guarantee, equilibrium rates. In a floating system, exchange rate targeting and government interventions can push the exchange rates towards or away from equilibrium. Admittedly, there is no exchange rate system that is best for all countries or for all times. Upper and lower limits for exchange rate fluctuations would only invite currency speculations and render the management task unduly difficult. The absence of ceilings or floors does not necessarily imply extreme volatility, as the authorities can still exercise their discretion to intervene at any time or at any point. Prior to the crisis, the system did work fairly well. The crisis cannot be blamed on the exchange rate system but on policy failures and errors that led the system to react in the manner in which it did.

Prior to the 1997 crisis, the external value of the ringgit was influenced more by capital inflows than by current account balances. Then, despite persistent current account deficits, the ringgit had remained strong, thanks to massive inflows of foreign capital. The post-crisis situation is markedly different. It is current account surpluses rather than capital inflows that have

contributed to increased reserves. Curiously, reserves have not been keeping pace with current account surpluses in recent times, which implies net capital outflows, but for which the ringgit would have been even more undervalued.

The question in front of us revolves around (a) timing, and (b) form of change in the exchange rate regime. One argument is that a stronger ringgit would be less painful for primary producers if the suggested revaluation or appreciation takes place when primary commodity prices are doing well. High oil prices would meet this requirement, but then there are other considerations that would militate against any imminent revaluation. Thus, ideal timing can be elusive. Malaysia may have to bite the bullet and unshackle the ringgit. It is advisable to de-peg the currency while the going is still good. It is proposed that the ringgit be aligned to a transparent composite currency basket of key currencies and that the ringgit be allowed to revert to a flexible rate system in a gradual manner transiting through crawling pegs.

No one would deny that all is not well with the present international financial system. But, Malaysia cannot afford to wait till the international financial architecture is restructured before it would review its exchange rate regime. The International Monetary Fund has no authority to ban currency trading. Currency trading cannot be done away with so long as there is no single world currency. To be sure, there is a need for rules, regulations, transparency, and accountability in currency trading. None of the existing international institutions are designed to monitor international currency transactions that far exceed the value of trade in goods and services. While international efforts on international financial reforms must continue, a process which will undoubtedly and understandably take much time, countries must learn to accept the world as it is with all its imperfections and make the best out of it.

REFERENCES

Ariff, M. *et al.* (1998), *Currency Turmoil and the Malaysian Economy: Genesis, Prognosis and Response* (Kuala Lumpur: Malaysian Institute of Economic Research).

Ariff, M. (1993), *The Malaysian Economy: Pacific Connections* (Kuala Lumpur: Oxford University Press).

Ariff, M. and M. Semudram (1987), *Trade and Financing Strategies: A Case Study of Malaysia* (London: Overseas Development Institute).

Corden, W.M. (1997), "The Dilemmas of Currency Boards," in G.E. Perry (ed.), *Currency Boards and External Shocks: How Much Pain, How Much Gain?* (Washington, DC: The World Bank).

Friedman, M. (1953), "The Case for Flexible Exchange Rates," *Essays in Positive Economics*.

Lin, S.Y. (1991), "Exchange rate regimes and practices: Malaysian Perspectives," in M. Ariff (ed.), *The Pacific Economy: Growth with Stability*, (Sydney: Allen & Unwin).

Mundell, R.A. (1962), "Flexible Exchange Rate and Employment Policy," *Canadian Journal of Economics and Political Science*, March.

Perry, G.E. (1997), "Introduction and Summary," in G.E. Perry (ed.), *Currency Boards and External Shocks: How Much Pain, How Much Gain?* (Washington, DC: The World Bank).

Sohmen, E. (1961), *Flexible Exchange Rates, Theory and Controversy* (Chicago: University of Chicago Press).

Semudram, M. (1985), "The Management of the Malaysian Ringgit," *Institute of Strategic and International Studies (ISIS)*, mimeo (Kuala Lumpur, Malaysia).

Williamson, J. (1997), "Features and Implications of Currency Boards: Thoughts About the Argentine Situation," in G.E. Perry (ed.), *Currency Boards and External Shocks: How Much Pain, How Much Gain?* (Washington, DC: The World Bank).

Figure 1
Ringgit versus Major Currencies

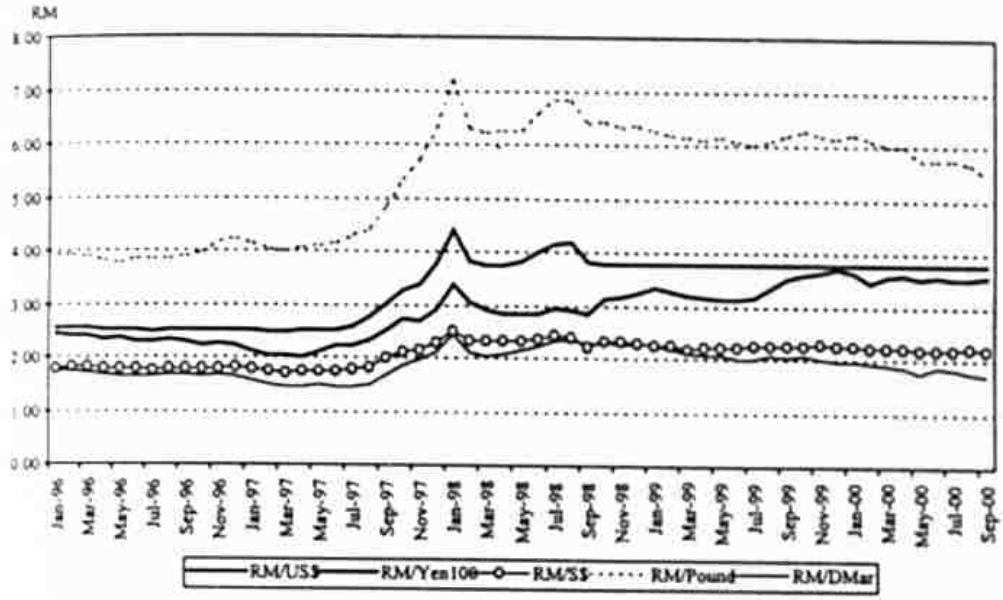


Figure 2
Index of Ringgit versus Major Currencies (June 1997 = 1.00)

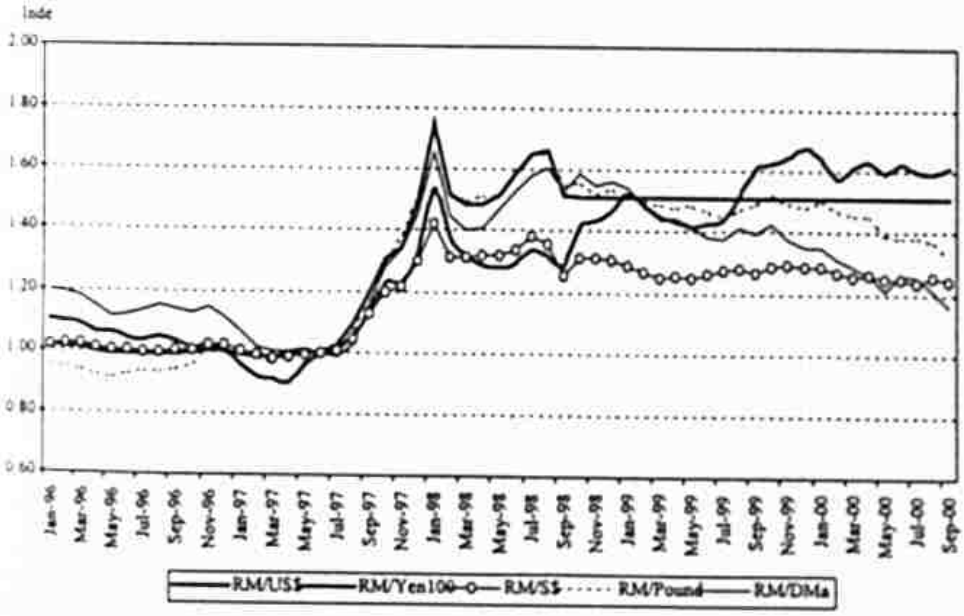


Figure 3

Index of Ringgit versus Regional Currencies (June 1997=1.00)

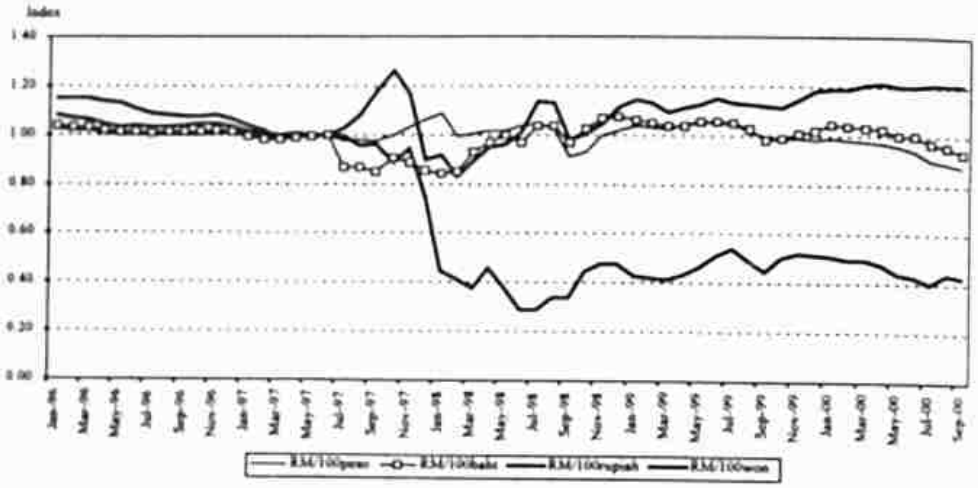
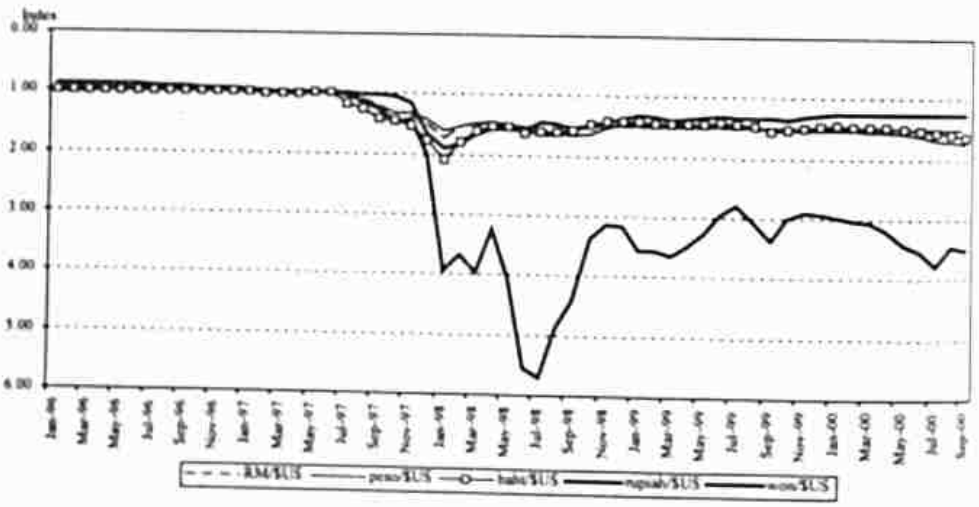


Figure 4

Exchange Rate Index, Regional Currency per $US (June 1997=1.00)



The International Roles of the US Dollar, the Euro and the Japanese Yen in East Asia's Exchange Rate Arrangements

Masahiro Kawai

I. INTRODUCTION

This paper examines the roles of the US dollar, the Japanese yen, and the euro as international currency. In particular, it focuses on these currencies' roles in East Asia's exchange rate policies.

The East Asian currency crisis forced many economies in the region to shift away from *de facto* US dollar-pegged regimes to flexible exchange rate regimes. The US dollar had played a dominant role as an international anchor (reference) currency in East Asia until the outbreak of the currency crisis in July 1997. During the crisis, the anchor currency role of the US dollar was substantially reduced, at least temporarily. As the currency crisis subsided in the second half of 1998, however, the East Asian economies largely returned, in practice, to arrangements akin to the pre-crisis, dollar-based exchange rate stabilization regimes. The question is whether or not this apparent reversion to US dollar-based regimes is a long-term trend and, if so, whether or not this trend is desirable. This question is important because it is often claimed that one of the causes of the East Asian currency crisis was the *de facto* US dollar-pegged regimes of the pre-crisis period.

This paper argues that any emerging market economy, including those in East Asia, faces a trade-off between the virtue of exchange rate stability and the need for flexibility, particularly during a time of a crisis, to maintain international price competitiveness. The "two-corner solution" approach of choosing either a free floating or a fully committed fixed rate regime (a common currency, dollarization, or a currency board) does not appear to be realistic in many emerging market economies, including East Asia, because these economies have strong preferences towards exchange rate stability, though not necessarily rigidity. Given East Asia's diversified trade and FDI relationships with the United States, Japan, and the European Union and given the continued large exchange-rate volatility among the tri-polar currencies, a reasonable exchange rate policy for many East Asian economies would be to stabilize rates to a basket of currencies consisting of the US dollar, the Japanese yen, and the euro. This paper proposes that the East Asian economies should achieve real effective exchange rate stabilization by loosely tying their rates to currency baskets during normal times, while allowing enough room for flexibility during a crisis driven by unsustainable economic conditions.

The organization of the paper is as follows. Section II studies the nature of "reported" and "observed" exchange rate arrangements for developing economies in the world. By econometrically identifying major currencies and their weights in a currency basket for almost all developing countries, this section demonstrates that many authorities in these economies exhibit a preference to stabilize their exchange rates vis-à-vis an international currency or a basket of such currencies. Using further regression analyses, the observed weights in a currency basket are explained by the country's share of trade with the relevant anchor countries or the currency areas formed by such anchor countries. Section III empirically analyzes the changing importance of the US dollar, the Japanese yen and the euro as an international anchor currency for the exchange rate behaviour of 12 East Asian economies before, during, and after the currency crisis using daily exchange rate data. It then argues that the *de facto* US dollar-pegged exchange rate regimes were indeed one of the factors behind the crisis. Section IV develops a scope for future exchange rate arrangements in emerging East Asia. It proposes a "soft" currency basket system where the US dollar, the Japanese yen and the euro play more balanced roles than in the pre-crisis period. Section V summarizes the paper and offers an agenda for future research.

II. EXCHANGE RATE ARRANGEMENTS OF THE LDCS IN THE 1990S

This section reviews the exchange rate arrangements of almost all developing countries in the world for the 1990s and obtains some stylized facts and general conclusions.[1] It focuses particularly on the role played by the world's major currencies, such as the US dollar, the Deutsche mark, and the Japanese yen, as international anchor currencies for other countries' exchange rate stabilization.

"Reported" Exchange Rate Arrangements

The International Monetary Fund (IMF) regularly publishes exchange rate arrangements reported by its member countries according to its own classification scheme. Table 1 presents the overview of the developing world's exchange rate arrangements reported by LDC members, for the period December 1980 through December 1999.[2] Exchange rate arrangements are classified broadly into three categories: (a) a fixed rate arrangement; (b) limited exchange rate flexibility; and (c) a more flexible rate arrangement.[3]

First, the fixed rate arrangement includes a "peg to a single currency" and a "peg to a basket of currencies." As target currencies for single-currency pegs, the IMF lists the US dollar, the French franc, the Deutsche mark, the Australian dollar, the Indian rupee, the South African rand, the Italian lira, and the Singapore dollar at end-September 1998.[4] A peg to a basket of currencies is further divided into a "peg to the Special Drawing Rights (SDR)" and a "peg to a currency composite other than the SDR." While currency compositions of the SDR and their weights are clearly defined by the IMF, those of other currency

[1] See International Monetary Fund (1997) for discussions of exchange rate arrangements in developing countries.

[2] This table is compiled from the IMF's International Financial Statistics (various issues) by removing industrialized countries.

[3] Beginning January 1999, the IMF introduced a new classification of categories that include: (a) exchange rate arrangements with no separate legal tender; (b) currency board arrangements; (c) other conventional fixed peg arrangements (including *de facto* peg arrangements under managed floating); (d) pegged exchange rates within horizontal bands; (e) crawling pegs; (f) exchange rates within crawling bands; (g) managed floating with no preannounced path for exchange rate; and (h) independently floating. Since the new classification, however, is not strictly comparable to earlier classifications, we have decided to use classification adopted until September 1998.

[4] In the past, the IMF used to list also the UK pound, the Spanish peseta, the Portuguese escudo (for their respective former colonies), and the Russian ruble (for the newly independent, former Soviet republics soon after the collapse of the Soviet Union) as target anchors for single-currency pegs.

composites are specific to the respective country and are in most cases not made publicly available. To find such information, one must statistically analyze the observed exchange rate movements and estimate the basket composition and currency weights.

Next, limited exchange rate flexibility refers to "flexibility limited in terms of a single currency." Though not officially part of a "fixed rate arrangement," it is in reality a peg to the US dollar.

Finally, the more flexible rate arrangement includes "other managed floating" and "independently floating." The sub-category "other managed floating" suggests that the authorities intervene frequently in the foreign exchange market to influence the level and/or volatility of the exchange rate. The sub-category "independently floating" is supposed to represent a textbook-style flexible exchange rate regime. Both of these sub-categories may possibly contain heavily managed, or even *de facto* fixed, exchange rate regimes.

While the number of IMF members in the developing world has increased over time (from 118 in 1980 to 159 in 1998), the number of developing countries under fixed exchange rate arrangements has decreased (from 90 to 63), and the number of countries under more flexible exchange rate arrangements has increased (from 25 to 92). As far as "reported" exchange rate arrangements are concerned, developing countries have shifted from fixed to more flexible arrangements since 1980.

Though the number of developing countries on "more flexible rate arrangements" reached 92 (58 percent of the total) in September 1998, quite a few developing countries still attempt to stabilize their exchange rates. Indeed, 67 developing countries (42 percent of the total) were on "fixed exchange rate arrangements," including "limited exchange rate flexibility." It is also possible that some countries under "more flexible arrangements" have actually stabilized their exchange rates vis-à-vis a certain currency or a basket of currencies.

Focusing on the fixed rate arrangements, as of September 1998, the US dollar is the most popular target currency (for 24 developing countries including 4 countries under "flexibility limited in terms of a single currency"), followed by the French franc (for 15 countries), non-SDR currency baskets (for 12 countries), the SDR (for 4 countries), and the Deutsche mark (for 3 countries).[5] It is noteworthy to observe that no country any longer pegs its exchange rate to the UK pound sterling, particularly since 1986, or the Japanese yen throughout the period.

[5] Other target currencies for single-currency pegs include the South African rand (for 3 countries), the Indian rupee (for 2 countries), the Australian dollar, the Portuguese escudo and the Singapore dollar (for 1 country each).

"Observed" Exchange Rate Arrangements: Regression Analyses

The "reported" exchange rate arrangements provide useful information about the nature of the arrangements as reported by individual developing countries. However, these reported arrangements do not always describe the actual practice of exchange rate policies, nor do they offer sufficient information as to which currency or basket of currencies is chosen as a target for exchange rate stabilization. To understand what exchange rate arrangements are actually in place, one must statistically examine the behaviour of observed exchange rates.[6]

Regression analyses

One way to do this is to find, through regression analyses, which major currency or currency basket is chosen as a target for a particular country's exchange rate stabilization and how closely such a relationship can be observed. Extending the studies by Frankel and Wei (1993, 1994, 1995), Kawai and Akiyama (1998) conducted regression analyses to identify specific currencies that comprise a basket used as a target for a particular country's exchange rate stabilization and to find their weights in the basket. Exchange rate stabilization to a single currency can be interpreted as a special case in which only one currency is identified with a significant and large positive weight, while other currencies' weights are negligible.

Specifically, Kawai and Akiyama (1998) estimated the following type of regression equation:

$$\Delta e^{j}_{t} = \alpha + \beta_1 \Delta e^{USD}_{t} + \beta_2 \Delta e^{DM}_{t} + \beta_3 \Delta e^{JY}_{t} + \beta_4 \Delta e^{FF}_{t} + \beta_5 \Delta e^{UKP}_{t} + u_t, \qquad (1)$$

where Δe^{j}_{t} is the monthly change in the log exchange rate of currency j in month t, α is a constant term, β_k ($k = 1, 2, \ldots$) is the coefficient on the monthly change in the log exchange rate of currency k, and u_t is the residual term. The estimated standard error of residuals is interpreted as a measure of exchange rate volatility. Though the G-5 currencies (the US dollar, the Deutsche mark, the Japanese yen, the French franc, and the UK pound) were mainly used as candidates for potential targets for exchange rate stabilization, the SDR, ECU, and other relevant minor, regional currencies were also tried as potential targets, depending on a country's economic as well as non-economic (i.e., colonial, historical, cultural, and geographical) relationships. Using information from the "reported" exchange rate arrangements, the Australian dollar, the Indian rupee, the New Zealand dollar, the Portuguese escudo, the Singapore dollar, the South African rand, and the Spanish peseta were included in the list of potential target

[6] A more detailed study would require analysis of changes in foreign exchange reserves.

currencies for certain countries.[7] Data used were monthly average exchange rates for the sample period of January 1990 through December 1996.[8] Following Frankel and Wei (1994), all the exchange rates were expressed in terms of a numeraire currency, the Swiss franc.[9]

The underlying hypothesis is that every country attempts to stabilize its exchange rate to a basket of multiple currencies. The coefficients on the right-hand side exchange rates, β_i, are interpreted as the weights in a currency basket assigned by the country's authorities. A single currency peg is a special case, where the coefficient on the target currency for exchange rate pegging should be unity, the coefficients on other currencies should all be zero, and the value of the standard error of regression residuals should be zero. If one country's currency is not pegged rigidly, but is only loosely stabilized to another currency, the estimated coefficient for this target currency should be statistically significant and close to unity. Also, the standard error of residuals should take a sufficiently small value. If a currency is pegged or stabilized to a basket of multiple currencies, several coefficients should be statistically significant and should approximately add to unity. On the other hand, if a currency is on a purely

---

[7] The Russian ruble was not tried as a potential nominal anchor currency due to the lack of a sufficient number of exchange rate data for the former Soviet republic countries.

[8] The monthly average series of the exchange rates of G-5 currencies, a few regional currencies, SDR and ECU vis-à-vis the US dollar were obtained from the IFS data base (line code rf). Exchange rate data for Taiwan Province of China (POC) were obtained from the Central Bank of China, Taiwan District, *Financial Statistics*, various issues. To obtain meaningful regression results, data observations with values of log first differences greater than 0.1 (approximately a 10.5 percent change in both directions) were removed. This procedure was taken because countries often devalue their currencies to accommodate persistent differences in inflation rates vis-à-vis their reference-currency country. Without eliminating the effects of such discrete currency devaluations (or revaluations), the regression results could be too unstable to conclude the presence or absence of target/reference currency.

[9] In other papers, Frankel and Wei (1993, 1995) use the SDR as a numeraire currency, but Kawai and Akiyama (1998) did not follow this procedure because the SDR was regarded as a potential candidate for a reference currency.

flexible exchange rate regime, no coefficient should be statistically significant, and the estimated standard error of the regression residuals should be large.[10]

"Observed" exchange rate arrangements

Estimation results are summarized in Table 2.[11] The table classifies developing economies into three broad categories according to their "observed" exchange rate arrangements, that is, pegged, intermediate, and flexible, depending on the size of exchange rate volatility as measured by the estimated standard error of regression. Countries are classified to be under the "pegged" arrangement when volatility is less than 0.005, "intermediate" when volatility is between 0.005 and 0.015, and "flexible" when volatility exceeds 0.015; where the value 0.01 is approximately a 1 percent change in monthly exchange rates. The size of exchange rate volatility is shown next to each country's name. In each category, the table further classifies countries into three groups, depending on what currency or currency basket is assigned a significant weight in the regression equation.[12] Countries in the "USD" group are those for which the US dollar appears as the only significant currency in the regression equation. Countries in the "other single currency" group are those for which any other single currency appears as the only significant currency in the regression equation, with the name of the currency shown in parenthesis. Countries in the "basket of currencies" group are those for which multiple currencies appear as significant in the regression equation, with the names of currencies shown in parenthesis. The pound sign "#" is attached to a currency's name in parenthesis if its estimated coefficient exceeds 0.80 on an adjusted basis. When the sum of the estimated coefficients on multiple currencies is greater than unity, adjustments

---

[10] Interpretation of regression results, however, requires caution. The reason is that the exchange rate of a country whose shocks are highly correlated with those of the anchor country and whose inflation objective is similar to that of the anchor country authorities may appear to be stabilized vis-à-vis the anchor currency, even in the absence of any conscious effort of exchange rate stabilization. Such examples for industrialized countries in the 1990s include the Swiss franc vs. the Deutsche mark and the New Zealand dollar vs. the Australian dollar.

[11] The results in the table are obtained after extensive trial and error using many different combinations of the G-5 currencies, the SDR, the ECU, and relevant regional currencies as explanatory variables in each currency's regression. For each country (or economy), a regression equation with the highest explanatory power, measured by the R^2-adjusted and with reasonable coefficient estimates was chosen and its results reported.

[12] The statistical significance level is 5 percent.

are made by proportionally re-scaling the estimated coefficients downward so as to make the sum of the adjusted coefficients equal to one.

The table provides interesting information on "observed" exchange rate arrangements adopted by developing countries. While Table 1 indicates that an increasing number of developing countries have shifted away from fixed towards more flexible exchange rate arrangements, Table 2 reveals that almost all countries attempt to stabilize their exchange rates against one currency or a currency basket, though the degree of rate stabilization varies considerably across countries. Many countries regard the US dollar as the target currency even though they do not formally peg their currencies to the US dollar. Indeed, some countries under formal, flexible exchange rate arrangements do assign a large weight to the US dollar. Many other countries are using currency baskets as their anchor without officially announcing it. In addition to the French franc zone countries, there are other isolated cases where regionally influential currencies such as the Australian dollar and the South African rand are used as target currencies.

Exchange rate volatility and domestic price inflation

Cross-country data reveal that developing economies that allow large exchange rate volatilities are those with relatively high inflation rates. This is depicted in Figure 1 where exchange rate volatility (measured by the standard error of regression reported in Table 2) is plotted against the inflation rate (average of the log differences of monthly CPI series during January 1990 - December 1996). Since both exchange rate volatility and CPI data are needed to draw this figure, the number of developing countries is limited to 124. These economies are grouped into 6 regions: Africa, East Asia, South Asia, Europe, the Middle East, and Latin America.

Figure 1 clearly demonstrates that developing countries with high inflation rates tend to have high volatility of exchange rates. Many developing countries in Africa, Europe, and Latin America exhibit high inflation rates as well as large exchange rate volatility, although there are several exceptions. Developing countries in the Middle East tend to have both low inflation rates and small exchange rate volatility. Inflation rates of the East Asian emerging market economies are generally low, thus enabling them to achieve relatively stable exchange rates.

Estimating the Size of Currency Areas Formed by the US Dollar, the Euro and the Yen

The above regression result enables us to calculate the size of currency areas formed by the US dollar, the euro, and the Japanese yen. Calculation procedures and statistics draw on Kawai and Akiyama (1998).

First, each country is divided into a single currency area or a set of currency areas based on the estimated coefficients of the exchange rate regression for the country's currency. If a country has a unitary coefficient with very small standard error of residuals (the case of Hong Kong), it is regarded as pegging its exchange rate to a particular major or regional currency and its entire economy is classified as belonging to the currency area formed by this particular currency. If a country assigns several different weights to a basket of major or regional currencies (the case of Thailand), its economy is divided according to these weights and distributed to the corresponding currency areas. In dividing a country's economy into particular currency areas, we neglect statistically insignificant coefficients as well as negative coefficients. If the sum of statistically significant positive coefficients is equal to or less than one, the values of the estimated coefficients themselves are used. If the sum exceeds unity, all coefficients are proportionally adjusted so that the sum becomes one.[13]

Second, several measures such as GDP, trade flows, and financial aggregates (money supplies and stock market capitalizations) are used to calculate the economic size of the currency areas formed by the US dollar, the euro and the yen. For this purpose, we distribute currency areas formed by minor, regional countries to the larger G-5 currency areas using the estimated coefficients for these minor countries. The ECU and SDR areas are similarly distributed to the G-5 currency areas, using each country's estimated coefficients of the ECU and SDR as well as the estimated regression results for the ECU and SDR on G-5 currencies.[14] In calculating the size of the euro area, we add currency areas formed by actual and prospective EMU member countries.

Table 3 summarizes the economic size of the US dollar area, the euro area, and the Japanese yen area including the counterfactual case in which all fifteen EU members as well as all Central and Eastern European countries and Former Soviet Union countries form the EMU.[15] The table uses a sample of 82 countries for which data are available. Using GDP as a measure in calculating economic size, the case of EMU-15 indicates that about 46 percent of the world economy is in the US dollar area, 34 percent in the euro area, and 17 percent in

---

[13] For example, the estimated G-5 currency weights in the basket for the Thai baht are 0.82 for the US dollar (USD), 0.11 for the Japanese yen (JY), 0.05 for the Deutsche mark (DM), and 0.02 for the UK pound sterling (UKP). This means that 82 percent of Thailand belongs to the USD area, 11 percent to the JY area, 5 percent to the DM area, and 2 percent to the UKP area.

[14] We take this procedure for convenience. Regression of SDR on the G-5 currencies yields reasonable average weights, as reported in the bottom of Table 2.

[15] Needless to say, 11 joined the EMU: Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain.

the Japanese yen area.[16] The dollar area is larger than the size of the United States itself, which is 27.5 percent (average for 1990-96). This is because many developing countries regard the US dollar as the most important nominal anchor. In particular, a substantial part of the Asian and Western Hemisphere economies belong to the US dollar area. The euro area is bigger than the size of the European Union by about 3 percentage points. The Japanese yen area accounts for 17.4 percent which is only slightly larger than the relative share of the Japanese economy itself in the world, which is 17 percent; the yen area outside Japan is only 0.4 percent of the world economy. The yen, therefore, cannot be said to be a full-fledged, global nominal anchor currency.

The use of stock market capitalizations as a measure of economic size produces much larger dollar and yen areas (51 percent and 23 percent respectively) and a much smaller euro area (25 percent), while the use of total trade flows produces a euro area (48 percent) that is bigger than the dollar area (41 percent) and substantially bigger than the yen area (9 percent).[17] In short, if trade flows are the fundamental factors determining currency dominance, the results indicate a rapid rise in the euro's role. If these fundamentals are based on capital market measures the results suggest a much slower rise for the euro. The truth seems to lie somewhere in between.

Explaining the Estimated Currency Weights

Trade with the anchor country or the anchor currency area

What determines the estimated G-5 currency weights in each developing country's currency basket? The hypothesis tested here is that the estimated currency weights are explained either by (a) the country's share of trade with the respective anchor country (direct-trade based share), or (b) the country's share of trade with the currency area formed by the respective anchor country (currency-area based share). In addition, it is also postulated that non-economic factors, such as geographical location and former colonial relationship, may explain the currency weights.

The size of the currency area formed by an anchor country is calculated in the previous section. For each developing country, the volume of trade with each G-5 currency area is computed according to this principle, and using

[16] These numbers are largely consistent with those provided by other authors who use different methods. See Bergsten (1997), Hartmann (1998), and Masson and Turtleboom (1997).

[17] If intra-EU trade flows are netted out, the size of the trade-based euro area turns out to be much smaller and about comparable to that of the dollar area.

bilateral trade data (average exports plus imports for the 1990-96 period) obtained from IMF, *Direction of Trade Statistics*.[18]

In explaining the estimated G-5 currency weights, we have used a set of dummy variables that represent the country's geographical location and the past (or present) colonial status. First, 5 regional dummies are introduced: Africa, East Asia, Europe, the Middle East, and Latin America. South Asia is the remaining regional dummy that is excluded to avoid linear dependence in regressor variables. Second, 3 colonial dummies are introduced: the French colony, the UK colony, and the former Soviet Union Republic dummy. Only when a country was a French or UK colony in year 1950 or was part of the former Soviet Union at the time of its breakup, is the colonial dummy used.[19]

Estimation results

In the regression analysis, all possible combinations of the above-mentioned 13 regressors are tried as the right-hand side variables and, after excluding non-sensical combinations of regressors, the regression results that are considered to be the best according to explanatory power, as judged by R^2-adjusted, are chosen. Table 4 summarizes these results using direct trade-based and currency area-based trade shares for a sample of 146 developing economies. Generally speaking, use of currency-area based trade shares seems to explain G-5 currency weights better than does the use of direct-trade based variables: the more a developing economy trades with one of the G-5 currency areas (rather than the G-5 countries), the larger the weight of this anchor currency in the economy's exchange rate stabilization policy. One notable exception is the case of the DM weight, where use of direct-trade based shares produces better results, although there is no qualitative difference in the estimation results. Another exception is the case of the UKP weight where use of currency-area based trade shares does not yield an expected positive coefficient.

For the USD weight equation, use of currency-area data produces reasonable results with an expected positive coefficient on the USD area. While the coefficient on the French colony dummy is negative as expected, the model

---

[18] Taking Thailand as an example again, any country that trades with Thailand is considered to trade with the USD, JY, DM and UKP areas according to the proportions reflecting the estimated currency weights. A country's total volume of trade with each G-5 currency area was obtained by summing up over all its trading partners' decomposed fractions of the G-5 currency area. See Kawai and Akiyama (1998) for a detailed explanation of this computation procedure.

[19] It turns out that there were many countries that had colonial ties with France or the UK in 1950, but none with the US, Germany or Japan. The data source is an electronic text version of the US Central Intelligence Agency (CIA), *The World Factbook*, 1998.

for the USD weight may not be completely satisfactory because of the negative coefficients of East Asia regional dummies. For the DM weight equation, the choice of direct-trade based or currency-area based trade share is not important: a country's share of trade with Germany or with the DM area has the expected positive sign in explaining the DM weight in a currency basket. For the JY weight equation, the results are relatively weak: the coefficient on the JY area or Japan variable is statistically insignificant, and explanatory power is the lowest among the 5 equations. Trading with the JY area or with Japan does not necessarily increase the relative weight of the yen in a country's exchange rate policy.[20] For the FF weight equation, the estimation result is satisfactory because the coefficient on the FF area or France variable is positive and statistically significant, even after the relevant dummies are included. Finally, for the UKP weight equation, the results are difficult to interpret: the UKP weight is not adequately explained by the share of trade with the UKP area or with the United Kingdom. Numerous specifications failed to produce meaningful results in explaining the UKP weight.

Summary of Exchange Rate Arrangements

The results discussed above reveal that the "observed" exchange rate arrangements are largely consistent with the "reported" exchange rate policies, with some exceptions. The discussions in this section provide several stylized facts and general conclusions about the individual developing countries' exchange rate arrangements.

First, many developing countries have shifted their formal exchange rate arrangements from "fixed" to "more flexible" rate regimes. However, countries often exhibit preferences toward stable exchange rates vis-à-vis a single currency or a currency basket. Countries facing large exchange rate fluctuations against major international currencies are those in economic transition in Eastern Europe or the former Soviet Union or those subject to chronically high inflation.

Second, the US dollar is the most favoured target currency for exchange rate stabilization in the developing world (see Kawai and Akiyama, 1998) for numerical estimation of the size of the US dollar area). However, significant diversity exists across regions in exchange rate arrangements. Africa includes rigid exchange-rate peggers as well as free exchange-rate floaters, and its major anchor currencies are the French franc, the US dollar, and the SDR. Asian economies generally attempt to stabilize their exchange rates vis-à-vis the US dollar, the SDR and a few regional currencies. The Japanese yen does not play a major role as an anchor currency even in East Asia. Developing Europe

[20] Thus, the limited use of the Japanese yen as a reference/target currency for exchange rate stabilization is reflected in the weak sensitivity of currency use to trade shares.

has not experienced stable exchange rates in general, while the US dollar, major Western European currencies, or a basket of these serve as loose anchor currencies.[21] The Middle East includes countries that successfully stabilize exchange rates vis-à-vis the US dollar and the SDR. It is one of the most stable regions in the world in terms of exchange rate movements. The whole of Latin America is a *de facto* US dollar area, and even countries not officially pegging exchange rates to the US dollar do assign significantly positive, and close to unitary, weights to the dollar.

Third, a developing country's choice of reference/target currencies for exchange rate stabilization depends largely on which currency areas the country tends to trade with (excepting the UKP area), as well as on the country's geographical location and its past colonial ties. That is, a country that trades heavily with a particular currency area tends to choose this particular currency as an anchor for exchange rate stabilization. By implication, a country that trades with several currency areas with more or less equal shares is expected to choose a well-balanced currency basket as its target for exchange rate stabilization.

III. THE EAST ASIAN CURRENCY CRISIS AND EXCHANGE RATE MOVEMENTS

The Currency Crisis and the Changing Roles of the US Dollar, the Yen and the Euro

This section examines the anchor currency roles of the US dollar, the Japanese yen, and the euro during the East Asian currency crisis. To do so, we have decided to run the following simple regression equation by using daily exchange rates:

$$\Delta e^{j}_{t} = \alpha + \beta_1 \Delta e^{USD}_{t} + \beta_2 \Delta e^{JY}_{t} + \beta_3 \Delta e^{EURO}_{t} + u_t, \qquad (2)$$

where Δe^{j}_{t} is now the daily change in the log exchange rate of currency j on date t. Similar to equation (1) discussed earlier in the previous section, this regression equation attempts to determine how daily movements in each country's exchange rate are explained by the movements of three major international currencies of the world, i.e., the US dollar, the Japanese yen, and the euro.[22] All exchange

[21] However, the Central and Eastern European countries and Former Soviet Union countries willing to be EU members are expected to stabilize their currencies vis-à-vis the euro if they have not done so already (Honohan and Lane, 1999).

[22] For the sample period prior to the introduction of the euro on January 1, 1999, the European Currency Unit (ECU), the predecessor of the euro, is used for the euro rate.

rates are expressed vis-à-vis the Swiss franc. This simpler specification, rather than country-specific regression form, has been chosen because of the need to compare the roles of the tri-polar currencies across economies in East Asia as well as over time for each economy. As in the previous monthly regression, the estimated coefficients are interpreted as the weights assigned by the authorities to the corresponding currencies in their exchange rate policies.[23] Similarly, the estimated standard error of residuals can be interpreted as a measure of exchange rate volatility.

In order to examine possible shifts in the "observed" role of the tri-polar currencies before and after the currency crisis, we have run exchange-rate regressions (2) for twelve emerging East Asian economies, including the Asian NIEs (Hong Kong SAR, Korea, Singapore, and Taiwan POC), the ASEAN-4 (Indonesia, Malaysia, the Philippines, and Thailand), the smaller ASEAN-3 (Cambodia, Laos, and Vietnam), and China. In particular, to examine shifts in exchange rate arrangements, we consider the period before, during, and after the Thai baht devaluation. Using daily exchange rate data up to December 1999, we have chosen to run a set of rolling regressions by dividing the sample into a series of 3-month periods to capture changing patterns of exchange rate movements.[24] This procedure is particularly useful for the analysis of the mid-crisis period because regional contagion, delayed currency attacks (Korea) and large exchange rate depreciations at times of political uncertainty (Indonesia) may have altered patterns of exchange rate movements over the course of events.

Table 5 summarizes the results of such rolling regressions for the period January 1990 - December 1999. The 10-year period is divided into a series of 3-month sub-samples, by rolling over the sample by one month each. More concretely, a total of 118 regressions are run, using the first sub-sample period as January-March 1990, the second as February-April 1990, and so on – up to the final sub-sample period of October-December 1999.[25] Results for earlier 18-month periods are also reported, to compare with later periods.

The table confirms that in the pre-crisis period (January 1990 - June 1997), the estimated coefficients of the US dollar were statistically significant and close to unity, the R^2-adjusted is close to 1, and the estimated standard errors of regression are small (except for the smaller Indochina countries). This again supports the proposition that many East Asian economies were on *de facto*

---

[23] Again, this interpretation requires caution because the market, without conscious efforts on the part of the authorities, may have chosen the estimated coefficients.

[24] Our preliminary experiment indicated that one month (with about 20 observations) was too short to produce statistically significant results for coefficients other than the USD.

[25] No observations have been removed in this regression analyses.

US dollar-pegged systems until the time of the crisis. Nonetheless, the estimated coefficients of the Japanese yen were significant, for some sub-sample periods, in Singapore, Thailand, Korea, Taiwan POC, and Malaysia, but were much smaller than the coefficients for the US dollar. In this sense, the Japanese yen played some role as part of a currency basket in the pre-crisis period.[26] The euro also played an important role in Vietnam and some role in Singapore, Malaysia, and Thailand though it was relatively insignificant in other countries.

Not surprisingly, many affected economies experienced noticeable declines in US dollar weights and the R^2-adjusted in the mid-crisis period (July 1997 - Fall 1998). This was particularly pronounced in Indonesia, Thailand, Malaysia, Korea, the Philippines, and Singapore. As the US dollar weights declined, the weights of the Japanese yen rose in a significant way in some countries, particularly in Indonesia, Singapore, Thailand, and Malaysia.[27] The weights of the euro were relatively unaffected except for Vietnam where its role was relatively prominent in the pre-crisis period. The overall implication is that the importance of the Japanese yen in the exchange rate policies of several ASEAN countries rose during the crisis, while the euro's importance did not.[28]

The regression results for the post-crisis period (Fall 1998 - December 1999) indicate a return to the pre-crisis pattern of exchange rate arrangements. That is, the coefficients on the US dollar have become greater and significant again, and the R^2-adjusted level has become substantially larger than in the mid-

[26] The observed role of the Japanese yen in a currency basket for some countries such as Singapore, however, may reflect the fact that the authorities chose the SDR as a target for exchange rate management policy. The Japanese yen is an important component currency of the SDR.

[27] If the mid-crisis sample period is shortened to, say July 1997 - August 1998, the decline in US dollar weights and the rise in yen weights are much more pronounced.

[28] Whether the greater importance of the yen in the mid-crisis period truly reflects a conscious policy on the part of some ASEAN countries to target the yen remains debatable. This may simply reflect correlations between shocks and news affecting ASEAN's foreign exchange markets and those affecting Japan's, thus creating the observed statistical results.

crisis period.[29] The exception is Indonesia where the US dollar coefficient is still lower and the R^2-adjusted much lower than the pre-crisis level.

The table clearly reveals that countries under a stable peg throughout the period, such as Hong Kong SAR and China have maintained US dollar weights at levels close to unity. The R^2-adjusted is close to 1 and the estimated standard errors of regression are small and consistently below 0.001, which is close to a 0.1 percent change in daily exchange rates.[30]

Singapore and Taiwan POC were less affected by the East Asian currency turmoil as judged from the high US dollar weights maintained throughout the entire sample period. In the mid-crisis period, however, the US dollar weights declined more significantly for the Singapore dollar than for the new Taiwan dollar. An interesting observation is that the weights of the Japanese yen for these two currencies became significant in 1998 (Singapore) or in the last few months of 1998 (Taiwan POC). Furthermore, declines in R^2-adjusted in the mid-crisis period for these two currencies were much less pronounced than those for the East Asia-5 affected currencies.

Pros and Cons of a Currency "Peg" Policy

With free mobility of capital, exchange rate movements are susceptible to market psychology and herding behaviour, particularly in emerging market economies. Once investors are convinced that the exchange rate is out of a perceived "equilibrium" level, massive, one-way speculation can take place.

As discussed in the previous sections, many affected East Asian economies had attempted to maintain relatively stable exchange rates vis-à-vis the US dollar. For example, Thailand had been on a basket peg system until July 1, 1997, which required the Bank of Thailand to stabilize the baht with respect to a basket of foreign currencies where the weight of the US dollar was dominant. Similarly, other countries *de facto* stabilized their exchange rates against the US dollar.

---

[29] The higher US dollar weights observed in the post-crisis regressions may indicate that the East Asian monetary authorities have reverted to the pre-crisis pattern of US dollar-based exchange rate stabilization regimes despite their stated objective of free floating (with the notable exception of Malaysia). Alternatively, the post-crisis pattern may simply reflect either the decline in exchange rate volatility in the post-crisis period (January - December 1999), rather than a conscious policy shift to exchange rate stabilization, or the authorities' concern about too rapid an appreciation of the currency when growth momentum was about to pick up. Whatever the interpretation, it appears that the authorities continue to regard the US dollar as the most relevant reference currency for their exchange rate policies.

[30] This volatility is not directly comparable in size to the volatility reported in Table 2 where monthly exchange rates were used.

The East Asian currencies with a large weight on the US dollar in their currency baskets, became overvalued on a real, effective basis due to both higher domestic inflation than in the United States and the US dollar's appreciation since mid-1995 vis-à-vis the major industrialized currencies, particularly the Japanese yen and the Deutsche mark. The emergence of real, effective overvaluation of the currency was an important factor behind the mounting speculative pressure that developed in the foreign exchange market in 1997. Hence, the *de facto* US dollar-peg system was one of the underlying triggers of the currency crisis. We must discuss the "peg" part and the "US dollar" part separately.

The first issue is whether the affected East Asian economies made a mistake by pursuing the *de facto* "peg" system, rather than a flexible rate system, in the pre-crisis period. Exchange rate stability clearly benefited the East Asian economies, by ensuring nominal anchor and price stability, creating stable environments for trade- and FDI-driven economic development and growth, and avoiding regional beggar-thy-neighbour policies of competitive depreciation. In fact, exchange rate stability was an important factor behind the remarkable economic performance during the East Asian Miracle period of the mid-1960s through the mid-1990s (McKinnon, 2000).

However, an argument can be made that adopting greater exchange rate flexibility in the mid-1990s, for example in 1995 or the first half of 1996 in the case of Thailand, might have reduced the volume of capital inflows because of the probable exchange rate appreciation. Exchange rate appreciation would have raised the risk of undertaking continued foreign borrowing, because of the increased probability of currency depreciation, thus limiting further accumulation of short-term external debt. Instead, *de-facto* fixed exchange rate arrangements provided a perception that foreign currency-denominated inflows posed little risks for both domestic borrowers and foreign lenders. With high nominal interest rates at home relative to foreign countries, large volumes of foreign capital continued to pour into Thailand (and other economies). In addition, defending a pegged exchange rate at the time of severe speculative attacks and massive capital outflows is a difficult and potentially counterproductive task. An early adoption of exchange rate flexibility would have relieved such speculative pressure without imposing large costs on the economy. In sum, even if countries may benefit from stable exchange rates at normal times, maintaining an overvalued exchange rate at a time of speculative attack would be difficult and potentially costly.

The Role of the *De-facto* Dollar Peg as a Crisis Trigger

The next issue is whether the affected East Asian economies made a mistake by *de facto* pegging the exchange rates to the wrong currency, the US dollar. There is no doubt that the East Asian economies had enjoyed large benefits, for a long

time until the mid-1990s, by choosing the US dollar as an anchor for exchange rate stabilization.

First, the US dollar was used extensively as a trade invoicing currency for international trade in East Asia and in other parts of the world.[31] For each East Asian economy, stabilizing the value of its trade in terms of the US dollar was a reasonable policy given that its neighbours and many other countries in the world were using the dollar for trade invoicing.

Second, rapid economic development and growth in the Asian NIEs, the ASEAN countries, and China in the fifteen years until the outbreak of the crisis had been stimulated by their stabilization to the US dollar. In the face of rapid yen rate appreciation that began in the mid-1980s, the *de facto* US dollar-pegged system allowed these economies to receive foreign direct investment from Japan and to integrate themselves with the regional and global trading system. As Japan had already been gradually losing its international price competitiveness in the low- to mid-tech manufacturing products, yen rate appreciation accelerated this process by forcing Japanese firms to move their production sites to East Asia. From East Asian economies' perspectives, their exchange rate depreciation vis-à-vis the Japanese yen helped transform these economies into attractive production bases and platforms, for Japanese multinationals, to export products to the US and European markets. This process promoted international division of labour in the manufacturing sector within the region and helped these economies industrialize and grow, at least until 1995 when the yen rate rapidly depreciated.

When the yen began to depreciate vis-à-vis the US dollar in the spring of 1995, however, the emerging East Asian economies started to see deterioration of their international price competitiveness. Growth, driven by Japanese FDI inflows, began to lose its momentum. In addition, yen depreciation began to dampen real economic activity in relatively advanced East Asian economies (such as Korea, Taiwan POC, and Malaysia) that compete against Japan in third markets (such as the United States and Europe). If the Japanese yen were to continue to experience the "ever higher yen syndrome" (McKinnon and Ohno, 1997), then continued exchange rate stabilization vis-à-vis the US dollar would have been attractive to emerging East Asia. However, once the yen/dollar exchange rate became volatile, US dollar-based exchange rate regimes began to produce wide fluctuations of economic activity, severely limiting its benefits. The reason for the close association between yen/dollar exchange rate movements and East Asian economies' real activity is that these economies not only trade with Japan, but also compete with Japan in third markets in certain products.

---

[31] Commodities and primary products exported by many developing countries tend to be priced in the US dollar in the global markets.

Table 6 summarizes the emerging East Asian economies' relationship with the United States, Japan, the European Union, and the region itself in trade (exports and imports), FDI inflows, and total stocks of inward bank loans in the pre-crisis year of 1996. The table shows that for many East Asian economies, the United States is no longer the most dominant economic partner and that the relative importance provided by Japan and the European Union is as large as, and in some cases much larger than, that of the United States. Striking is the fact that the share provided by emerging East Asia is the largest for exports, imports and FDI. Following emerging East Asia, the United States is the most dominant as an export market, Japan is the most dominant as an import and FDI source country, and the European Union is the largest bank lender to East Asia.

The fact that the emerging East Asian economies have diverse linkages with the rest of the world in trade and FDI suggests that exchange rate stabilization vis-à-vis the US dollar alone is not the best choice. Indeed, when the US dollar began to appreciate in the spring of 1995, this system resulted in a loss of international price competitiveness and an overvaluation of the currencies on a real, effective basis.

IV. A REGIONAL EXCHANGE RATE ARRANGEMENT IN EAST ASIA

Need for a Viable Exchange Rate Arrangement Reflecting Diverse Economic Linkages

The recent currency crisis in East Asia created a common trend towards more flexible exchange rates at least as a "formal" regime in the affected countries (except for Malaysia). During the crisis, the role of the US dollar as an anchor currency clearly declined in the affected East Asia-5 (Korea and the ASEAN-4). As the crisis subsided, East Asia's exchange rate behaviour began to revert to the pre-crisis pattern of assigning a considerable weight to the US dollar. This trend implies that the role for the US dollar may continue to be important in the post-crisis period, despite increased flexibility in the exchange rates vis-à-vis the dollar. If these economies are to stabilize their exchange rates vis-à-vis some international currency or a basket, at least in normal times, the issue is what currency or currency basket should be targeted.

For many emerging market economies in East Asia, a return to a "formal" fixed exchange rate regime is unlikely, except for Malaysia, at least in the medium run. These economies have learned the hard lesson that a pegged exchange rate regime can be vulnerable to currency speculation unless they close the capital account vis-à-vis the rest of the world or choose to institutionalize a more permanent fixed rate commitment such as a currency board system or dollarization (or yenization). They are not likely to close the capital account or

set up a permanent fixed rate institution; they are likely to maintain "formal" flexible exchange rate arrangements under open capital accounts. On the other hand, these economies are reluctant to float freely (Calvo and Reinhart's (2000) "fear of floating") and have a greater tendency to intervene in the foreign exchange market. The implication is that the East Asian economies are likely to manage exchange rates so as to ensure reasonable rate stability. Essentially, the immediate adoption of the "two-corner solution" approach (Eichengreen, 1994 and Obstfeld and Rogoff, 1995) would be unrealistic.[32]

Under this scenario, given a well-balanced diversification of East Asia's economic transactions, a reasonable choice of target for exchange rate stabilization is a currency basket that includes the US dollar, the yen and the euro in a more balanced way than in the pre-crisis period.[33] Actual currency weights in the new basket will depend on: the relative importance of the United States, Japan, and the European Union as trade partners and FDI sources for each East Asian economy; future expectations of trend movements of the yen/US dollar exchange rate; and the perceived success of the newly introduced euro.

In general, monetary authorities cannot pursue simultaneously both nominal exchange rate and inflation targets, when the capital account is open. However, if inflation targeting is defined as a policy of achieving a weighted average of inflation rates of the United States, Japan, and the European Union and if nominal exchange rate targeting is defined as a policy of stabilizing the nominal exchange rate vis-à-vis a basket of the US dollar, the Japanese yen and the euro, then these two policies are in fact one and the same, at least in the long-run when purchasing power parity (PPP) tends to hold. Nominal exchange rate targeting has one added advantage over inflation targeting cum free floating: by removing the problems associated with a floating rate regime (short-run volatility and medium-run misalignment of exchange rates), a policy of nominal exchange rate targeting (with some bands) can better ensure exchange rate

---

[32] In the longer run, however, one of the corner solutions, that is, introducing a common currency through coordinated regional integration may be feasible and even desirable from optimum currency area criteria. For example, Bayoumi and Eichengreen (1994) found that Northeast Asia (Japan, Korea, and Taiwan POC) and Southeast Asia (Hong Kong SAR, Indonesia, Malaysia, Singapore, and perhaps Thailand), in addition to Northern Europe (not entire Western Europe), were respectively plausible candidates for monetary union. Bayoumi, Eichengreen and Mauro (2000) concluded that in terms of preparedness for monetary union, Asia in 1995 was not much different from continental Europe in 1987. But the lack of political commitment and institutional capacity would make such a move difficult in the short run.

[33] As the earlier finding in Section II-3 indicated, an economy that has diversified trade and FDI relationships with the major currency areas has strong potential for choosing a well-balanced currency basket.

stability in a way consistent with inflation targeting (with some bands). This is particularly the case for East Asia where the economies are small and relatively open so that domestic price inflation reflects international price movements. In essence, a "soft" peg to a basket of the tri-polar currencies can stabilize intra-regional exchange rates, while maintaining a targeted range of inflation rates.

It is not easy, however, for any East Asian economy to move unilaterally away from the current exchange rate arrangement in which the US dollar has a dominant weight to a new arrangement in which the relative weight of the dollar is smaller and those of the yen and euro larger.[34] Given other countries' arrangements, each economy may not have sufficient incentive to unilaterally alter its own exchange rate policy; a large share of trade with US dollar areas can increase the country's US-dollar weight. When neighbouring countries stabilize their exchange rates primarily against the US dollar, there may be no good reason for any one country to unilaterally alter its exchange rate policy. This demonstrates the potential importance of coordinated action on the part of the East Asian economies.

The rising intra-regional interdependence of trade and investment in East Asia means that economies in the region are expected to benefit from avoiding large fluctuations in intra-regional exchange rates. This is particularly the case for the ASEAN members, which are expected to complete the ASEAN Free Trade Agreement (AFTA) by the year 2003 through lowering tariffs on manufactured products below 5 percent. Essentially, large swings in exchange rates among the ASEAN countries would be counterproductive because they would alter international price competitiveness suddenly and make the prospective free trade agreement unsustainable. One way to maintain stable currencies with one another is for the ASEAN countries to adopt similar currency baskets consisting of the US dollar, the yen, and the euro and to loosely stabilize their exchange rates to such baskets. This does not require formal agreements on common baskets or frequent, concerted joint actions in the foreign exchange markets. Instead, the countries have only to choose similar baskets.[35]

To summarize, emerging East Asia is sufficiently integrated with Japan and Europe, as well as with the United States, in the area of trade and FDI. The region would be better off by adopting officially flexible arrangements, while in

---

[34] Honohan and Lane (1999) emphasized the existence of strategic interdependence in the choice of exchange rate regimes for neighbouring countries that compete for exports in third markets and for FDI inflows.

[35] As the degree of intra-regional integration becomes deeper, however, more concerted actions in the area of exchange rate, monetary and fiscal policies may be called for. And the choice of a common currency basket, or even adoption of a common currency, may become desirable. See Williamson (1999a, b).

normal times actually stabilizing the rates vis-à-vis a basket consisting of the tri-polar currencies. The desired weight to be assigned to the US dollar would be lower and those to the yen and the euro higher than the pre-crisis levels.

Impact of the Euro on East Asia's Exchange Rate Arrangements

Although the above discussion suggests that the weights of the euro in East Asia's future exchange rate policy could be higher, the newly introduced single currency is unlikely to rise to the status of a dominant key currency. The geographical distance between Europe and East Asia and the continued structural rigidity of the EU economy are other important reasons why the euro may not serve as a dominant key currency in emerging East Asia.[16]

The introduction of the euro will bring several benefits and costs to East Asia. In terms of benefits, the emergence of the euro will give private traders and investors a wider menu of dominant international currencies and financial instruments from which to choose. This does great service to everyone in the world, including East Asia. East Asian traders and investors will be able to hedge exchange risks using a larger, more efficient, and more liquid money market in a unified Europe. Investors will be able to diversify their portfolios across an increasing variety of international financial instruments, particularly those offered in the broader, deeper, and more liquid European capital market.[17]

In terms of costs, the emergence of the euro is expected to increase currency substitution, thus creating greater fluctuations in the exchange rates among the euro, the US dollar, and the Japanese yen. Given that East Asia trades with the US, Japan, and the EU, exchange rate fluctuations among the tri-polar currencies could pose a large strain on many East Asian economies. Furthermore, a unified, larger Europe would begin to exert greater financial and macroeconomic influence on the rest of the world, including East Asia. The East

---

[16] Once East Asia resumes its export expansion based on sustained economic growth, Europe is expected to face renewed trade competition from East Asian exporters. East Asia's targeting of its exchange rates to the euro would reinforce this trend to levels that might be politically unsustainable. Under exchange rate stabilization vis-à-vis the euro, the East Asian economies probably would have to realign exchange rates frequently. This suggests that, while its international role may rise in East Asia, the euro is not a realistic candidate for the region's major reference currency.

[17] Another global impact is that the emergence of the euro might place considerable limits on the policy autonomy of the United States (Bergsten, 1997). The United States might be forced to pursue macroeconomic policies consistent with sustainable current accounts and stable exchange rates. This would be a welcome consequence because it would ensure stable purchasing power and increased attractiveness for the US dollar, the most dominant international currency in the world.

Asian authorities will have to take into account shocks emanating from Europe, in addition to those from the US and Japan. East Asia's deepening financial interdependence with the rest of the world, including Europe, implies that they will face even greater risks of sudden capital flow reversals, increased pressure on the exchange rates, and undesirable effects on its local financial institutions, as illustrated by the recent currency crisis. This would require prudent macroeconomic policy management on the part of the East Asian authorities, as well as more frequent consultation with the EU (as well as the US and Japan) on the latter's macroeconomic policy.

As the exchange rates of the tri-polar currencies are expected to remain volatile, the East Asian economies have the incentive to increase the euro's weight (and the yen's weight) in their exchange rate management.

Possibilities for an Increased Role of the Yen

As in the case of the euro, the Japanese yen is unlikely to be the sole anchor currency, due to Japan's limited size as an export market for East Asia, the continued perception of an "ever higher yen," and its still shallow money and capital markets.[38] Whether the weight of the yen in East Asian exchange rate arrangements rises or not, depends on how soon and strongly the Japanese economy recovers from the long financial crisis of the 1990s, and how attractive an international currency, the yen, becomes. There are reasons to believe that potential exists for a greater international use of the yen.

First, Japan's economic interdependence with emerging East Asia has deepened over time. This process is expected to continue as the East Asian economies resume their sustained growth path, and as they become more similar to Japan, both in terms of economic and industrial structure and in terms of output and trade composition. In addition, Japan has been expanding imports of manufactured products, particularly from East Asia, mainly due to its overseas FDI activity expanded since the mid-1980s. If this trend continues, and if Japan offers larger markets for foreign products, the international use of the yen as a trade invoicing currency is likely to rise. In fact, in manufacturing products, 48 percent of Japan's exports to, and 29 percent of its imports from, East Asia are

[38] See Hamada and Horiuchi (1987), Tavlas and Ozeki (1992), Garber (1996), and Kawai (1996) for explanations of the limited use of the Japanese yen as an international currency, even in emerging East Asia. Essentially, there are two reasons for this. First, Japan's postwar recovery and growth were made possible by joining the US dollar area and that the dollar has continued as the most dominant international currency at the global level, preventing other national currencies from developing into full-fledged international currencies. Second, Japan's short-term money markets were shallow and thin, making it difficult for residents and non-residents to use yen-denominated assets as liquid working balances for international transactions. As a result, Japanese firms and investors did not had sufficient incentive to denominate international transactions in the yen.

invoiced in yen. Though still low compared with those of the United States and Germany, these shares are much higher than those for Japan's overall trade that is denominated in yen. A rapid expansion of Japanese markets for foreign products has potential for the yen's greater attractiveness.

Second, the Japanese yen is being used widely to denominate long-term lending in East Asia (see Table 7). The East Asian economies have increased the share of yen-denominated external debts at the cost of dollar-denominated debts since the 1980s. The Japanese government extended yen loans to crisis-affected countries in 1998-1999 for emergency financing and crisis resolution, including the New Miyazawa Initiative. The rising role of the yen in debt denomination is suggestive of the future continuing role of the yen backed by official financing, which is expected to promote yen internationalization in the region.

Third, the expectations of trend appreciation of the Japanese yen may be reversed in the process of financial sector consolidation, economic recovery, and rapid aging of the population, which would render use of the yen attractive in the exchange rate policies of East Asia. The trend appreciation of the yen gave strong incentive for the emerging East Asian economies to stabilize their exchange rates to the US dollar, because they could gain international price competitiveness against Japan by doing so. Japan's current account surplus is expected to be smaller due to its eventual economic recovery (greater absorption) in the short-run and its population aging (lower savings rates) in the medium term, which would restrain the expectations of an "ever higher yen."

Fourth, the on-going deregulation and liberalization of the Japanese money and capital markets is expected to make some progress to transform Tokyo into a more user-friendly international financial center. This process would be accelerated by the Tokyo financial "Big Bang" policy on the one hand, and on the other, by the Japanese government's response to the introduction of the euro and the unification of money and capital markets in Europe. If it is successful in reconstructing as a healthy financial system, the Tokyo market could grow into one of the top three international financial centers in the world. This would promote the international use of the yen.

Room exists for the yen to play a more prominent role as one of the international anchor currencies in East Asia. At the same time, however, the role of the US dollar will continue to be dominant because of the effects of inertia and history. To the extent that the yen's attractiveness rises, it may come to share the anchor currency role with the US dollar, in the sense of receiving greater weights assigned by the East Asian authorities in their currency basket policies.[39]

---

[39] Hence, the yen's role in East Asia will not be as distinct as the one that was played by the Deutsche mark in the European Monetary System. Even in Western Europe, the French franc and the ECU before the introduction of the euro shared the anchor currency role of the Deutsche mark (see Kawai and Akiyama, 1998).

V. CONCLUDING REMARKS

This paper has found that the role of the US dollar as the dominant anchor currency in East Asia was reduced during the recent currency crisis period, but its prominence has recently been restored, particularly since late-1998. The crisis experience suggests that the East Asian economies are likely to maintain more flexible exchange rate arrangements, at least officially. At the same time, these economies would presumably continue to prefer to maintain exchange rate stability without fixed rate commitments. A case can be made that they are likely to choose a balanced currency basket system in which the yen and the euro play a more important role than before.

Given the strong degree of intra-regional trade and investment interdependence, each economy in East Asia has an incentive to avoid harmful large fluctuations in exchange rates within the region. This is particularly the case for ASEAN countries: large swings in exchange rates among the ASEAN members would be counterproductive because they could suddenly alter international price competitiveness and make the prospective free trade agreement unsustainable. This implies that the ASEAN countries might find it useful to choose similar currency baskets and stabilize their exchange rates against these baskets, ensuring intra-regional exchange rate stability.

From a global perspective, the avoidance of large exchange rate fluctuations among the major currencies will continue to be an important policy objective, not only for Japan, the United States, and Europe, but also for emerging market economies such as those in East Asia, which benefit from global exchange rate stability among the tri-polar currencies. These economies are particularly susceptible because (a) they have been pursuing financial deregulation, market opening, and capital account liberalization, and (b) they are facing increased risks of sudden capital flow reversals, as well as the consequent instability in their financial system and foreign exchange market caused by these flows. A greater effort is required to develop a framework for international monetary coordination, not only to maintain stable exchange rates among the tri-polar currencies, but also to minimize the risk of currency and financial crises in emerging economies. In choosing exchange rate arrangements, the emerging market economies, particularly those of East Asia, should focus on maintaining stable macroeconomic environments, minimizing currency risks, and promoting trade, investment and growth.

REFERENCES

Bayoumi, Tamim and Barry Eichengreen (1994), "One Money or Many? Analyzing the Prospects for Monetary unification in Various Parts of the World," *Princeton Studies in International Finance*, 76, International Finance Section, Princeton University.

Bayoumi, Tamim, Barry Eichengreen, and Paolo Mauro (2000), "On Regional Monetary Arrangements for ASEAN," *Journal of the Japanese and International Economies*, 14, June, pp. 121-148.

Bergsten, C. Fred (1997), "The Impact of the Euro on Exchange Rates and International Policy Cooperation" in Paul R. Masson, Thomas H. Krueger, and Bart G. Turtleboom (eds.), *EMU and the International Monetary System* (Washington, DC: International Monetary Fund), pp. 17-48.

Calvo, Guillermo A. and Carmen M. Reinhart (2000), "Fear of Floating," mimeograph (May), University of Maryland, College Park.

Eichengreen, Barry (1994), *International Monetary Arrangements for the 21st Century* (Washington, DC: Brookings Institution).

_____ (1998), "The Euro as a Reserve Currency," *Journal of the Japanese and International Economies*, December, pp. 483-506.

Frankel, Jeffrey A. and Shang-Jin Wei (1993), "Is There a Currency Bloc in the Pacific?" in Adrian Blundell-Wingnall and Stephen Grenville (eds.), *Exchange Rates, International Trade and Monetary Policy* (Sydney: Reserve Bank of Australia), pp. 275-307.

_____ (1994), "Yen Bloc or Dollar Bloc?: Exchange Rate Policies of the East Asian Economies," in Takatoshi Ito and Anne Krueger (eds.), *Macroeconomic Linkage: Savings, Exchange Rates, and Capital Flows* (Chicago: University of Chicago Press), pp. 295-329.

_____ (1995), "Emerging Currency Blocks," in Hans Genberg (ed.), *The International Monetary System*, Spring, pp. 111-170.

Garber, Peter (1996), "The Use of the Yen as a Reserve Currency," *Monetary and Economic Studies*, Bank of Japan, 14 (December), pp. 1-21.

Goto, Junichi and Koichi Hamada (1994), "Economic Preconditions for Asian Regional Integration," in Takatoshi Ito and Anne Krueger (eds.), *Macroeconomic Linkage: Savings, Exchange Rates, and Capital Flows* (Chicago: University of Chicago Press), pp. 359-385.

Hamada, Koichi and Akiyoshi Horiuchi (1987), "Monetary, Financial and Real Effects of Yen Internationalization," in S. W. Arndt and J. D. Richardson (eds.), *Real-Financial Linkages among Open Economies* (Cambridge: MIT Press), pp. 167-191.

Hausmann, Ricardo, Ugo Panizza, and Ernesto Stein (1999), "Why Do Countries Float the Way They Float?," mimeograph, November (Washington, DC: Inter-American Development Bank).

Honohan, Patrick and Philip R. Lane (1999), "Pegging to the Dollar and the Euro," *International Finance*, 2 (3), pp. 379-410.

Ito, Takatoshi, Eiji Ogawa, and Yuri Nagataki-Sasaki (1998), "How Did the Dollar Peg Fail in Asia?," *Journal of the Japanese and International Economies*, 12, December, pp. 256-304.

Kawai, Masahiro (1996), "The Japanese Yen as an International Currency: Performance and Prospects," in Ryuzo Sato, Rama V. Ramachandran, and Hajime Hori (eds.), *Organization, Performance and Equity: Perspectives on the Japanese Economy* (Kluwer Academic Publishers), pp. 305-355.

_____ (1997), "Japan's Trade and Investment in East Asia," in David Robertson (ed.), *East Asian Trade after the Uruguay Round* (Cambridge: Cambridge University Press), pp. 209-226.

Kawai, Masahiro and Shigeru Akiyama (1998), "Roles of the World's Major Currencies in Exchange Rate Arrangements," *Journal of the Japanese and International Economies*, 12, December, pp. 334-387.

_____ (2000), "Implications of Currency Crisis for Exchange Rate Arrangements in Emerging East Asia," mimeograph, November, East Asia and the Pacific (Washington, DC: The World Bank).

Kawai, Masahiro and Shinji Takagi (2000), "Proposed Strategy for a Regional Exchange Rate Arrangement in Post-crisis East Asia: Analysis, Review and Proposal," mimeograph, November, East Asia and the Pacific, (Washington, DC: The World Bank).

Masson, Paul R. and Bart Turtleboom (1997), "Characteristics of the Euro, the Demand for Reserves, and Policy Coordination under EMU," in Paul R. Masson, Thomas H. Krueger, and Bart G. Turtleboom (eds.), *EMU and the International Monetary System* (Washington, DC: International Monetary Fund), pp. 194-224.

Mussa, Michael, Paul Masson, Alexander Swoboda, Esteban Jadresic, Paolo Mauro, and Andy Berg (2000), "Exchange Rate Regimes in an Increasingly Integrated World Economy," Occasional Paper 193, August (Washington, DC: International Monetary Fund).

McKinnon, Ronald I. (2000), "The East Asian Dollar Standard: Life after Death?," *Economic Notes*, 29, February, pp. 31-82.

McKinnon, Ronald I. and Kenichi Ohno (1997), *Dollar and Yen: Resolving Economic Conflict between the United States and Japan* (Cambridge, MA: MIT Press).

Obstfeld, Maurice and Kenneth Rogoff (1995), "The Mirage of Fixed Exchange Rates," *Journal of Economic Perspectives*, 9, Fall, pp. 73-96.

Ohno, Kenichi (1999), "Exchange Rate Management in Developing Asia: Reassessment of the Pre-crisis Soft Dollar Zone," ADBI Working Paper 1, January (Tokyo: Asian Development Bank Institute).

Tavlas, George S. and Yuzuru Ozeki (1992), *The Internationalization of Currencies: An Appraisal of the Japanese Yen*, Occasional Paper 90, January (Washington, DC: International Monetary Fund).

Williamson, John (1999a), "The Case for a Common Basket Peg for East Asian Currencies," in Stefan Collignon, Jean Pisani-Ferry, and Yung Chul Park (eds.), *Exchange Rate Policies in Emerging Asian Countries* (London and New York: Routledge), pp. 327-343.

_____ (1999b), "Future Exchange Rate Regimes for Developing East Asia: Exploring the Policy Options," mimeograph, May (Washington, DC: The World Bank, South Asia Region).

Table 1. Summary of Reported Exchange Rate Arrangements of IMF-member Developing Countries, 1980-1998

	1980	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998
Fixed exchange rate arrangement	90	89	81	75	82	71	70	65	65	65	63
Pegged to the US dollar	39	31	25	24	24	21	23	22	21	20	20
Pegged to the French franc	14	14	14	14	14	14	14	14	14	15	15
Pegged to the UK pound sterling	1	1	0	0	0	0	0	0	0	0	0
Pegged to the deutsche mark	0	0	1	1	1	1	1	2	2	3	3
Pegged to the Russian ruble	0	0	0	0	6	1	1	0	0	0	0
Pegged to other currency	3	4	5	3	5	6	7	6	7	8	9
Pegged to SDR	15	11	6	6	5	4	4	3	2	3	4
Pegged to other currency composite	18	28	30	27	27	24	20	18	19	16	12
Limited exchange rate flexibility	a	5	4	4	4	4	4	4	4	4	4
Flexibility limited vis-a-vis a single currency	a	5	4	4	4	4	4	4	4	4	4
Cooperative arrangements	0	0	0	0	0	0	0	0	0	0	0
More flexible exchange rate arrangement	3+b+c	32	46	54	58	77	81	88	89	89	92
Adjusted according to a set of indicators	3	4	5	5	3	4	3	2	2	0	0
Other managed floating	b	17	21	25	22	28	30	42	43	44	55
Independently floating	c	11	20	24	33	45	48	44	44	45	37
Unclassified	0	1	1	1	0	0	0	0	0	0	0
Total	118	127	132	134	144	152	155	157	158	158	159

Notes: 1) There are several IMF-member and non-member developing economies that are not included in this table, such as Hong Kong SAR, Taiwan Province of China, and Cambodia (1980 and 1992).
2) The last date of this sample is September 1998.
3) The sum of a, b, and c in the table in 1980 is 25.

Sources: IMF, International Financial Statistics, various issues.

Table 2 Summary of Observed Exchange Rate Arrangements of Developing Countries, 1990-1996

(a) Pegged Volatility < 0.005

USD	Volatility	Excl/Incl
Afghanistan, I. S. of #	0.0000	0/84
Antigua & Barbuda #	0.0000	0/84
Aruba #	0.0000	0/84
Bahamas, The #	0.0000	0/84
Bahrain #	0.0000	0/84
Barbados #	0.0000	0/84
Belize #	0.0000	0/84
Djibouti #	0.0000	0/84
Dominica #	0.0000	0/84
Grenada #	0.0000	0/84
Iraq #	0.0000	0/84
Liberia #	0.0000	0/84
Micronesia, Fed Sts #	0.0000	0/84
Netherlands Antilles #	0.0000	0/84
Oman #	0.0000	0/84
Panama #	0.0000	0/84
Qatar #	0.0000	0/84
St. Vincent & Grenadines #	0.0000	0/84
Saudi Arabia #	0.0000	0/84
St. Kitts and Nevis #	0.0000	0/84
St. Lucia #	0.0000	0/84
Syrian Arab Republic #	0.0000	0/84
United Arab Emirates #	0.0000	0/84
Yemen, Republic of #	0.0000	0.0260
Hong Kong SAR#	0.0011	0/84
Indonesia #	0.0027	0/84
Egypt #	0.0035	0.0244
Bolivia #	0.0036	0/83
Trinidad & Tobago #	0.0047	0.0120

Other Single Currency	Volatility	Excl/Incl
Benin (FF#)	0.0000	1/83
Burkina Faso (FF#)	0.0000	1/83
Cameroon (FF#)	0.0000	1/83
Central African Rep (FF#)	0.0000	1/83
Chad (FF#)	0.0000	1/83
Comoros (FF#)	0.0000	1/83
Congo (FF#)	0.0000	1/83
Cote d'Ivoire (FF#)	0.0000	1/83
Equatorial Guinea (FF#)	0.0000	1/83
Gabon (FF#)	0.0000	1/83
Mali (FF#)	0.0000	1/83
Niger (FF#)	0.0000	1/83
Senegal (FF#)	0.0000	1/83
Togo (FF#)	0.0000	1/83
Kiribati (AD#)	0.0000	0/84
Lesotho (SAR#)	0.0000	0/84
Namibia (SAR#)	0.0000	0/84
Swaziland (SAR#)	0.0000	0/84
Bhutan (IR#)	0.0002	2/82
Brunei Darussalam (SID#)	0.0033	0/30
Estonia (DM#)	0.0037	0/54

Basket of Currencies	Volatility	Excl/Incl
Thailand (USD#, JY, DM, UKP)	0.0009	0/84
Fiji (USD, AD, JY, UKP, NZD)	0.0027	0/84
Czech Republic (DM, USD)	0.0042	0/47
Jordan (USD, SDR)	0.0043	0/84
Tonga (AD, USD, NZD)	0.0048	0/84
Singapore (SDR, USD)	0.0050	0/84

(b) Intermediate. 0.005 < Volatility < 0.015

USD	Volatility	Excl/Incl
Bangladesh #	0.0066	0/84
Lao People's Dem. #	0.0068	1/83
Moldova #	0.0073	0/31
Azerbaijan #	0.0076	1/18
China, People's Rep. #	0.0093	2/82
Costa Rica #	0.0107	0/84
Suriname #	0.0118	5/79
Paraguay #	0.0119	0/84
Guinea #	0.0124	0/83
Ethiopia #	0.0125	1/83
Solomon Islands #	0.0127	0/84
Israel	0.0127	0/84
Pakistan #	0.0128	0/84
India #	0.0130	2/82
Maldives #	0.0134	0/84
Sri Lanka #	0.0140	0/84
Nicaragua	0.0143	16/68

Other Single Currency	Volatility	Excl/Incl
Croatia (DM#)	0.0064	0/24
Vanuatu (AD)	0.0122	0/84
Western Samoa (AD)	0.0146	0/84
Macedonia (DM#)	0.0148	0/36

Basket of Currencies	Volatility	Excl/Incl
Mauritius (ECU, FF, USD)	0.0056	0/84
Cyprus (ECU, USD, UKP)	0.0056	0/84
Korea (USD#, JY)	0.0062	0/84
Cape Verde (FF, PE)	0.0069	1/83
El Salvador (USD#, UKP)	0.0069	2/82
Tunisia (ECU#, USD)	0.0070	0/84
Kuwait (USD, JY)	0.0073	0/75
Seychelles (USD, JY, UKP)	0.0075	0/84
Libya (USD, FF, JY, UKP)	0.0079	1/83
Botswana (SAR, USD)	0.0085	2/82
Taiwan POC (USD, FF, JY)	0.0087	0/84
Myanmar (SDR#)	0.0089	0/84
Malta (ECU#, USD)	0.0096	0/84
Slovak Republic (FF#, USD)	0.0103	0/47
Iran, I.R. of (USD, DM, UKP)	0.0106	2/82
Malaysia (SID, USD)	0.0106	0/84
Morocco (FF, DM, USD)	0.0108	0/84
Colombia (USD, SDR)	0.0114	1/83
Argentina (USD, DM)	0.0124	6/78
Guyana (USD, DM)	0.0130	4/80
Hungary (USD, FF)	0.0133	1/83
South Africa (USD, UKP)	0.0135	0/84
Mauritania (USD, UKP)	0.0139	1/83
Gambia, The (FF, USD, UKP)	0.0146	0/83
Nepal (IR, USD)	0.0148	0/84

(c) Flexible Volatility > 0.015

USD	Volatility	Excl/Incl	Other Single Currency	Volatility	Excl/Incl	Basket of Currencies	Volatility	Excl/Incl
Poland	0.0152	3/81	Malawi (UKP)	0.0166	7/74	Latvia (USD, JY)	0.0150	5/53
Somalia #	0.0156	0/5	Slovenia (DM#)	0.0202	1/60	Chile (USD#, JY)	0.0151	0/84
Dominican Republic #	0.0158	3/81	Tajikistan (UKP#)	0.0346	21/18	Burundi (SDR#)	0.0152	1/79
Algeria	0.0159	6/78				Papua New Guinea (USD, AD)	0.0166	1/83
Mexico #	0.0163	4/80				Zimbabwe (USD, UKP)	0.0187	3/81
Honduras #	0.0165	4/80				Madagascar (SDR#)	0.0191	3/81
Uruguay #	0.0166	0/84				Ghana (USD, FF)	0.0192	0/84
Philippines #	0.0168	0/84				Kenya (USD, UKP)	0.0204	5/79
Vietnam #	0.0169	2/69				Guatemala (USD#, JY)	0.0220	2/82
Mongolia #	0.0175	6/71				Mozambique (FF, USD)	0.0254	7/77
Ecuador #	0.0180	1/83				Sao Tome & Principe (SDR#)	0.0276	9/73
Venezuela #	0.0180	6/78				Angola (ECU#)	0.0395	40/28

(c) Flexible Volatility > 0.015 (cont.)

USD	Volatility	Excl/Incl	Other Single Currency	Volatility	Excl/Incl	Basket of Currencies	Volatility	Excl/Incl
Lebanon #	0.0203	16/68						
Rwanda	0.0203	8/70						
Peru #	0.0214	16/68						
Turkmenistan #	0.0239	18/23						
Sierra Leone #	0.0242	7/77						
Armenia #	0.0244	21/35						
Guinea-Bissau	0.0249	6/78						
Tanzania #	0.0250	2/82						
Cambodia #	0.0250	13/46						
Albania	0.0251	2/57						
Lithuania #	0.0260	3/45						
Russian Federation #	0.0261	11/25						
Nigeria #	0.0267	3/79						
Ukraine #	0.0274	16/32						
Kazakhstan #	0.0281	7/30						
Uganda #	0.0283	2/82						
Haiti #	0.0284	5/79						
Bulgaria #	0.0294	14/58						
Sudan #	0.0295	9/71						
Romania	0.0303	13/71						
Jamaica #	0.0318	3/81						
Zambia #	0.0335	19/65						
Brazil #	0.0360	46/38						
Zaire #	0.0453	53/21						

Notes:

1) Countries are classified into three categories of exchange rate arrangements (pegged, intermediate, and flexible), depending on the size of exchange rate volatility as measured by the estimated standard error of regression. Countries are classified as "pegged" when the volatility is less than 0.005, "intermediate" when the volatility is between 0.005 and 0.015, and "flexible" when the volatility is greater than 0.015. The size of exchange rate volatility is shown next to each country's name. In each category, countries are further classified into three groups, depending on what currency or basket of currencies is assigned a significant weight in the regression equation. Countries in the "USD" group are those for which the US dollar appears as the only significant currency in the regression equation. Countries in the "other single currency" group are those for which other single currency appears as the only significant currency in the regression equation, with the name of the currency shown in each parenthesis. Countries in the "basket of currencies" group are those for which multiple currencies appear as significant in the regression equation, with the names of currencies shown in each parenthesis. The pound sign "#" is attached to a currency if its estimated coefficient exceeds 0.80 on an adjusted basis; when the sum of the estimated coefficients on multiple currencies is greater than unity, adjustment is made by proportionally re-scaling the estimated coefficients downward so as to make the sum of the adjusted coefficients equal to one.
2) Data observations with values of log first differences greater than 0.1 have been excluded. The column, excl/incl, shows the number of observations excluded and included in the regression equation.
3) The currency names are abbreviated as: USD = US dollar, FF = French franc, SAR = South African rand, SID = Singapore dollar, DM = Deutsche mark, AD = Australian dollar, JY = Japanese yen, UKP = UK pound, NZD = New Zealand dollar, SDR = Special drawing rights, ECU = European currency unit.
4) Croatia refers to the 1995-96 period. Only Belarus (the size of volatility being 0.0336) exhibited no significant currency in the regression equation. However, the number of observations for Belarus was only eight.

Data Source: Kawai and Akiyama (1998), Appendix Table.

Table 3 The Estimated Size of the Currency Areas for the Euro, the US Dollar, and the Japanese Yen
Percentage Averages Based on 1990-96 Data

(1) Measured by Gross Domestic Product (GDP) in Current US Dollars

	Case of EMU-11					Future Case of EMU-15					Regional Total
	Euro Area	US dollar Area	Japanese Yen Area	UK Pound Area	Other	Euro Area	US dollar Area	Japanese Yen Area	UK Pound Area	Other	
INDUSTRIAL COUNTRIES	28.1	31.0	17.1	5.0	0.4	33.4	30.8	17.1	0.0	0.3	81.5
EUROPEAN UNION-15	26.6	0.2	0.0	4.6	0.1	31.5	0.0	0.0	0.0	0.0	31.5
EMU-11	25.1	0.0	0.0	0.0	0.0	25.1	0.0	0.0	0.0	0.0	25.1
4 OTHER EU MEMBERS	1.4	0.2	0.0	4.6	0.1	6.3	0.0	0.0	0.0	0.0	6.3
UNITED STATES	0.0	27.5	0.0	0.0	0.0	0.0	27.5	0.0	0.0	0.0	27.5
JAPAN	0.0	0.0	17.0	0.0	0.0	0.0	0.0	17.0	0.0	0.0	17.0
OTHER	1.5	3.3	0.1	0.4	0.3	1.9	3.3	0.1	0.0	0.3	5.6
DEVELOPING COUNTRIES	1.1	15.7	0.4	0.2	1.1	1.3	15.7	0.4	0.0	1.1	18.5
AFRICA	0.3	0.7	0.0	0.1	0.2	0.5	0.7	0.0	0.0	0.2	1.4
ASIA	0.3	7.5	0.3	0.0	0.2	0.3	7.5	0.3	0.0	0.2	8.3
EUROPE	0.1	0.8	0.0	0.0	0.6	1.4	0.0	0.0	0.0	0.0	1.4
MIDDLE EAST	0.0	1.0	0.0	0.0	0.1	0.0	1.0	0.0	0.0	0.1	1.2
WESTERN HEMISPHERE	0.4	5.7	0.1	0.0	0.0	0.4	5.7	0.1	0.0	0.0	6.2
TOTAL	29.2	46.7	17.5	5.2	1.5	36.0	45.6	17.5	0.0	0.8	100.0

(2) Measured by Total Trade Flows (Exports plus Imports) in Current US Dollars

	Case of EMU-11					Future Case of EMU-15					Regional Total
	Euro Area	US dollar Area	Japanese Yen Area	UK Pound Area	Other	Euro Area	US dollar Area	Japanese Yen Area	UK Pound Area	Other	
INDUSTRIAL COUNTRIES	38.8	19.1	8.1	6.4	0.6	45.8	18.8	8.1	0.0	0.5	73.1
EUROPEAN UNION-15	36.5	0.4	0.0	5.9	0.2	43.0	0.0	0.0	0.0	0.0	43.0
EMU-11	34.5	0.0	0.0	0.0	0.0	34.5	0.0	0.0	0.0	0.0	34.5
4 Other EU Members	2.1	0.4	0.0	5.9	0.2	8.5	0.0	0.0	0.0	0.0	8.5
UNITED STATES	0.0	14.2	0.0	0.0	0.0	0.0	14.2	0.0	0.0	0.0	14.2
JAPAN	0.0	0.0	8.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	8.0
OTHER	2.3	4.6	0.1	0.5	0.5	2.8	4.6	0.1	0.0	0.5	7.9
DEVELOPING COUNTRIES	1.9	22.1	1.1	0.4	1.4	2.4	22.1	1.1	0.0	1.4	26.9
AFRICA	0.5	1.3	0.0	0.2	0.4	0.7	1.3	0.0	0.0	0.4	2.4
ASIA	1.1	14.6	1.0	0.2	0.2	1.3	14.6	1.0	0.0	0.2	17.1
EUROPE	0.2	0.9	0.0	0.0	0.6	1.6	0.0	0.0	0.0	0.0	1.6
MIDDLE EAST	0.0	1.7	0.0	0.0	0.2	0.0	1.7	0.0	0.0	0.2	1.9
WESTERN HEMISPHERE	0.2	3.7	0.1	0.0	0.0	0.2	3.7	0.1	0.0	0.0	3.9
TOTAL	40.8	41.3	9.2	6.8	2.0	49.5	40.0	9.2	0.0	1.2	100.0

(3) Measured by Money Supply (Money plus Quasi-Money) in Current US Dollars

	Case of EMU-11					Future Case of EMU-15					Regional Total
	Euro Area	US dollar Area	Japanese Yen Area	UK Pound Area	Other	Euro Area	US dollar Area	Japanese Yen Area	UK Pound Area	Other	
INDUSTRIAL COUNTRIES	26.3	26.1	26.4	6.5	0.4	33.0	26.0	26.4	0.0	0.3	85.6
EUROPEAN UNION-15	24.2	0.2	0.0	6.1	0.1	30.6	0.0	0.0	0.0	0.0	30.6
EMU-11	23.2	0.0	0.0	0.0	0.0	23.2	0.0	0.0	0.0	0.0	23.2
4 Other EU Members	1.0	0.2	0.0	6.1	0.1	7.4	0.0	0.0	0.0	0.0	7.4
UNITED STATES	0.0	23.3	0.0	0.0	0.0	0.0	23.3	0.0	0.0	0.0	23.3
JAPAN	0.0	0.0	26.3	0.0	0.0	0.0	0.0	26.3	0.0	0.0	26.3
OTHER	2.1	2.6	0.1	0.3	0.3	2.4	2.6	0.1	0.0	0.3	5.4
DEVELOPING COUNTRIES	0.9	12.2	0.5	0.2	0.7	1.1	12.2	0.5	0.0	0.7	14.4
AFRICA	0.2	0.4	0.0	0.1	0.1	0.3	0.4	0.0	0.0	0.1	0.8
ASIA	0.6	8.8	0.4	0.0	0.2	0.6	8.8	0.4	0.0	0.2	10.0
EUROPE	0.1	0.3	0.0	0.0	0.2	0.6	0.0	0.0	0.0	0.0	0.6
MIDDLE EAST	0.0	0.9	0.0	0.0	0.1	0.0	0.9	0.0	0.0	0.1	1.0
WESTERN HEMISPHERE	0.1	1.8	0.0	0.0	0.0	0.1	1.8	0.0	0.0	0.0	1.9
TOTAL	27.2	38.3	26.8	6.6	1.1	34.5	37.8	26.8	0.0	0.8	100.0

(4) Measured by Stock Market Capitalizations in Current US Dollars

	Case of EMU-11					Future Case of EMU-15					Regional Total
	Euro Area	US dollar Area	Japanese Yen Area	UK Pound Area	Other	Euro Area	US dollar Area	Japanese Yen Area	UK Pound Area	Other	
INDUSTRIAL COUNTRIES	14.7	41.3	22.4	9.0	0.4	23.9	41.1	22.4	0.0	0.4	87.9
EUROPEAN UNION-15	12.7	0.2	0.0	8.6	0.1	21.5	0.0	0.0	0.0	0.0	21.5
EMU-11	11.7	0.0	0.0	0.0	0.0	11.7	0.0	0.0	0.0	0.0	11.7
4 Other EU Members	1.0	0.2	0.0	8.6	0.1	9.9	0.0	0.0	0.0	0.0	9.9
UNITED STATES	0.0	37.9	0.0	0.0	0.0	0.0	37.9	0.0	0.0	0.0	37.9
JAPAN	0.0	0.0	22.4	0.0	0.0	0.0	0.0	22.4	0.0	0.0	22.4
OTHER	2.0	3.2	0.1	0.4	0.4	2.4	3.2	0.1	0.0	0.4	6.0
DEVELOPING COUNTRIES	0.7	10.1	0.5	0.4	0.4	1.1	10.1	0.5	0.0	0.4	12.1
AFRICA	0.0	0.9	0.0	0.3	0.2	0.3	0.9	0.0	0.0	0.2	1.4
ASIA	0.5	6.7	0.5	0.1	0.1	0.6	6.7	0.5	0.0	0.1	7.8
EUROPE	0.0	0.1	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.2
MIDDLE EAST	0.0	0.3	0.0	0.0	0.1	0.0	0.3	0.0	0.0	0.1	0.3
WESTERN HEMISPHERE	0.1	2.2	0.0	0.0	0.0	0.1	2.2	0.0	0.0	0.0	2.3
TOTAL	15.4	51.5	22.9	9.4	0.9	25.0	51.2	22.9	0.0	0.7	100.0

Note: (a) The EMU-11 include Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain.
(b) Four Other EU Members include Denmark, Greece, Sweden, and the United Kingdom.
(c) The future case of EMU-15 also assumes that developing European countries stabilize their exchange rates to the Euro.

Source: Kawai and Akiyama (1998), Table 3.

Table 4 Determinants of G-5 Currency Weights in Developing Countries' Exchange Rate Arrangements

Direct-Trade based Regression Results				
Major Currency Weight	Coefficient		Std Error	R2-adj
US dollar (USD) Weight				0.451
Constant	1.001	**	0.080	
US's Trade Share	-0.020		0.208	
France's Trade Share	-1.977	**	0.328	
---	---		---	
Germany's Trade Share	-0.682		0.671	
Regional: Africa	-0.271	**	0.079	
Regional: East Asia	-0.322	**	0.082	
Regional: Europe	-0.393	**	0.129	
---	---		---	
---	---		---	
Colonial: Former USSR	0.213		0.148	
Deutsche mark (DM) Weight				0.153
Constant	-0.029		0.019	
Germany's Trade Share	0.829	**	0.267	
Regional: Europe	0.068		0.040	
Japanese yen (JY) Weight				0.025
Constant	-0.001		0.009	
Japan's Trade Share	-0.047		0.070	
Germany's Trade Share	0.161	*	0.079	
---	---		---	
---	---		---	
---	---		---	
---	---		---	
Regional: East Asia	0.025		0.016	
---	---		---	
Regional: Middle East	0.017		0.015	
Colonial: Former USSR	0.025		0.017	

Currency-Area based Regression Results				
Major Currency Weight	Coefficient		Std Error	R2-adj
US dollar (USD) Weight				0.515
Constant	0.029		0.084	
USD Area's Trade Share	1.247	**	0.146	
---	---		---	
JY Area's Trade Share	1.072	**	0.364	
---	---		---	
---	---		---	
Regional: East Asia	-0.344	**	0.091	
---	---		---	
Regional: Middle East	0.114		0.083	
Colonial: France	-0.267	**	0.076	
---	---		---	
Deutsche mark (DM) Weight				0.129
Constant	-0.034		0.024	
DM Area's Trade Share	0.403	*	0.173	
Regional: Europe	0.078		0.042	
Japanese yen (JY) Weight				0.046
Constant	-0.229		0.144	
JY Area's Trade Share	0.176		0.153	
DM Area's Trade Share	0.412	*	0.171	
UKP Area's Trade Share	0.369	*	0.176	
FF Area's Trade Share	0.230		0.149	
USD Area's Trade Share	0.212		0.147	
Regional: Africa	-0.016		0.015	
Regional: East Asia	0.021		0.016	
Regional: Europe	-0.035		0.023	
---	---		---	
Colonial: Former USSR	0.070	*	0.028	

French franc (FF) Weight				0.536
Constant	0.053		0.048	
France's Trade Share	1.270	**	0.356	
Germany's Trade Share	-0.811		0.483	
---	---		---	
Japan's Trade Share	-0.250		0.247	
Regional: Africa	0.113	*	0.053	
Regional: Europe	0.146		0.093	
Colonial: France	0.207	*	0.097	
Colonial: UK	-0.063		0.044	
Colonial: Former USSR	-0.161		0.107	
UK pound sterling (UKP) Weight				0.090
Constant	-0.025		0.017	
UK's Trade Share	0.442	**	0.155	
---	---		---	
---	---		---	
Japan's Trade Share	0.106		0.103	
---	---		---	
Regional: Africa	0.031		0.018	
---	---		---	
---	---		---	
---	---		---	
Colonial: Former USSR	0.110	**	0.033	

French franc (FF) Weight				0.572
Constant	-0.004		0.047	
FF Area's Trade Share	1.092	**	0.189	
---	---		---	
UKP Area's Trade Share	-0.798	*	0.376	
JY Area's Trade Share	-0.242		0.211	
---	---		---	
---	---		---	
Colonial: France	0.241	**	0.078	
Colonial: UK	0.052		0.048	
---	---		---	
UK pound sterling (UKP) Weight				0.159
Constant	0.857	**	0.259	
UKP Area's Trade Share	-0.665		0.343	
FF Area's Trade Share	-1.044	**	0.291	
USD Area's Trade Share	-0.943	**	0.263	
JY Area's Trade Share	-0.800	**	0.266	
DM Area's Trade Share	-0.664	*	0.306	
---	---		---	
Regional: Europe	-0.074		0.038	
Colonial: France	0.052		0.037	
Colonial: UK	0.023		0.023	
Colonial: Former USSR	0.076		0.051	

Note: 1) Double asterisks (**) and a single asterisk (*) indicate that the estimated coefficients are statistically significant at the 1% and 5% levels, respectively.
2) The number of observations is 146.

Table 5. Rolling Regression Results of Exchange Rate Movements

(a) Hong Kong Dollar

Period	Const		USD		JY		EURO		R2-adj	D.W.	Std-res	No. obs.
90/01-90/03	0.009		0.991	**	0.001		0.004		0.9993	1.972	0.000219	64
90/02-90/04	-0.039		0.990	**	0.000		0.006		0.9985	1.938	0.000227	63
90/03-90/05	-0.053	#	0.997	**	0.000		0.003		0.9984	2.069	0.000248	66
90/04-90/06	-0.043		1.003	**	-0.003		-0.001		0.9984	2.092	0.000254	65
90/05-90/07	-0.046		0.995	**	0.003		0.005		0.9983	2.017	0.000292	66
90/06-90/08	-0.037		0.999	**	0.004		0.003		0.9979	1.772	0.000356	66
90/07-90/09	-0.048		0.997	**	0.003		0.003		0.9983	1.639	0.000364	65
90/08-90/10	0.065		0.998	**	0.001		-0.002		0.9982	1.164	0.000378	66
90/09-90/11	0.083	#	0.993	**	0.003		0.000		0.9981	1.135	0.000343	65
90/10-90/12	0.077	#	0.988	**	0.003		0.008		0.9980	1.391	0.000351	66
90/11-91/01	-0.001		0.982	**	0.003		0.022	*	0.9983	2.086	0.000302	66
90/12-91/02	-0.023		0.988	**	-0.004		0.018	*	0.9984	2.395	0.000312	64
91/01-91/03	-0.042		0.991	**	-0.008		0.008		0.9982	2.193	0.000313	64
91/02-91/04	-0.006		1.001	**	-0.008		0.005		0.9990	2.101	0.000294	63
91/03-91/05	-0.119		0.997	**	-0.012		0.008		0.9963	1.662	0.000600	66
91/04-91/06	-0.076		1.001	**	-0.021		0.012		0.9926	1.452	0.000800	65
91/05-91/07	-0.076		0.997	**	-0.021		0.020		0.9909	1.719	0.000843	66
91/06-91/08	0.032		0.998	**	-0.019		0.012		0.9942	1.846	0.000659	65
91/07-91/09	-0.032		0.998	**	-0.019		0.014		0.9951	2.535	0.000595	66
91/08-91/10	0.022		1.002	**	-0.036	#	0.023		0.9913	2.418	0.000676	66
91/09-91/11	0.021		0.985	**	-0.032		0.020		0.9883	2.545	0.000735	65
91/10-91/12	0.068		1.003	**	-0.039		-0.005		0.9812	2.744	0.000936	66
91/11-92/01	-0.036		1.003	**	-0.024		-0.026		0.9896	2.718	0.000923	66
91/12-92/02	-0.032		1.013	**	-0.028		-0.026		0.9906	2.606	0.000916	65
92/01-92/03	-0.088		1.000	**	-0.014		-0.008		0.9960	2.237	0.000596	65
92/02-92/04	0.010		0.992	**	-0.015		0.049	**	0.9960	2.132	0.000462	64
92/03-92/05	-0.015		0.989	**	-0.024		0.044	*	0.9960	2.189	0.000478	65
92/04-92/06	0.002		0.988	**	-0.008		0.023		0.9961	1.885	0.000453	65
92/05-92/07	-0.017		0.991	**	-0.015		0.018		0.9978	1.974	0.000389	66
92/06-92/08	-0.022		0.984	**	0.009		0.023	#	0.9975	2.809	0.000402	66
92/07-92/09	-0.015		0.993	**	0.001		0.013	#	0.9987	2.825	0.000387	66
92/08-92/10	-0.018		0.996	**	-0.002		0.009		0.9990	2.951	0.000366	65
92/09-92/11	0.014		1.002	**	-0.007		0.002		0.9992	2.672	0.000341	65
92/10-92/12	0.038		1.002	**	-0.002		-0.002		0.9978	2.744	0.000482	66
92/11-93/01	0.007		0.999	**	0.005		-0.004		0.9973	2.758	0.000480	65
92/12-93/02	-0.006		0.992	**	0.008		-0.001		0.9980	2.540	0.000396	64
93/01-93/03	-0.020		0.991	**	0.004		-0.001		0.9995	2.494	0.000170	64
93/02-93/04	-0.002		0.994	**	0.001		0.000		0.9995	2.309	0.000175	65
93/03-93/05	-0.015		0.993	**	0.000		0.004		0.9995	2.323	0.000164	66
93/04-93/06	0.023		0.998	**	-0.003		-0.009		0.9964	1.879	0.000494	65
93/05-93/07	0.056		0.999	**	-0.001		-0.010		0.9936	2.298	0.000602	65
93/06-93/08	0.048		1.004	**	-0.006		-0.008		0.9939	2.258	0.000614	66
93/07-93/09	-0.015		1.001	**	-0.003		-0.001		0.9966	2.172	0.000440	66
93/08-93/10	-0.054		1.001	**	-0.002		0.004		0.9984	1.698	0.000320	65
93/09-93/11	-0.053		0.990	**	0.009		0.010		0.9980	1.477	0.000301	65
93/10-93/12	-0.031		0.987	**	0.010		0.012		0.9987	1.715	0.000239	66
93/11-94/01	-0.011		0.996	**	0.005		0.000		0.9991	2.205	0.000194	66
93/12-94/02	0.001		0.982	**	0.004		0.026	#	0.9958	1.750	0.000450	64
94/01-94/03	0.013		0.988	**	0.000		0.019		0.9945	1.872	0.000463	64
94/02-94/04	0.014		0.987	**	0.000		0.018		0.9946	1.845	0.000448	64

94/03-94/05	0.002	0.995	**	0.000		0.004		0.9994	2.138	0.000136		66
94/04-94/06	0.011	0.991	**	0.001		0.002		0.9985	2.582	0.000229		65
94/05-94/07	0.003	0.996	**	-0.002		0.001		0.9990	2.625	0.000223		65
94/06-94/08	0.006	0.997	**	0.000		0.000		0.9991	2.619	0.000221		66
94/07-94/09	-0.004	1.000	**	-0.001		0.001		0.9999	2.251	0.000068		66
94/08-94/10	0.004	1.002	**	-0.001		-0.004		0.9998	2.641	0.000079		66
94/09-94/11	0.014	0.999	**	0.000		0.001		0.9996	2.348	0.000116		65
94/10-94/12	0.019	0.994	**	0.004		0.004		0.9994	2.273	0.000143		65
94/11-95/01	0.009	0.986	**	0.010		0.009		0.9960	1.766	0.000397		66
94/12-95/02	-0.002	0.986	**	0.011		0.008		0.9952	1.734	0.000397		64
95/01-95/03	-0.003	0.997	**	0.004		0.002		0.9986	1.775	0.000388		65
95/02-95/04	0.016	1.001	**	0.000		-0.003		0.9998	2.137	0.000158		63
95/03-95/05	0.008	0.999	**	-0.001		-0.001		0.9998	2.441	0.000196		66
95/04-95/06	0.009	0.998	**	-0.002		0.001		0.9996	2.458	0.000202		65
95/05-95/07	-0.005	0.994	**	0.000		0.007	#	0.9997	2.137	0.000169		66
95/06-95/08	0.002	0.994	**	0.003		0.007	#	0.9996	2.322	0.000150		66
95/07-95/09	-0.012	0.990	**	-0.002		0.014	•	0.9996	2.338	0.000180		65
95/08-95/10	-0.017	0.994	**	0.000		0.007		0.9996	2.420	0.000175		66
95/09-95/11	-0.007	0.993	**	-0.004		0.007		0.9996	2.263	0.000147		65
95/10-95/12	0.003	0.998	**	0.001		0.000		0.9997	2.327	0.000104		65
95/11-96/01	-0.005	0.996	**	0.006		-0.019		0.9908	2.563	0.000460		66
95/12-96/02	-0.013	0.995	**	0.012		-0.022		0.9917	2.524	0.000461		65
96/01-96/03	-0.012	0.993	**	0.011		-0.028		0.9900	2.514	0.000455		65
96/02-96/04	0.005	0.996	**	0.001		0.002		0.9996	2.233	0.000093		64
96/03-96/05	0.008	0.988	**	0.003		0.009	•	0.9995	2.129	0.000092		66
96/04-96/06	0.014	0.992	**	0.007	#	0.001		0.9993	1.943	0.000125		65
96/05-96/07	-0.002	0.991	**	0.006		-0.002		0.9995	1.762	0.000130		66
96/06-96/08	-0.008	1.000	**	-0.002		-0.011		0.9992	2.100	0.000156		65
96/07-96/09	-0.015	0.997	**	-0.007	#	0.001		0.9995	2.536	0.000134		66
96/08-96/10	-0.001	1.003	**	-0.007	#	-0.003		0.9993	2.678	0.000122		66
96/09-96/11	-0.001	1.000	**	0.000		-0.001		0.9998	2.595	0.000072		65
96/10-96/12	-0.003	0.997	**	0.000		-0.002		0.9997	1.964	0.000096		66
96/11-97/01	0.035	# 1.001	**	0.000		0.000		0.9994	1.956	0.000157		66
96/12-97/02	0.023	0.994	**	0.011	#	-0.001		0.9989	2.045	0.000209		65
97/01-97/03	0.030	0.999	**	0.012	•	-0.002		0.9990	2.180	0.000203		64
97/02-97/04	-0.010	0.995	**	0.016	**	-0.006		0.9987	2.597	0.000227		63
97/03-97/05	0.012	0.998	**	0.021	•	-0.006		0.9974	2.984	0.000389		65
97/04-97/06	0.030	1.006	**	0.022	**	-0.016		0.9971	2.910	0.000406		65
97/05-97/07	0.019	1.001	**	0.019	•	-0.005		0.9967	2.791	0.000415		66
97/06-97/08	0.004	0.999	**	0.007		0.011		0.9976	2.162	0.000287		65
97/07-97/09	-0.026	0.992	**	0.005		0.013	#	0.9985	1.929	0.000245		66
97/08-97/10	-0.052	0.995	**	0.023		0.019		0.9789	2.648	0.001015		66
97/09-97/11	-0.070	0.985	**	0.025		0.011		0.9759	2.760	0.001029		65
97/10-97/12	-0.004	0.992	**	0.022		0.009		0.9755	2.713	0.001034		66
97/11-98/01	0.018	1.009	**	0.015		-0.025		0.9892	2.917	0.000663		65
97/12-98/02	0.048	1.016	**	0.024	•	-0.036		0.9906	2.965	0.000643		65
98/01-98/03	0.005	1.022	**	0.023	#	-0.052	•	0.9915	3.040	0.000641		64
98/02-98/04	0.014	1.008	**	0.006		-0.025	•	0.9980	2.568	0.000273		64
98/03-98/05	0.011	1.004	**	-0.001		-0.009		0.9980	2.759	0.000245		65
98/04-98/06	-0.004	0.997	**	0.006		-0.001		0.9966	3.003	0.000255		65
98/05-98/07	-0.012	0.997	**	0.007	•	0.003		0.9977	2.883	0.000212		66
98/06-98/08	-0.004	0.997	**	0.007	•	0.003		0.9987	2.870	0.000215		66
98/07-98/09	-0.003	1.001	**	-0.001		0.011		0.9988	2.037	0.000221		66
98/08-98/10	-0.004	0.998	**	0.000		0.006		0.9993	1.980	0.000221		65

98/09-98/11	-0.011		1.000	**	0.000		0.003	0.9991	2.133	0.000239	65
98/10-98/12	-0.004		1.000	**	0.000		-0.001	0.9997	2.313	0.000163	66
98/11-99/01	0.007		1.002	**	-0.001		-0.003	0.9997	2.415	0.000155	65
98/12-99/02	0.006		0.999	**	-0.001		0.001	0.9999	2.142	0.000105	64
99/01-99/03	0.002		0.997	**	-0.001		0.001	0.9999	2.435	0.000082	64
99/02-99/04	0.001		0.998	**	-0.001		0.001	0.9997	2.157	0.000087	65
99/03-99/05	0.014		0.999	**	0.001		0.000	0.9997	2.308	0.000085	66
99/04-99/06	0.019	*	1.000	**	0.001		0.000	0.9998	2.056	0.000074	65
99/05-99/07	0.022	**	1.001	**	0.000		-0.003	0.9999	1.994	0.000058	65
99/06-99/08	0.021	#	1.002	**	0.001		0.000	0.9998	2.765	0.000094	66
99/07-99/09	0.021	#	1.001	**	0.002		0.000	0.9998	2.787	0.000097	66
99/08-99/10	0.017		1.001	**	0.002		0.001	0.9998	2.571	0.000101	65
99/09-99/11	0.008		1.000	**	0.003	#	-0.001	0.9998	1.659	0.000105	65
99/10-99/12	0.014		0.993	**	0.006	*	0.007	0.9994	2.285	0.000153	66

Note: Double asterisks (**), a single asterisk (*) and a pound (#) indicate that the estimated coefficients are statistically significant at the 1%, 5%, and 10% levels, respectively.

(b) Korean Won

Period	Const		USD		JY		EURO		R2-adj	D.W.	Std-res	No. obs.
90/01-90/03	0.635	#	1.019	**	-0.155	*	-0.059		0.8888	2.029	0.002654	64
90/02-90/04	0.377		1.079	**	-0.048		-0.064		0.8828	1.757	0.002163	63
90/03-90/05	0.367		1.060	**	-0.031		-0.082		0.8854	1.843	0.002215	66
90/04-90/06	0.404	#	0.899	**	0.066	#	0.010		0.9198	1.906	0.001841	65
90/05-90/07	0.353		1.009	**	0.024		0.019		0.9463	2.160	0.001746	66
90/06-90/08	0.233		1.037	**	0.017		0.007		0.9644	2.098	0.001555	66
90/07-90/09	0.128		1.028	**	-0.006		0.021		0.9790	2.033	0.001334	65
90/08-90/10	-0.010		0.998	**	-0.002		0.002		0.9999	1.801	0.000083	66
90/09-90/11	-0.029		1.002	**	-0.008	*	0.001		0.9993	1.860	0.000204	65
90/10-90/12	-0.011		1.003	**	-0.006	#	0.001		0.9994	1.921	0.000188	66
90/11-91/01	0.043		0.996	**	0.000		-0.001		0.9958	1.991	0.000481	66
90/12-91/02	0.057		0.992	**	0.011		0.002		0.9968	2.060	0.000441	64
91/01-91/03	0.109		0.928	**	0.007		0.032		0.9553	2.038	0.001530	64
91/02-91/04	0.186		1.064	**	-0.093		-0.001		0.8572	2.016	0.003895	63
91/03-91/05	0.166		1.065	**	-0.091		-0.005		0.8730	2.015	0.003811	66
91/04-91/06	-0.056		1.151	**	-0.144	#	-0.039		0.8924	2.002	0.003426	65
91/05-91/07	0.121		0.980	**	0.035		-0.019		0.9797	1.956	0.001277	66
91/06-91/08	0.155		0.979	**	0.011		-0.026		0.9678	1.992	0.001564	65
91/07-91/09	0.328		1.034	**	-0.088		-0.027		0.9440	2.077	0.002026	66
91/08-91/10	0.280		1.094	**	-0.220	**	-0.021		0.9198	2.117	0.002084	66
91/09-91/11	0.401		1.076	**	-0.177	**	-0.027		0.9212	2.183	0.001983	65
91/10-91/12	0.328		1.053	**	-0.115	*	-0.013		0.9447	2.116	0.001650	66
91/11-92/01	0.269	*	1.022	**	-0.017		-0.006		0.9915	2.116	0.000858	66
91/12-92/02	-0.026		1.026	**	-0.032		-0.023		0.9545	1.951	0.002080	65
92/01-92/03	0.298		0.944	**	0.123		-0.030		0.8091	2.006	0.004623	65
92/02-92/04	0.500		1.101	**	0.027		-0.417	#	0.5789	1.862	0.006128	64
92/03-92/05	0.786		1.152	**	0.381		-0.301		0.5023	2.018	0.009329	65
92/04-92/06	-0.027		1.157	**	0.279		-0.225		0.4862	1.956	0.008990	65
92/05-92/07	-0.493		0.997	**	0.241		0.067		0.5960	1.877	0.007940	66
92/06-92/08	-0.099		0.853	**	0.097		0.024		0.8603	2.083	0.003005	66
92/07-92/09	0.238		1.024	**	-0.063		-0.034		0.9443	2.156	0.002533	66
92/08-92/10	-0.162		1.047	**	-0.092		0.029		0.9241	2.062	0.003308	65
92/09-92/11	-0.070		1.064	**	-0.097		0.038		0.9310	2.045	0.003228	65
92/10-92/12	-0.303		0.988	**	-0.038		0.087	#	0.9480	1.884	0.002397	66
92/11-93/01	0.195		1.012	**	-0.009		-0.005		0.9761	2.094	0.001447	65
92/12-93/02	0.164		1.014	**	-0.025		-0.023		0.9720	2.446	0.001495	64
93/01-93/03	0.114		1.018	**	0.003		-0.026		0.9729	2.286	0.001327	64
93/02-93/04	0.038		1.009	**	-0.007		-0.008		0.9858	2.559	0.000912	65
93/03-93/05	0.137		0.985	**	0.021		-0.006		0.9916	1.805	0.000690	66
93/04-93/06	0.221		0.998	**	-0.003		-0.087	*	0.9775	2.297	0.001224	65
93/05-93/07	0.178		1.008	**	-0.035		-0.016		0.9569	2.364	0.001583	65
93/06-93/08	0.108		1.003	**	-0.030		-0.003		0.9572	2.433	0.001638	66
93/07-93/09	0.091		1.010	**	-0.024		0.020		0.9714	2.464	0.001294	66
93/08-93/10	0.034		1.001	**	-0.011		-0.013		0.9810	2.157	0.001103	65
93/09-93/11	-0.018		0.997	**	0.012		-0.030		0.9775	1.858	0.001015	65
93/10-93/12	-0.002		1.019	**	0.013		-0.020		0.9773	1.742	0.001008	66
93/11-94/01	-0.036		0.979	**	0.029		0.025		0.9649	2.090	0.001248	66
93/12-94/02	-0.030		1.071	**	-0.038		-0.021		0.9692	2.148	0.001279	64
94/01-94/03	-0.105		1.080	**	-0.032		-0.026		0.9567	2.320	0.001387	64
94/02-94/04	-0.067		1.050	**	-0.046	*	0.011		0.9717	2.335	0.001089	64
94/03-94/05	-0.018		0.982	**	-0.014		0.037		0.9644	2.249	0.001105	66

94/04-94/06	-0.001		0.985	**	-0.046	*	0.027		0.9743	2.005	0.000948	65
94/05-94/07	-0.093		0.999	**	0.001		0.005		0.9825	2.071	0.000953	65
94/06-94/08	-0.110		1.024	**	-0.016		-0.007		0.9860	1.995	0.000915	66
94/07-94/09	-0.145		0.970	**	0.054	*	0.028		0.9839	1.895	0.000973	66
94/08-94/10	-0.102		1.004	**	-0.003		-0.010		0.9384	2.672	0.001612	66
94/09-94/11	-0.123		0.987	**	-0.014		0.006		0.9348	2.810	0.001601	65
94/10-94/12	-0.210		1.026	**	-0.064		-0.031		0.9229	2.647	0.001702	65
94/11-95/01	-0.154		0.976	**	0.001		-0.017		0.9225	1.995	0.001749	66
94/12-95/02	-0.090		1.044	**	-0.025		-0.096		0.8301	2.021	0.002470	64
95/01-95/03	-0.334		1.075	**	0.024		-0.165	**	0.9376	1.999	0.002615	65
95/02-95/04	-0.505		1.054	**	0.053		-0.119	*	0.9565	2.069	0.002437	63
95/03-95/05	-0.539	*	1.021	**	0.058	*	-0.079	*	0.9819	1.934	0.001830	66
95/04-95/06	-0.263		1.017	**	0.037		-0.048		0.9738	2.163	0.001717	65
95/05-95/07	-0.144		1.005	**	0.034		-0.057		0.9693	2.334	0.001611	66
95/06-95/08	0.037		1.020	**	0.159	#	-0.079		0.8229	1.587	0.003394	66
95/07-95/09	-0.336		0.958	**	0.223	**	-0.034		0.8597	1.679	0.003466	65
95/08-95/10	-0.302		0.975	**	0.211	**	-0.048		0.8671	1.722	0.003463	66
95/09-95/11	-0.170		0.871	**	0.129	**	0.070		0.9114	2.304	0.002230	65
95/10-95/12	0.080		0.908	**	0.026		0.087		0.9097	1.956	0.001725	65
95/11-96/01	0.344		0.904	**	0.133	*	0.063		0.7921	1.951	0.002526	66
95/12-96/02	0.165		0.844	**	0.200	**	0.008		0.8288	2.067	0.002285	65
96/01-96/03	0.069		0.832	**	0.193	*	0.015		0.7622	2.024	0.002447	65
96/02-96/04	-0.138		0.812	**	0.091	#	0.053		0.8885	1.945	0.001466	64
96/03-96/05	0.051		0.897	**	0.063		0.025		0.8871	1.788	0.001416	66
96/04-96/06	0.510	#	0.831	**	0.087		0.073		0.7971	1.400	0.002152	65
96/05-96/07	0.733	*	0.720	**	0.112		0.190		0.7784	1.821	0.002697	66
96/06-96/08	0.669	#	0.680	**	0.144		0.184		0.7761	1.778	0.002690	65
96/07-96/09	0.255		0.807	**	0.068		0.083		0.8271	2.067	0.002448	66
96/08-96/10	0.168		0.924	**	0.062		-0.016		0.8087	1.769	0.002222	66
96/09-96/11	0.151		0.921	**	0.127	#	0.000		0.8475	2.007	0.002275	65
96/10-96/12	0.410		0.836	**	0.192	**	0.149	#	0.8965	1.318	0.001995	66
96/11-97/01	0.678	**	0.929	**	0.081		0.070		0.9303	1.932	0.001780	66
96/12-97/02	0.852	*	1.049	**	0.065		0.066		0.8352	1.653	0.003096	65
97/01-97/03	1.136	*	1.184	**	0.044		-0.067		0.8306	1.656	0.003311	64
97/02-97/04	0.592		1.183	**	0.028		-0.058		0.8264	1.655	0.003303	63
97/03-97/05	0.495	#	1.068	**	0.022		-0.088		0.9383	1.783	0.001994	65
97/04-97/06	-0.137		0.988	**	-0.008		0.006		0.9838	2.354	0.000960	65
97/05-97/07	-0.060		0.982	**	0.000		0.025		0.9771	2.335	0.001093	66
97/06-97/08	0.175		0.983	**	-0.016		0.049		0.9374	2.539	0.001500	65
97/07-97/09	0.441	*	0.968	**	-0.011		0.053		0.9331	2.617	0.001624	66
97/08-97/10	1.035		1.019	**	0.070		0.347	*	0.6314	2.091	0.006180	66
97/09-97/11	4.177	#	1.100	*	-0.061		-0.579		0.0445	2.491	0.019299	65
97/10-97/12	10.149		1.925		-0.645		-0.150		-0.0109	1.466	0.050732	66
97/11-98/01	8.484		2.650	#	-0.631		-1.045		0.0056	1.437	0.054698	65
97/12-98/02	5.371		2.043		-0.245		0.509		0.0250	1.453	0.052364	65
98/01-98/03	-2.909		1.367	#	-0.174		0.134		0.0797	1.840	0.025593	64
98/02-98/04	-1.956		0.639		0.109		0.463		0.0594	1.464	0.017073	64
98/03-98/05	-2.020		-0.172		0.094		1.488	#	0.0537	1.729	0.015661	65
98/04-98/06	0.194		0.391		0.143		1.327	*	0.1797	2.020	0.010588	65
98/05-98/07	-1.235		0.828	*	-0.020		1.032	#	0.1590	2.177	0.011850	66
98/06-98/08	-0.754		1.225	**	-0.021		0.086		0.2411	1.818	0.012569	66
98/07-98/09	-0.136		1.263	**	-0.057		0.009		0.2712	1.857	0.012377	66
98/08-98/10	1.296		1.057	**	0.158	#	-0.014		0.4539	1.795	0.010380	65
98/09-98/11	-1.041		1.084	**	0.133	*	0.112		0.6333	1.797	0.007217	65

98/10-98/12	-1.491		1.197	**	0.205	*	-0.046	0.6078	1.850	0.008804	66
98/11-99/01	-1.593		1.149	**	0.120		-0.251	0.5299	1.841	0.009098	65
98/12-99/02	-0.307		0.785	**	0.133		0.159	0.4859	1.796	0.009096	64
99/01-99/03	0.083		0.737	**	0.104		0.071	0.6011	1.423	0.005550	64
99/02-99/04	0.041		0.840	**	0.063		0.116	0.5258	1.347	0.004461	65
99/03-99/05	-0.469		0.951	**	0.084		0.014	0.6562	1.655	0.003688	66
99/04-99/06	-0.956	*	0.889	**	0.053		0.121	0.6585	1.780	0.003719	65
99/05-99/07	0.233		0.963	**	0.023		-0.071	0.7142	1.623	0.003635	65
99/06-99/08	-0.057		1.000	**	0.010		-0.013	0.7716	1.688	0.003557	66
99/07-99/09	0.794	#	1.053	**	0.044		-0.107	0.8461	1.737	0.003261	66
99/08-99/10	0.072		1.032	**	0.067	#	-0.074	0.9161	1.815	0.002447	65
99/09-99/11	-0.097		1.128	**	0.048		-0.136	0.8908	1.772	0.002788	65
99/10-99/12	-1.083	*	1.006	**	-0.031		0.082	0.7601	1.959	0.003669	66

Note: Double asterisks (**), a single asterisk (*) and a pound (#) indicate that the estimated coefficients are statistically significant at the 1%, 5%, and 10% levels, respectively.

(c) Singapore Dollar

Period	Const		USD		JY		EURO		R2-adj	D.W.	Std-res	No. obs.
90/01-90/03	-0.234		0.790	**	0.082	#	0.155	**	0.9410	2.677	0.001959	64
90/02-90/04	-0.056		0.799	**	0.093	**	0.158	**	0.9624	2.118	0.001140	63
90/03-90/05	-0.221		0.768	**	0.143	**	0.158	**	0.9647	2.012	0.001192	66
90/04-90/06	-0.290	*	0.752	**	0.139	**	0.156	**	0.9709	1.972	0.001123	65
90/05-90/07	-0.269		0.737	**	0.136	**	0.157	**	0.9548	2.415	0.001484	66
90/06-90/08	-0.501	*	0.787	**	0.065	#	0.152	**	0.9484	2.254	0.001706	66
90/07-90/09	-0.443		0.815	**	0.008		0.140	*	0.8834	2.275	0.002896	65
90/08-90/10	-0.785	#	0.880	**	0.005		0.085		0.8752	2.477	0.003188	66
90/09-90/11	-0.302		0.878	**	0.022		0.071		0.8467	2.389	0.003180	65
90/10-90/12	-0.186		0.875	**	0.056		0.066		0.9066	2.211	0.002375	66
90/11-91/01	0.329		0.717	**	0.026		0.282	**	0.9053	2.261	0.002011	66
90/12-91/02	0.006		0.721	**	0.039		0.215	**	0.8953	1.949	0.002162	64
91/01-91/03	0.004		0.700	**	0.060		0.201	**	0.8803	1.961	0.002225	64
91/02-91/04	-0.403		0.676	**	0.033		0.267	**	0.9274	1.941	0.002152	63
91/03-91/05	-0.232		0.685	**	0.030		0.291	**	0.9339	2.218	0.002176	66
91/04-91/06	-0.478	*	0.637	**	0.099	*	0.314	**	0.9423	2.333	0.001900	65
91/05-91/07	-0.284		0.727	**	0.058		0.206	**	0.9420	2.451	0.001815	66
91/06-91/08	-0.397	*	0.690	**	0.102	*	0.190	**	0.9594	2.265	0.001447	65
91/07-91/09	-0.353	#	0.716	**	0.030		0.242	**	0.9535	2.186	0.001502	66
91/08-91/10	-0.292	#	0.715	**	0.030		0.265	**	0.9495	2.194	0.001360	66
91/09-91/11	-0.219		0.679	**	0.046		0.418	**	0.9396	2.265	0.001622	65
91/10-91/12	-0.143		0.654	**	0.081		0.410	**	0.9184	2.746	0.001878	66
91/11-92/01	-0.293		0.717	**	0.069		0.292	**	0.9248	2.890	0.002240	66
91/12-92/02	-0.244		0.735	**	0.010		0.187	**	0.9352	2.961	0.001986	65
92/01-92/03	-0.003		0.702	**	0.078		0.207	**	0.8980	2.235	0.002581	65
92/02-92/04	0.001		0.570	**	0.157	#	0.337	**	0.8574	2.125	0.002391	64
92/03-92/05	-0.036		0.659	**	0.161	*	0.235	**	0.8782	2.069	0.002350	65
92/04-92/06	-0.145		0.789	**	0.094	*	0.107	*	0.9537	2.532	0.001428	65
92/05-92/07	-0.225		0.843	**	0.075	#	0.076	#	0.9749	2.595	0.001231	66
92/06-92/08	-0.116		0.902	**	0.027		0.035		0.9827	2.736	0.000999	66
92/07-92/09	-0.154		0.844	**	0.079	*	0.088	**	0.9878	2.134	0.001120	66
92/08-92/10	0.013		0.818	**	0.093	*	0.084	**	0.9819	1.644	0.001451	65
92/09-92/11	0.111		0.787	**	0.118	**	0.104	**	0.9753	1.695	0.001709	65
92/10-92/12	0.186		0.818	**	0.084		0.102	**	0.9705	1.831	0.001642	66
92/11-93/01	0.110		0.871	**	-0.008		0.107	*	0.9540	1.658	0.001830	65
92/12-93/02	0.000		0.888	**	0.015		0.062		0.9589	1.742	0.001701	64
93/01-93/03	-0.036		0.878	**	-0.004		0.070		0.9471	1.900	0.001680	64
93/02-93/04	-0.212		0.894	**	0.030		0.070	#	0.9676	2.068	0.001307	65
93/03-93/05	-0.270	#	0.901	**	0.024		0.068	#	0.9694	2.271	0.001254	66
93/04-93/06	-0.022		0.808	**	0.122	*	-0.007		0.9116	2.598	0.002284	65
93/05-93/07	-0.025		0.799	**	0.097	*	0.073		0.8901	2.784	0.002309	65
93/06-93/08	-0.057		0.842	**	0.074	*	0.046		0.8984	2.642	0.002398	66
93/07-93/09	-0.397	*	0.950	**	0.034	#	0.035		0.9637	2.582	0.001441	66
93/08-93/10	-0.292		0.982	**	0.005		0.049		0.9175	1.983	0.002393	65
93/09-93/11	-0.065		0.969	**	0.004		0.070		0.8795	1.928	0.002465	65
93/10-93/12	0.086		0.790	**	0.017		0.285	**	0.8775	1.785	0.002315	66
93/11-94/01	-0.083		0.700	**	0.078	#	0.310	**	0.9228	1.964	0.001804	66
93/12-94/02	-0.140		0.803	**	0.047		0.184	**	0.9064	1.866	0.002114	64
94/01-94/03	-0.276		0.867	**	0.065	#	0.162	**	0.8965	1.900	0.002133	64
94/02-94/04	-0.256		0.890	**	0.087	**	0.101	*	0.9256	1.992	0.001701	64
94/03-94/05	-0.426	*	0.868	**	0.105	**	0.126	**	0.9250	2.277	0.001609	66

94/04-94/06	-0.346	#	0.832	**	0.070	#	0.138	**	0.9286	2.291	0.001543	65
94/05-94/07	-0.353	#	0.811	**	0.030		0.175	**	0.9549	2.209	0.001419	65
94/06-94/08	-0.248	*	0.841	**	0.029		0.123	**	0.9822	2.235	0.000945	66
94/07-94/09	-0.408	*	0.839	**	0.092	**	0.094	**	0.9673	1.587	0.001293	66
94/08-94/10	-0.359	#	0.828	**	0.159	**	0.076	#	0.9410	1.657	0.001493	66
94/09-94/11	-0.326	#	0.719	**	0.269	**	0.153	**	0.9413	1.720	0.001466	65
94/10-94/12	-0.275		0.701	**	0.194	**	0.196	**	0.9425	2.135	0.001420	65
94/11-95/01	-0.173		0.856	**	-0.012		0.180	**	0.8936	2.242	0.002147	66
94/12-95/02	-0.030		0.868	**	-0.044		0.133	#	0.8583	2.275	0.002245	64
95/01-95/03	-0.071		0.784	**	0.039		0.063		0.9195	2.248	0.002558	65
95/02-95/04	-0.308		0.794	**	0.080	*	0.079	#	0.9527	2.397	0.002239	63
95/03-95/05	-0.389		0.815	**	0.070	*	0.074	#	0.9649	2.190	0.002287	66
95/04-95/06	-0.147		0.870	**	0.032		0.104	**	0.9685	2.053	0.001778	65
95/05-95/07	0.022		0.857	**	-0.008		0.089	*	0.9700	1.748	0.001454	66
95/06-95/08	0.071		0.811	**	0.087	*	0.102	*	0.9319	1.692	0.001725	66
95/07-95/09	-0.236		0.722	**	0.171	**	0.221	**	0.9170	1.959	0.002293	65
95/08-95/10	-0.300		0.719	**	0.186	**	0.177	*	0.9057	1.987	0.002482	66
95/09-95/11	-0.264		0.667	**	0.177	**	0.230	**	0.8920	2.019	0.002265	65
95/10-95/12	-0.173		0.752	**	0.102	*	0.124	*	0.9024	1.916	0.001628	65
95/11-96/01	-0.097		0.746	**	0.150	**	0.231	**	0.8682	2.297	0.001861	66
95/12-96/02	-0.094		0.617	**	0.153	*	0.300	**	0.8182	1.851	0.002187	65
96/01-96/03	-0.201		0.610	**	0.180	*	0.337	**	0.7856	1.868	0.002194	65
96/02-96/04	-0.201		0.642	**	0.034		0.242	**	0.8447	1.738	0.001636	64
96/03-96/05	-0.105		0.797	**	0.061	*	0.122	**	0.9410	2.061	0.000965	66
96/04-96/06	0.001		0.847	**	0.069	**	0.074	*	0.9708	2.154	0.000750	65
96/05-96/07	0.130		0.840	**	0.057	*	0.095	*	0.9719	2.108	0.000892	66
96/06-96/08	0.010		0.889	**	0.040		0.065		0.9677	2.150	0.000995	65
96/07-96/09	-0.044		0.885	**	0.052		0.076		0.9656	2.282	0.001087	66
96/08-96/10	-0.103		0.857	**	0.080	*	0.103	*	0.9563	2.036	0.001008	66
96/09-96/11	-0.115		0.791	**	0.138	**	0.120	*	0.9621	1.937	0.001022	65
96/10-96/12	-0.120		0.773	**	0.138	**	0.141	**	0.9708	1.625	0.000921	66
96/11-97/01	-0.165		0.826	**	0.094	**	0.116	**	0.9790	1.893	0.000891	66
96/12-97/02	0.072		0.836	**	0.046		0.121	**	0.9476	2.316	0.001367	65
97/01-97/03	0.346		0.849	**	0.029		0.130	#	0.9033	2.254	0.001931	64
97/02-97/04	0.281		0.794	**	0.098	#	0.105		0.8778	2.314	0.002085	63
97/03-97/05	0.059		0.872	**	0.118	**	0.055		0.9388	2.171	0.001819	65
97/04-97/06	-0.064		0.862	**	0.116	**	0.056		0.9612	2.128	0.001397	65
97/05-97/07	0.255		0.850	**	0.054		0.063		0.8825	1.550	0.002355	66
97/06-97/08	0.757		0.812	**	0.071		0.074		0.6014	1.763	0.004104	65
97/07-97/09	0.986	#	0.812	**	0.054		0.053		0.5864	1.999	0.004430	66
97/08-97/10	1.165	#	0.777	**	0.070		0.239	#	0.5858	2.032	0.005168	66
97/09-97/11	0.722		1.005	**	0.039		0.040		0.5579	2.316	0.005978	65
97/10-97/12	1.293		0.900	**	0.128		0.170		0.5250	2.029	0.006627	66
97/11-98/01	1.221		0.888	**	0.389	*	-0.163		0.3984	2.086	0.008720	65
97/12-98/02	0.342		0.644	**	0.502	**	0.237		0.3861	2.171	0.009107	65
98/01-98/03	-0.763		0.751	**	0.385	*	-0.217		0.2845	2.206	0.009231	64
98/02-98/04	-1.592	#	0.816	**	0.271	*	-0.302		0.3711	2.076	0.006480	64
98/03-98/05	0.074		0.588	**	0.285	**	-0.073		0.3667	1.577	0.005242	65
98/04-98/06	0.471		0.170		0.682	**	0.820	*	0.4939	2.215	0.007185	65
98/05-98/07	0.313		0.183		0.762	**	0.638	#	0.4798	2.153	0.007884	66
98/06-98/08	0.665		0.233		0.725	**	0.394		0.5184	2.345	0.007838	66
98/07-98/09	-0.033		0.571	**	0.429	**	0.441	#	0.5591	2.177	0.007380	66
98/08-98/10	-0.199		0.749	**	0.264	**	0.333	#	0.6677	1.972	0.006689	65
98/09-98/11	-0.546		0.658	**	0.254	**	0.476	*	0.6262	1.633	0.006518	65

98/10-98/12	0.121		0.713	**	0.159	**	0.175		0.8271	1.751	0.003559	66
98/11-99/01	0.468		0.620	**	0.187	**	0.304	**	0.8828	2.003	0.003186	65
98/12-99/02	0.759	*	0.874	**	0.112	**	0.105		0.9353	2.221	0.002457	64
99/01-99/03	0.551		0.880	**	0.121	**	0.157	#	0.9010	2.461	0.002865	64
99/02-99/04	0.067		0.872	**	0.136	**	0.194	*	0.7173	2.262	0.003423	65
99/03-99/05	-0.078		0.823	**	0.136	*	0.185	#	0.6898	2.319	0.003516	66
99/04-99/06	-0.304		0.866	**	0.099	#	0.015		0.6887	2.228	0.003385	65
99/05-99/07	-0.137		0.941	**	0.040		-0.006		0.8328	2.215	0.002599	65
99/06-99/08	-0.294		0.881	**	0.052		0.046		0.8352	2.259	0.002704	66
99/07-99/09	0.142		0.841	**	0.050		0.079		0.8477	2.110	0.002860	66
99/08-99/10	-0.107		0.822	**	0.045		0.133		0.8533	1.829	0.002960	65
99/09-99/11	0.060		0.973	**	0.040		-0.006		0.8488	1.966	0.003056	65
99/10-99/12	-0.291		0.950	**	0.040		0.134		0.8747	1.970	0.002519	66

Note: Double asterisks (**), a single asterisk (*) and a pound (#) indicate that the estimated coefficients are statistically significant at the 1%, 5%, and 10% levels, respectively.

(d) New Taiwan Dollar

Period	Const	USD		JY		EURO		R2-adj	D.W.	Std-res	No. obs.
90/01-90/03	0.436	1.053	**	-0.139	•	0.066		0.9018	2.032	0.002818	64
90/02-90/04	-0.068	1.064	**	0.026		0.010		0.7396	2.634	0.003785	63
90/03-90/05	0.695	1.123	**	-0.003		-0.153		0.6177	2.091	0.004986	66
90/04-90/06	0.489	0.994	**	0.030		-0.060		0.5833	2.129	0.005243	65
90/05-90/07	0.703	0.699	**	0.122		0.058		0.4150	2.277	0.006886	66
90/06-90/08	0.231	0.699	**	0.055		0.297		0.4650	2.783	0.007792	66
90/07-90/09	0.071	0.702	**	0.060		0.269		0.4827	2.788	0.008251	65
90/08-90/10	-0.258	0.998	**	-0.243		0.091		0.3902	2.797	0.009469	66
90/09-90/11	-0.389	1.013	**	-0.366	•	0.124		0.3396	2.693	0.010056	65
90/10-90/12	-0.018	0.826	**	-0.337	#	0.135		0.2205	2.700	0.011327	66
90/11-91/01	0.101	0.672	**	-0.089		0.484		0.2620	2.727	0.010364	66
90/12-91/02	-0.014	0.545	**	0.286		0.403		0.2420	2.929	0.010476	64
91/01-91/03	0.389	0.645	**	0.395	#	0.378	#	0.3362	3.095	0.010014	64
91/02-91/04	-0.141	0.749	**	0.200		0.469	•	0.4048	3.000	0.012087	63
91/03-91/05	-0.190	0.796	**	0.128		0.462	•	0.4857	2.901	0.010756	66
91/04-91/06	-0.383	0.990	**	-0.072		0.538	**	0.5604	2.857	0.009519	65
91/05-91/07	0.071	0.698	**	0.371	•	0.462	•	0.7075	2.702	0.006165	66
91/06-91/08	-0.085	0.723	**	0.464	•	0.137		0.6940	2.944	0.006199	65
91/07-91/09	-0.346	0.862	**	0.257		0.002		0.6254	2.992	0.006661	66
91/08-91/10	-0.260	0.863	**	0.093		-0.030		0.5033	3.022	0.006512	66
91/09-91/11	-0.615	1.244	**	-0.239		-0.533	**	0.4373	2.609	0.007449	65
91/10-91/12	-0.534	1.050	**	-0.142		-0.314		0.3701	2.745	0.007560	66
91/11-92/01	-0.676	1.049	**	0.032		-0.324		0.3931	2.815	0.010930	66
91/12-92/02	-0.449	0.870	**	0.199		0.175		0.4218	3.017	0.011125	65
92/01-92/03	-0.148	0.925	**	0.157		0.117		0.4336	3.026	0.011045	65
92/02-92/04	0.192	0.938	**	-0.140		0.570	•	0.5658	2.649	0.006799	64
92/03-92/05	-0.082	0.940	**	-0.058		-0.044		0.7506	2.414	0.003875	65
92/04-92/06	-0.484	1.001	**	-0.062		-0.152		0.8215	2.357	0.003102	65
92/05-92/07	-0.098	0.948	**	0.065		-0.083		0.6958	2.725	0.005209	66
92/06-92/08	0.095	0.930	**	0.096		0.036		0.7032	2.876	0.005239	66
92/07-92/09	0.305	0.929	**	0.072		0.083		0.8042	2.936	0.005350	66
92/08-92/10	0.205	0.996	**	-0.025		0.043		0.8840	2.872	0.004184	65
92/09-92/11	0.335	1.005	**	-0.020		0.067		0.8828	2.756	0.004341	65
92/10-92/12	0.103	1.056	**	-0.105		0.049		0.8166	2.799	0.004861	66
92/11-93/01	0.183	1.270	**	-0.219		0.044		0.8240	2.744	0.004806	65
92/12-93/02	0.074	1.244	**	-0.112		-0.167		0.7751	2.702	0.005295	64
93/01-93/03	0.381	1.144	**	-0.020		-0.180		0.6429	2.806	0.006209	64
93/02-93/04	0.168	1.071	**	-0.043		-0.156		0.5728	2.655	0.006378	65
93/03-93/05	0.281	0.846	**	0.029		0.063		0.5121	2.762	0.006368	66
93/04-93/06	0.143	0.862	**	0.094		0.247		0.6207	2.922	0.006416	65
93/05-93/07	0.918	0.860	**	0.200		-0.062		0.5256	2.828	0.006632	65
93/06-93/08	0.601	1.098	**	0.082		0.041		0.6269	2.736	0.006989	66
93/07-93/09	0.325	1.053	**	0.051		0.022		0.6219	2.768	0.006372	66
93/08-93/10	-0.113	1.047	**	0.061		0.095		0.6328	3.102	0.006755	65
93/09-93/11	-0.111	0.912	**	0.211		0.010		0.5538	3.058	0.006435	65
93/10-93/12	-0.353	0.952	**	0.261	#	-0.129		0.5785	2.962	0.006034	66
93/11-94/01	-0.062	1.141	**	0.003		-0.120		0.6728	2.760	0.004743	66
93/12-94/02	-0.071	1.028	**	-0.062		-0.067		0.8171	2.470	0.003113	64
94/01-94/03	0.025	0.983	**	-0.037		-0.027		0.8580	2.504	0.002398	64
94/02-94/04	-0.015	0.989	**	-0.016		-0.013		0.9800	2.531	0.000849	64
94/03-94/05	0.308	1.005	**	-0.001		-0.038		0.9097	1.965	0.001777	66

94/04-94/06	0.303		0.972	**	0.029		0.013		0.9164	2.088	0.001760		65
94/05-94/07	0.147		0.970	**	-0.008		0.034		0.8913	2.007	0.002442		65
94/06-94/08	-0.441	#	0.965	**	-0.024		0.056		0.9351	2.076	0.001958		66
94/07-94/09	-0.378		0.990	**	0.039		0.012		0.9366	2.063	0.001900		66
94/08-94/10	-0.287	*	0.949	**	-0.007		0.026		0.9691	1.888	0.001083		66
94/09-94/11	0.019		0.933	**	-0.038		0.060		0.9517	2.169	0.001313		65
94/10-94/12	0.041		0.904	**	-0.037		0.100	*	0.9373	2.071	0.001498		65
94/11-95/01	0.144		0.968	**	-0.044		0.092	#	0.9407	2.256	0.001606		66
94/12-95/02	0.022		1.033	**	-0.049		0.038		0.9621	2.316	0.001190		64
95/01-95/03	-0.204		0.977	**	0.049	#	0.084	*	0.9808	1.930	0.001514		65
95/02-95/04	-0.561		1.035	**	0.103	*	0.045		0.9443	1.980	0.003067		63
95/03-95/05	-0.259		0.915	**	0.139	*	0.097		0.9186	2.047	0.004123		66
95/04-95/06	0.003		0.898	**	0.217	**	0.024		0.8713	2.152	0.004024		65
95/05-95/07	0.536		0.802	**	0.146		0.083		0.8513	2.273	0.003407		66
95/06-95/08	1.169	*	0.987	**	-0.054		-0.136		0.7852	2.337	0.003478		66
95/07-95/09	0.817	#	1.047	**	-0.017		-0.213	#	0.8438	2.052	0.003669		65
95/08-95/10	0.414		1.061	**	0.012		-0.222	*	0.8780	1.963	0.003195		66
95/09-95/11	-0.120		1.016	**	0.046		-0.098		0.8569	1.678	0.002994		65
95/10-95/12	0.154		0.980	**	0.036		-0.107		0.7645	1.847	0.002816		65
95/11-96/01	0.172		0.883	**	0.078		0.004		0.7575	1.955	0.002535		66
95/12-96/02	0.068		0.891	**	0.019		0.047		0.8572	2.713	0.001923		65
96/01-96/03	-0.098		0.883	**	0.028		0.015		0.7915	2.452	0.002119		65
96/02-96/04	-0.215		0.882	**	0.004		0.016		0.8061	2.454	0.002040		64
96/03-96/05	-0.011		0.707	**	0.125	#	0.138		0.6961	2.101	0.002421		66
96/04-96/06	0.054		0.635	**	0.131	*	0.210	*	0.7518	2.118	0.002292		65
96/05-96/07	0.290		0.655	**	0.136		0.253	#	0.7539	2.522	0.002857		66
96/06-96/08	-0.085		0.893	**	0.037		0.078		0.8866	2.702	0.001965		65
96/07-96/09	-0.019		0.938	**	0.022		0.051		0.9116	2.845	0.001825		66
96/08-96/10	-0.013		0.979	**	0.044	*	-0.003		0.9884	2.068	0.000524		66
96/09-96/11	0.010		0.976	**	0.042	**	0.003		0.9916	2.191	0.000498		65
96/10-96/12	0.018		0.952	**	0.050	**	0.042	*	0.9950	1.952	0.000400		66
96/11-97/01	-0.116		0.954	**	0.014		0.018		0.9864	1.912	0.000729		66
96/12-97/02	-0.059		0.954	**	-0.002		0.019		0.9789	1.802	0.000880		65
97/01-97/03	-0.010		0.968	**	-0.010		0.021		0.9696	2.134	0.001084		64
97/02-97/04	0.120		0.980	**	0.007		-0.004		0.9772	2.452	0.000933		63
97/03-97/05	0.274		1.080	**	0.048		-0.184		0.6783	-2.884	0.005113		65
97/04-97/06	0.283		1.067	**	0.055		-0.184		0.6723	2.884	0.005097		65
97/05-97/07	0.721		1.050	**	0.063		-0.146		0.6255	2.591	0.005400		66
97/06-97/08	0.453	#	1.014	**	-0.018		0.016		0.8843	0.876	0.002141		65
97/07-97/09	0.449	#	1.034	**	-0.035		-0.001		0.9016	0.772	0.002079		66
97/08-97/10	1.250		0.894	**	0.007		0.007		0.4760	1.053	0.006288		66
97/09-97/11	1.811	#	0.726	**	0.112		0.050		0.2907	1.242	0.008161		65
97/10-97/12	1.824		0.659	**	0.120		0.036		0.2166	1.321	0.008924		66
97/11-98/01	1.315		0.845	**	0.080		0.042		0.3162	1.489	0.008132		65
97/12-98/02	-0.062		0.800	**	0.160		0.011		0.4001	1.414	0.006980		65
98/01-98/03	0.062		0.796	**	0.209	#	0.068		0.5234	1.255	0.005960		64
98/02-98/04	-0.646		0.779	**	0.211	**	-0.033		0.6796	1.097	0.003644		64
98/03-98/05	0.737	#	0.820	**	0.087		0.010		0.6856	2.526	0.003163		65
98/04-98/06	0.759		0.791	**	0.111		0.494		0.2731	2.747	0.007072		65
98/05-98/07	0.490		0.867	**	0.100		0.324		0.2629	2.711	0.007082		66
98/06-98/08	0.287		0.846	**	0.101		0.308		0.4587	2.657	0.006662		66
98/07-98/09	-0.012		0.986	**	0.035	#	0.002		0.9351	1.648	0.001717		66
98/08-98/10	-0.644		0.918	**	0.078	**	0.096		0.8845	1.484	0.003090		65
98/09-98/11	-0.930	*	0.913	**	0.079	**	0.086		0.8800	1.646	0.002922		65

98/10-98/12	-0.652	#	0.865	**	0.107	**	0.124		0.9093	1.702	0.002717	66
98/11-99/01	-0.071		0.956	**	0.059	**	-0.004		0.9814	2.194	0.001244	65
98/12-99/02	0.208		0.857	**	0.022		0.151		0.9219	1.785	0.002580	64
99/01-99/03	0.326		0.902	**	0.025		0.078		0.8935	1.818	0.002690	64
99/02-99/04	0.082		0.889	**	0.026		0.087		0.7589	1.733	0.002706	65
99/03-99/05	-0.129		1.004	**	0.046	*	-0.012		0.9573	1.974	0.001096	66
99/04-99/06	-0.384	**	0.996	**	0.039	*	0.006		0.9735	1.459	0.000909	65
99/05-99/07	-0.224	*	0.971	**	0.022		0.040		0.9805	1.694	0.000844	65
99/06-99/08	-0.388	**	0.960	**	0.034	#	0.056	*	0.9794	1.982	0.000952	66
99/07-99/09	-0.232	#	0.970	**	0.011		0.043		0.9831	2.093	0.000966	66
99/08-99/10	-0.215	#	0.986	**	0.011		0.030		0.9880	1.987	0.000866	65
99/09-99/11	-0.061		1.018	**	-0.008		0.001		0.9929	2.055	0.000623	65
99/10-99/12	-0.178		0.994	**	-0.001		0.051		0.9777	2.187	0.000991	66

Note: Double asterisks (**), a single asterisk (*) and a pound (#) indicate that the estimated coefficients are statistically significant at the 1%, 5%, and 10% levels, respectively.

(e) Indonesian Rupiah

Period	Const		USD		JY		EURO		R2-adj	D.W.	Std-res	No. obs.
90/01-90/03	0.207	**	0.974	**	0.017		-0.004		0.9950	2.138	0.000581	64
90/02-90/04	0.145		0.932	**	0.035		0.012		0.9242	1.665	0.001627	63
90/03-90/05	0.185		0.947	**	0.024		-0.007		0.9347	2.041	0.001589	66
90/04-90/06	0.396		0.826	**	0.098	#	0.046		0.8556	2.155	0.002520	65
90/05-90/07	0.395		0.928	**	0.061		0.017		0.9199	2.115	0.002057	66
90/06-90/08	0.405		0.907	**	0.045		0.032		0.9198	2.107	0.002186	66
90/07-90/09	-0.036		0.998	**	-0.030		0.091	*	0.9651	2.470	0.001722	65
90/08-90/10	0.042		1.036	**	-0.052		0.114	#	0.8903	2.192	0.003367	66
90/09-90/11	0.130		0.961	**	0.009		0.170	#	0.8412	2.111	0.003756	65
90/10-90/12	0.404		0.939	**	0.040		0.093		0.8163	1.930	0.003773	66
90/11-91/01	0.185		0.818	**	0.036		0.062		0.7761	2.013	0.003361	66
90/12-91/02	0.099		0.879	**	0.048		0.008		0.8488	2.036	0.002950	64
91/01-91/03	0.194		0.909	**	0.098		0.071		0.8278	2.112	0.003287	64
91/02-91/04	0.323		1.016	**	0.024		0.002		0.9448	1.971	0.002324	63
91/03-91/05	0.557		1.044	**	0.012		-0.014		0.9342	1.974	0.002733	66
91/04-91/06	0.228		1.095	**	-0.112	*	-0.062		0.9547	1.947	0.002063	65
91/05-91/07	0.295		1.089	**	-0.071		-0.086		0.9570	2.150	0.001928	66
91/06-91/08	0.143		1.006	**	-0.037		0.070	*	0.9773	2.106	0.001330	65
91/07-91/09	0.183		1.001	**	-0.022		0.075	**	0.9866	2.309	0.000999	66
91/08-91/10	0.182	#	0.975	**	0.012		0.068	**	0.9883	2.442	0.000795	66
91/09-91/11	0.130	#	1.016	**	-0.029	#	-0.021		0.9935	2.308	0.000555	65
91/10-91/12	0.150		0.967	**	0.010		0.010		0.9688	2.356	0.001210	66
91/11-92/01	0.181		1.008	**	0.000		-0.015		0.9810	2.637	0.001278	66
91/12-92/02	0.241		0.992	**	0.030		-0.008		0.9802	2.533	0.001360	65
92/01-92/03	0.236	*	1.021	**	-0.004		-0.016		0.9933	2.026	0.000792	65
92/02-92/04	0.119		1.000	**	-0.003		0.005		0.9931	2.085	0.000611	64
92/03-92/05	0.115	#	1.018	**	-0.021		-0.003		0.9957	2.079	0.000499	65
92/04-92/06	0.131	#	1.019	**	-0.020		-0.013		0.9946	2.581	0.000541	65
92/05-92/07	0.129		1.006	**	-0.025		-0.007		0.9925	2.283	0.000715	66
92/06-92/08	0.080		0.977	**	-0.005		0.015		0.9937	2.250	0.000626	66
92/07-92/09	0.108		0.998	**	-0.013		0.000		0.9950	2.154	0.000755	66
92/08-92/10	0.050		1.014	**	-0.022		0.018		0.9945	1.997	0.000870	65
92/09-92/11	0.209		1.003	**	-0.012		0.025		0.9914	2.023	0.001100	65
92/10-92/12	0.116		0.975	**	0.009		0.044	*	0.9916	1.902	0.000939	66
92/11-93/01	0.146		0.962	**	0.025		0.021		0.9927	2.117	0.000780	65
92/12-93/02	-0.007		0.984	**	0.013		-0.009		0.9981	1.968	0.000388	64
93/01-93/03	0.050		0.990	**	-0.005		-0.026		0.9861	2.056	0.000914	64
93/02-93/04	0.083		0.978	**	0.008		-0.018		0.9825	2.060	0.000990	65
93/03-93/05	0.175		0.987	**	0.001		-0.025		0.9786	2.076	0.001091	66
93/04-93/06	0.158		0.976	**	0.025		0.018		0.9889	2.136	0.000880	65
93/05-93/07	0.189	#	0.994	**	0.019		0.003		0.9905	1.678	0.000742	65
93/06-93/08	0.175	#	1.005	**	0.004		0.015		0.9903	2.147	0.000788	66
93/07-93/09	0.077		1.012	**	-0.004		0.007		0.9936	2.140	0.000615	66
93/08-93/10	0.090		1.017	**	-0.009		0.015		0.9947	1.859	0.000592	65
93/09-93/11	0.005		1.024	**	-0.007		-0.008		0.9809	1.979	0.000953	65
93/10-93/12	0.023		1.036	**	-0.016		-0.024		0.9799	1.930	0.000942	66
93/11-94/01	0.098		1.053	**	0.006		-0.037		0.9467	1.999	0.001580	66
93/12-94/02	0.326		0.996	**	0.050		-0.035		0.9025	2.029	0.002255	64
94/01-94/03	0.380		1.006	**	0.058		-0.033		0.8825	2.003	0.002263	64
94/02-94/04	0.360		0.978	**	0.029		-0.007		0.9051	2.110	0.001927	64
94/03-94/05	0.154	*	0.994	**	-0.018		0.028	#	0.9917	2.382	0.000529	66

94/04-94/06	0.125	*	0.994	**	-0.021	#	0.025	*	0.9941	2.032	0.000456	65
94/05-94/07	0.051		1.001	**	-0.004		0.009		0.9956	1.876	0.000473	65
94/06-94/08	0.042		1.010	**	-0.022		0.005		0.9903	2.066	0.000750	66
94/07-94/09	0.054		1.026	**	-0.031		-0.003		0.9878	1.980	0.000842	66
94/08-94/10	0.015		1.023	**	-0.033		-0.003		0.9852	1.902	0.000781	66
94/09-94/11	0.036		1.007	**	0.002		0.015		0.9888	2.246	0.000666	65
94/10-94/12	0.172		1.005	**	-0.024		0.035		0.9689	2.212	0.001104	65
94/11-95/01	0.391		1.175	**	-0.196	**	-0.022		0.9220	2.491	0.001965	66
94/12-95/02	0.256		1.128	**	-0.158	*	0.023		0.8808	2.273	0.002290	64
95/01-95/03	0.234		1.028	**	-0.051		-0.016		0.9565	2.274	0.002217	65
95/02-95/04	0.139		0.983	**	-0.004		0.004		0.9850	1.722	0.001391	63
95/03-95/05	0.066		0.994	**	-0.007		-0.003		0.9953	1.559	0.000920	66
95/04-95/06	-0.075		0.992	**	0.002		0.009		0.9931	1.668	0.000868	65
95/05-95/07	0.013		0.982	**	0.015		0.036	*	0.9939	2.022	0.000720	66
95/06-95/08	0.344		0.951	**	-0.056		0.023		0.9453	1.637	0.001674	66
95/07-95/09	0.430	#	0.945	**	-0.073	*	0.026		0.9609	1.660	0.001715	65
95/08-95/10	0.371		0.950	**	-0.060		0.034		0.9511	1.777	0.001981	66
95/09-95/11	0.108		0.980	**	0.010		0.008		0.9624	2.159	0.001485	65
95/10-95/12	0.165		1.013	**	0.053		-0.026		0.9448	2.177	0.001365	65
95/11-96/01	0.192		1.062	**	0.026		-0.077		0.9353	1.839	0.001313	66
95/12-96/02	0.230		1.102	**	-0.011		-0.093		0.8694	2.535	0.002059	65
96/01-96/03	0.337		1.106	**	-0.043		-0.042		0.8368	2.466	0.002143	65
96/02-96/04	0.257		1.041	**	-0.014		-0.021		0.8399	2.470	0.002080	64
96/03-96/05	0.137		1.026	**	-0.009		0.022		0.9480	2.035	0.001018	66
96/04-96/06	-0.085		0.987	**	-0.009		-0.001		0.9563	1.854	0.000967	65
96/05-96/07	0.166		0.949	**	-0.005		0.043		0.8860	2.350	0.001957	66
96/06-96/08	0.087		0.918	**	0.040		0.041		0.8798	2.302	0.002037	65
96/07-96/09	-0.035		0.943	**	0.034		0.025		0.8733	2.157	0.002223	66
96/08-96/10	-0.180		0.937	**	0.038		0.026		0.9279	1.598	0.001311	66
96/09-96/11	-0.014		0.996	**	-0.037		0.003		0.9491	1.582	0.001223	65
96/10-96/12	0.240	**	1.023	**	-0.039	*	-0.026		0.9887	1.757	0.000594	66
96/11-97/01	0.353	**	1.015	**	-0.003		0.017		0.9780	1.619	0.000980	66
96/12-97/02	0.361	*	1.006	**	0.011		0.001		0.9678	1.800	0.001150	65
97/01-97/03	0.292	#	1.023	**	0.004		0.019		0.9670	2.002	0.001203	64
97/02-97/04	0.334	#	0.975	**	0.030		0.019		0.9497	2.100	0.001429	63
97/03-97/05	0.196		1.000	**	0.019		0.041		0.9667	2.027	0.001456	65
97/04-97/06	0.205		0.997	**	0.021		0.040		0.9674	2.022	0.001417	65
97/05-97/07	1.351		1.050	**	0.130		-0.133		0.4837	2.058	0.007348	66
97/06-97/08	2.807		1.178	**	0.362		-0.891	#	0.1602	1.510	0.016127	65
97/07-97/09	4.569	#	0.723		0.293		-0.610		0.0448	1.536	0.018647	66
97/08-97/10	4.681		0.900	#	0.253		-0.551		0.0438	1.689	0.022541	66
97/09-97/11	3.354		1.463	*	-0.077		-0.100		0.0863	1.905	0.023370	65
97/10-97/12	5.270		1.913		-0.731		-0.039		-0.0049	1.762	0.047121	66
97/11-98/01	18.471		2.980		1.706		-3.085		0.0203	1.846	0.090207	65
97/12-98/02	15.686		0.075		3.778	*	-2.277		0.0396	1.880	0.097554	65
98/01-98/03	10.436		-1.123		5.528	**	-1.895		0.1183	1.613	0.088583	64
98/02-98/04	-6.523		-2.951	*	2.944	**	-0.055		0.1681	1.797	0.045455	64
98/03-98/05	0.265		-1.584		2.069	#	-1.159		0.0093	2.355	0.064019	65
98/04-98/06	9.025		-0.780		0.100		2.535		-0.0376	2.457	0.066767	65
98/05-98/07	7.788		-0.937		-0.125		0.543		-0.0448	2.419	0.067745	66
98/06-98/08	0.205		-0.601		-0.260		1.720		-0.0241	1.782	0.035084	66
98/07-98/09	-4.617		0.765		0.112		0.080		0.0021	1.821	0.026168	66
98/08-98/10	-8.249	*	1.114	*	0.379		1.423	#	0.2976	2.078	0.027497	65
98/09-98/11	-5.687		0.818		0.172		2.117	*	0.2227	1.863	0.029594	65

98/10-98/12	-3.369		0.174		0.355	1.753	#	0.1546	2.066	0.029402	66
98/11-99/01	2.161		0.501		0.049	0.448		0.0502	1.946	0.024037	65
98/12-99/02	3.215		1.086	#	0.352	-0.415		0.1891	2.430	0.019004	64
99/01-99/03	1.337		0.869	#	0.316	0.354		0.2491	2.067	0.018137	64
99/02-99/04	-1.924		0.732	#	0.138	0.808	*	0.2525	1.786	0.012604	65
99/03-99/05	-1.336		0.672		0.196	0.982	**	0.2612	2.117	0.013092	66
99/04-99/06	-3.969	#	1.137	*	0.171	0.209		0.1246	2.181	0.016715	65
99/05-99/07	-2.502		1.223	**	-0.017	-0.198		0.1053	2.199	0.017376	65
99/06-99/08	-0.391		0.906	#	0.338	-0.466		0.0683	1.683	0.021083	66
99/07-99/09	4.142		0.682		0.420	0.073		0.0947	1.576	0.021432	66
99/08-99/10	1.102		0.388		0.800	* 0.106		0.0960	1.499	0.025264	65
99/09-99/11	-0.205		0.658		0.432	0.213		0.0974	1.517	0.021886	65
99/10-99/12	-2.711		0.203		0.442	-0.005		0.0326	1.392	0.016442	66

Note: Double asterisks (**), a single asterisk (*) and a pound (#) indicate that the estimated coefficients are statistically significant at the 1%, 5%, and 10% levels, respectively.

(f) Malaysian Ringgit

Period	Const		USD		JY		EURO		R2-adj	D.W.	Std-res	No. obs.
90/01-90/03	0.142		0.930	**	0.017		0.050	#	0.9833	2.431	0.001055	64
90/02-90/04	-0.051		0.931	**	0.083	**	0.052		0.9693	2.216	0.001074	63
90/03-90/05	-0.062		0.928	**	0.067	**	0.049		0.9667	2.327	0.001178	66
90/04-90/06	-0.077		0.951	**	0.048	*	0.014		0.9723	2.199	0.001093	65
90/05-90/07	-0.023		0.933	**	0.044	*	0.032		0.9804	2.388	0.000988	66
90/06-90/08	0.022		0.906	**	0.034	*	0.075	**	0.9901	1.980	0.000757	66
90/07-90/09	0.038		0.912	**	0.029	#	0.069	**	0.9916	2.232	0.000791	65
90/08-90/10	0.057		0.955	**	0.009		0.032	*	0.9922	2.366	0.000782	66
90/09-90/11	0.145		0.946	**	0.034	*	0.025		0.9827	1.968	0.001041	65
90/10-90/12	-0.029		0.971	**	0.033		0.020		0.9699	1.763	0.001381	66
90/11-91/01	0.009		0.925	**	0.025		0.115	*	0.9464	1.957	0.001719	66
90/12-91/02	0.069		0.927	**	-0.029		0.083	#	0.9517	1.989	0.001672	64
91/01-91/03	0.211		0.883	**	-0.008		0.093	**	0.9588	1.795	0.001429	64
91/02-91/04	-0.046		0.818	**	0.031		0.163	**	0.9755	1.954	0.001342	63
91/03-91/05	-0.050		0.848	**	0.020		0.168	**	0.9714	2.411	0.001567	66
91/04-91/06	-0.010		0.822	**	0.061		0.191	**	0.9689	2.624	0.001550	65
91/05-91/07	0.141		0.873	**	0.023		0.113	*	0.9724	2.709	0.001377	66
91/06-91/08	0.164		0.808	**	0.103	**	0.110	**	0.9830	2.299	0.001039	65
91/07-91/09	-0.105		0.837	**	0.043		0.126	**	0.9772	2.092	0.001163	66
91/08-91/10	-0.144		0.874	**	0.001		0.144	**	0.9719	2.172	0.001130	66
91/09-91/11	-0.056		0.856	**	-0.003		0.186	**	0.9746	2.312	0.001051	65
91/10-91/12	0.100		0.857	**	0.018		0.155	**	0.9765	2.068	0.001004	66
91/11-92/01	-0.596	*	0.864	**	0.079		0.079	#	0.9370	1.907	0.002198	66
91/12-92/02	-0.987	**	0.851	**	0.075		0.013		0.9348	1.928	0.002248	65
92/01-92/03	-0.943	*	0.906	**	0.024		-0.007		0.8973	1.911	0.002949	65
92/02-92/04	-0.592	#	0.998	**	-0.141		0.059		0.8707	1.754	0.002616	64
92/03-92/05	-0.412		0.873	**	-0.018		0.117		0.8503	2.005	0.002856	65
92/04-92/06	-0.220		0.822	**	-0.074		0.266	**	0.8664	2.371	0.002581	65
92/05-92/07	0.119		0.831	**	0.019		0.169	*	0.9216	2.747	0.002222	66
92/06-92/08	0.108		0.957	**	-0.098		0.140	*	0.9527	1.615	0.001700	66
92/07-92/09	0.079		0.864	**	0.041	#	0.052	**	0.9927	2.179	0.000842	66
92/08-92/10	-0.012		0.868	**	0.042	#	0.051	**	0.9921	2.292	0.000957	65
92/09-92/11	0.051		0.863	**	0.055	*	0.051	**	0.9911	2.242	0.001030	65
92/10-92/12	0.606	*	0.884	**	0.083		0.054		0.9685	1.766	0.001771	66
92/11-93/01	0.666	*	0.854	**	0.102		0.098	#	0.9414	1.573	0.002213	65
92/12-93/02	0.638	*	0.870	**	0.086		0.107	#	0.9268	1.867	0.002427	64
93/01-93/03	-0.162		0.945	**	-0.008		0.053		0.9333	1.975	0.002021	64
93/02-93/04	-0.363	#	0.977	**	-0.015		0.008		0.9613	2.420	0.001479	65
93/03-93/05	-0.386	**	0.969	**	0.006		-0.020		0.9777	2.097	0.001099	66
93/04-93/06	-0.084		0.900	**	0.075	*	0.068		0.9650	2.301	0.001530	65
93/05-93/07	-0.012		0.904	**	0.070	*	0.061		0.9567	2.714	0.001537	65
93/06-93/08	-0.091		0.936	**	0.030		0.057		0.9550	2.590	0.001662	66
93/07-93/09	-0.135		0.986	**	-0.004		0.001		0.9790	2.376	0.001088	66
93/08-93/10	-0.022		1.005	**	-0.015		0.006		0.9865	1.978	0.000932	65
93/09-93/11	0.078		1.017	**	-0.021		0.017		0.9764	2.375	0.001052	65
93/10-93/12	0.664		0.690	**	-0.049		0.184		0.6177	1.255	0.003793	66
93/11-94/01	1.187	#	0.411	#	-0.008		0.303		0.3382	1.474	0.005408	66
93/12-94/02	1.314	#	0.590	**	-0.048		0.015		0.2983	1.417	0.005837	64
94/01-94/03	0.094		0.828	**	0.025		-0.050		0.4671	1.429	0.005173	64
94/02-94/04	-0.445		0.924	**	0.022		-0.014		0.7914	1.704	0.002856	64
94/03-94/05	-0.752	*	0.886	**	-0.051		0.164	*	0.8127	1.659	0.002697	66

94/04-94/06	-0.426		0.954	**	-0.112	#	0.102		0.8447	1.749	0.002493	65
94/05-94/07	-0.459		0.991	**	-0.088		0.085		0.8951	1.688	0.002407	65
94/06-94/08	-0.088		0.962	**	-0.003		-0.019		0.9383	1.675	0.001848	66
94/07-94/09	-0.221		0.883	**	0.084	#	0.014		0.9430	1.906	0.001726	66
94/08-94/10	-0.123		0.842	**	0.122	*	-0.022		0.9127	1.789	0.001725	66
94/09-94/11	0.011		0.789	**	0.130	**	0.130	**	0.9540	2.276	0.001256	65
94/10-94/12	-0.060		0.832	**	0.067		0.126	**	0.9524	2.267	0.001295	65
94/11-95/01	0.015		0.932	**	-0.034		0.116	**	0.9607	2.171	0.001279	66
94/12-95/02	-0.020		1.011	**	-0.019		0.012		0.9662	2.078	0.001088	64
95/01-95/03	-0.041		0.943	**	-0.021		0.031		0.9876	1.944	0.001114	65
95/02-95/04	-0.426		0.902	**	0.029		0.088	*	0.9680	1.739	0.002023	63
95/03-95/05	-0.466		0.882	**	0.013		0.115	**	0.9707	1.786	0.002258	66
95/04-95/06	-0.572	#	0.887	**	0.041		0.089	#	0.9446	1.851	0.002413	65
95/05-95/07	-0.086		0.908	**	0.002		0.043		0.9613	1.933	0.001712	66
95/06-95/08	0.017		0.856	**	0.062	#	0.006		0.9480	1.913	0.001480	66
95/07-95/09	0.289		0.795	**	0.049		0.132	**	0.9612	2.229	0.001550	65
95/08-95/10	0.299		0.774	**	0.060		0.166	**	0.9353	2.296	0.002084	66
95/09-95/11	0.158		0.767	**	0.095	*	0.202	**	0.9202	2.247	0.002049	65
95/10-95/12	0.078		0.851	**	0.113	*	0.103		0.8913	2.219	0.001899	65
95/11-96/01	0.044		0.871	**	0.143	**	0.115	*	0.9280	2.211	0.001389	66
95/12-96/02	0.011		0.841	**	0.183	**	0.113	*	0.9302	2.410	0.001443	65
96/01-96/03	-0.104		0.862	**	0.138	**	0.183	**	0.9087	1.751	0.001509	65
96/02-96/04	-0.369	#	0.876	**	0.064		0.148	*	0.8775	2.107	0.001743	64
96/03-96/05	-0.350	#	0.864	**	-0.023		0.136	#	0.8500	2.023	0.001673	66
96/04-96/06	-0.255		0.873	**	0.007		0.072		0.8746	2.071	0.001620	65
96/05-96/07	0.083		0.923	**	-0.030		0.048		0.9589	2.400	0.001089	66
96/06-96/08	0.008		0.935	**	0.012		0.015		0.9786	2.059	0.000803	65
96/07-96/09	0.071		0.945	**	-0.015		0.016		0.9816	2.036	0.000774	66
96/08-96/10	0.144		0.985	**	-0.002		-0.039		0.9533	1.912	0.001019	66
96/09-96/11	0.118		0.929	**	0.040		-0.020		0.9579	2.024	0.001063	65
96/10-96/12	0.088		0.886	**	0.081	*	0.046		0.9678	1.825	0.000988	66
96/11-97/01	-0.353		0.895	**	0.087	#	0.004		0.9193	2.202	0.001794	66
96/12-97/02	-0.400		0.893	**	0.049		0.044		0.8997	2.221	0.001961	65
97/01-97/03	-0.410		0.900	**	0.048		0.027		0.8888	2.204	0.002091	64
97/02-97/04	0.033		0.840	**	0.021		0.148	**	0.9410	1.865	0.001457	63
97/03-97/05	0.155		0.793	**	0.011		0.210	**	0.9170	1.765	0.002121	65
97/04-97/06	0.206		0.834	**	-0.002		0.169	*	0.9174	1.922	0.002110	65
97/05-97/07	0.443		0.742	**	-0.088		0.246		0.6468	1.935	0.004566	66
97/06-97/08	2.329	**	1.090	**	-0.070		-0.220		0.4104	1.359	0.006933	65
97/07-97/09	4.018	**	1.089	**	-0.156		-0.175		0.2979	1.533	0.008848	66
97/08-97/10	4.175	*	0.955	**	-0.176		0.125		0.1442	1.634	0.013391	66
97/09-97/11	3.087		1.420	**	-0.309		-0.097		0.1396	1.853	0.016360	65
97/10-97/12	2.672		1.338	**	0.039		-0.014		0.1848	1.893	0.016795	66
97/11-98/01	3.847		1.725	**	0.485		-0.497		0.2246	1.273	0.020895	65
97/12-98/02	1.308		1.025	#	1.127	**	-0.011		0.2109	1.522	0.023513	65
98/01-98/03	-0.967		0.909		1.040	*	-0.715		0.0917	1.641	0.026334	64
98/02-98/04	-3.136		1.061	#	0.931	*	-1.441		0.1147	2.240	0.020542	64
98/03-98/05	-0.309		0.365		0.693	*	-0.162		0.0725	2.324	0.015947	65
98/04-98/06	1.865		0.382		0.743	**	0.821		0.2996	1.937	0.011703	65
98/05-98/07	0.615		0.236		0.777	**	0.316		0.3032	1.811	0.010927	66
98/06-98/08	1.218		0.187		0.631	**	0.222		0.3567	1.970	0.008952	66
98/07-98/09	-1.293		0.672	*	0.244	#	0.299		0.2641	1.780	0.010769	66
98/08-98/10	-1.104		0.837	**	0.052		0.308		0.4483	1.292	0.009446	65
98/09-98/11	-1.393		0.940	**	0.035		0.289		0.4880	0.906	0.008758	65

98/10-98/12	0.001	0.999	**	0.000	0.001		1.0000	2.873	0.000031	66
98/11-99/01	-0.003	0.997	**	0.001	0.009		0.9987	2.527	0.000330	65
98/12-99/02	0.013	1.018	**	-0.001	-0.015		0.9967	2.575	0.000523	64
99/01-99/03	-0.003	1.003	**	-0.001	0.009		0.9950	2.636	0.000576	64
99/02-99/04	0.012	1.011	**	-0.001	0.005		0.9917	2.610	0.000467	65
99/03-99/05	-0.007	0.989	**	0.001	0.017	**	0.9981	2.767	0.000223	66
99/04-99/06	0.000	1.000	**	0.000	0.001	*	1.0000	2.252	0.000013	65
99/05-99/07	0.000	1.000	**	0.000	0.001	*	1.0000	2.191	0.000013	65
99/06-99/08	0.000	1.000	**	0.000	0.001	#	1.0000	2.047	0.000009	66
99/07-99/09	0.000	1.000	**	0.000	0.000		1.0000	2.837	0.000000	66
99/08-99/10	0.000	1.000	**	0.000	0.000	#	1.0000	2.919	0.000000	65
99/09-99/11	0.000	1.000	**	0.000	0.000	**	1.0000	2.748	0.000000	65
99/10-99/12	0.000	1.000	**	0.000	0.000	*	1.0000	3.115	0.000000	66

Note: Double asterisks (**), a single asterisk (*) and a pound (#) indicate that the estimated coefficients are statistically significant at the 1%, 5%, and 10% levels, respectively.

(g) Philippines Peso

Period	Const		USD		JY		EURO		R2-adj	D.W.	Std-res	No. obs.
90/01-90/03	0.437		1.127	**	-0.153	**	-0.107	#	0.9248	1.983	0.002328	64
90/02-90/04	0.534		1.063	**	-0.136	#	-0.085		0.8005	1.917	0.002733	63
90/03-90/05	0.339		0.966	**	-0.013		0.040		0.8694	2.068	0.002381	66
90/04-90/06	0.331		0.884	**	0.030		0.134	#	0.9054	1.684	0.002096	65
90/05-90/07	0.552		1.116	**	-0.037		0.068		0.9018	2.347	0.002619	66
90/06-90/08	1.033	*	1.238	**	-0.224	**	0.053		0.8619	2.277	0.003335	66
90/07-90/09	1.195	*	1.260	**	-0.096		-0.051		0.8268	2.153	0.004621	65
90/08-90/10	0.940	#	1.143	**	-0.036		-0.046		0.8351	2.056	0.004283	66
90/09-90/11	1.850		1.292	**	0.339	#	-0.343		0.3822	1.973	0.012998	65
90/10-90/12	1.225		1.219	**	0.385	#	-0.393		0.3348	1.969	0.012705	66
90/11-91/01	1.134		1.165	**	0.365		-0.158		0.3145	1.027	0.012739	66
90/12-91/02	0.112		0.992	**	0.021		-0.028		0.9860	1.983	0.000923	64
91/01-91/03	0.000		1.000	**	0.000		0.000		1.0000	3.019	0.000000	64
91/02-91/04	-0.052		1.002	**	0.001		-0.010	#	0.9988	2.114	0.000324	63
91/03-91/05	-0.048		1.004	**	-0.002		-0.012	*	0.9986	2.129	0.000363	66
91/04-91/06	-0.086		1.012	**	-0.010		-0.020	*	0.9980	2.115	0.000418	65
91/05-91/07	-0.161	#	1.025	**	-0.041	*	-0.026		0.9927	1.878	0.000758	66
91/06-91/08	-0.543	*	1.100	**	-0.066		-0.182	**	0.9532	2.276	0.001988	65
91/07-91/09	-0.583	#	1.142	**	-0.115		-0.158	*	0.9221	1.842	0.002588	66
91/08-91/10	-0.239		1.049	**	-0.018		-0.153		0.7684	2.074	0.004051	66
91/09-91/11	0.018		0.856	**	0.055		0.172	#	0.7516	1.949	0.003799	65
91/10-91/12	0.163		0.819	**	0.103		0.168	#	0.7806	1.932	0.003469	66
91/11-92/01	-0.496	#	1.005	**	-0.046		0.046		0.9357	2.158	0.002387	66
91/12-92/02	-0.382		1.073	**	-0.041		-0.044		0.9405	2.183	0.002485	65
92/01-92/03	-1.141	*	0.998	**	0.016		0.036		0.8488	2.158	0.004071	65
92/02-92/04	-0.309		1.116	**	-0.137		0.106		0.7079	2.034	0.004971	64
92/03-92/05	0.064		1.110	**	-0.335	*	0.160		0.6924	1.898	0.005012	65
92/04-92/06	0.421		1.100	**	-0.454	**	0.229		0.6825	1.961	0.004862	65
92/05-92/07	-0.048		1.038	**	-0.275	#	0.133		0.7396	2.013	0.004616	66
92/06-92/08	-1.190		0.802	**	-0.098		0.058		0.3410	1.387	0.008144	66
92/07-92/09	-0.043		0.913	**	-0.010		0.008		0.4088	2.043	0.011414	66
92/08-92/10	-0.382		0.965	**	-0.039		0.054		0.4769	2.006	0.011390	65
92/09-92/11	1.435		1.081	**	-0.045		0.190		0.6167	1.950	0.010273	65
92/10-92/12	-0.662		1.097	**	-0.232		0.408	*	0.6981	1.853	0.007735	66
92/11-93/01	0.558		1.268	**	-0.456		0.488	*	0.5784	1.844	0.009001	65
92/12-93/02	-0.158		1.131	**	-0.166		0.187		0.6441	1.904	0.007243	64
93/01-93/03	0.885		0.949	**	0.018		0.003		0.6979	2.050	0.004926	64
93/02-93/04	0.612	#	1.053	**	0.055		0.001		0.9200	2.269	0.002433	65
93/03-93/05	0.983	*	0.964	**	0.055		0.045		0.8436	2.195	0.003269	66
93/04-93/06	1.106	*	0.975	**	0.049		0.057		0.8551	2.215	0.003485	65
93/05-93/07	0.871		0.931	**	0.048		0.191		0.6714	1.766	0.005361	65
93/06-93/08	0.599		0.918	**	0.027		0.163		0.6414	1.937	0.005759	66
93/07-93/09	0.789		0.947	**	0.030		0.092		0.6034	2.014	0.005981	66
93/08-93/10	0.814		1.002	**	0.038		-0.053		0.5766	2.013	0.006890	65
93/09-93/11	-0.101		1.087	**	0.013		-0.518	#	0.3322	1.975	0.009013	65
93/10-93/12	-0.356		1.414	**	-0.079		-0.950	*	0.3231	1.946	0.008761	66
93/11-94/01	-0.603		1.235	**	-0.122		-0.525	#	0.3568	2.033	0.007013	66
93/12-94/02	-0.026		1.069	**	-0.011		-0.121		0.8705	1.894	0.002610	64
94/01-94/03	0.104		0.993	**	0.006		-0.037		0.9117	2.317	0.001866	64
94/02-94/04	-0.005		0.996	**	-0.052	*	-0.027		0.9417	2.496	0.001467	64
94/03-94/05	-0.332		0.944	**	-0.237	**	0.041		0.7144	1.923	0.003354	66

94/04-94/06	-0.240		0.876	**	-0.171	#	0.101		0.6425	2.054	0.003915	65
94/05-94/07	-0.577		0.698	**	-0.114		0.251	#	0.5510	1.827	0.004919	65
94/06-94/08	-0.142		0.915	**	-0.177		0.123		0.6088	2.081	0.005357	66
94/07-94/09	-0.583		1.010	**	-0.143		-0.009		0.5695	1.972	0.005983	66
94/08-94/10	-0.872		1.237	**	-0.105		-0.204		0.6315	1.764	0.005214	66
94/09-94/11	-1.426	*	0.783	**	0.402	#	-0.002		0.5528	2.211	0.005518	65
94/10-94/12	-0.578		0.796	**	0.256		0.202		0.6102	1.981	0.005161	65
94/11-95/01	-0.206		0.529	*	0.579	*	0.260		0.4817	2.574	0.006622	66
94/12-95/02	1.224		0.709	**	0.378	#	0.107		0.4565	2.852	0.006022	64
95/01-95/03	1.228		0.946	**	0.224	*	-0.214		0.7078	2.879	0.005900	65
95/02-95/04	1.199	*	1.023	**	0.136	**	-0.216	**	0.9035	2.037	0.003521	63
95/03-95/05	0.231		1.062	**	0.109	**	-0.227	**	0.9598	2.124	0.002697	66
95/04-95/06	-0.229		1.034	**	-0.030		-0.026		0.9686	2.072	0.001891	65
95/05-95/07	-0.253		1.035	**	-0.004		-0.040		0.9652	2.039	0.001763	66
95/06-95/08	0.071		1.003	**	0.001		0.015		0.9532	1.565	0.001630	66
95/07-95/09	0.255		1.039	**	0.027		-0.027		0.9708	1.698	0.001587	65
95/08-95/10	0.137		1.031	**	0.036		-0.008		0.9734	1.659	0.001543	66
95/09-95/11	0.110		1.063	**	0.053		-0.095		0.9415	1.992	0.001923	65
95/10-95/12	0.062		0.989	**	0.036		-0.048		0.8939	2.107	0.001853	65
95/11-96/01	0.061		0.973	**	0.023		-0.077		0.8672	2.211	0.001778	66
95/12-96/02	0.003		1.016	**	-0.022		0.005		0.9719	2.312	0.000868	65
96/01-96/03	0.023		1.023	**	-0.015		-0.006		0.9722	2.304	0.000783	65
96/02-96/04	0.000		1.024	**	0.004		-0.002		0.9876	1.707	0.000536	64
96/03-96/05	0.015		0.998	**	-0.015		0.003		0.9903	1.968	0.000413	66
96/04-96/06	-0.010		1.014	**	-0.018		-0.021		0.9883	2.066	0.000497	65
96/05-96/07	0.045		1.021	**	-0.021		-0.034		0.9929	2.127	0.000470	66
96/06-96/08	0.009		1.005	**	-0.008		-0.007		0.9931	2.006	0.000475	65
96/07-96/09	0.023		0.994	**	0.001		-0.001		0.9952	2.036	0.000414	66
96/08-96/10	0.015		0.990	**	0.012		-0.005		0.9930	2.042	0.000403	66
96/09-96/11	0.032		1.005	**	0.000		-0.014		0.9942	1.892	0.000412	65
96/10-96/12	0.035		0.998	**	-0.004		0.004		0.9961	1.941	0.000352	66
96/11-97/01	0.042		0.998	**	-0.007		0.016		0.9964	1.673	0.000386	66
96/12-97/02	0.035		0.996	**	0.001		0.010		0.9972	1.908	0.000332	65
97/01-97/03	0.040		0.999	**	-0.004		0.008		0.9970	2.035	0.000346	64
97/02-97/04	0.006		0.992	**	0.003		0.005		0.9976	2.556	0.000302	63
97/03-97/05	0.023		1.011	**	-0.002		-0.009		0.9981	2.466	0.000331	65
97/04-97/06	0.007		1.004	**	0.002		0.003		0.9984	2.424	0.000306	65
97/05-97/07	0.892		0.198		-0.295		0.649		0.0563	1.295	0.014258	66
97/06-97/08	1.647		0.380		-0.029		-0.152		-0.0318	1.497	0.016089	65
97/07-97/09	3.967	#	0.267		0.308		-0.348		-0.0124	1.763	0.018857	66
97/08-97/10	1.826		0.909	*	0.483	#	-0.205		0.2002	2.041	0.015833	66
97/09-97/11	1.752		0.865	#	0.286		-0.188		0.1188	1.963	0.016314	65
97/10-97/12	2.146		0.860	#	0.095		0.019		0.0608	1.359	0.018436	66
97/11-98/01	3.219		1.016	#	0.392		-0.048		0.1153	1.258	0.019988	65
97/12-98/02	2.664		0.874	#	0.953	**	-0.204		0.1975	1.266	0.019928	65
98/01-98/03	-0.489		1.109	*	0.876	**	-0.248		0.2993	1.418	0.015934	64
98/02-98/04	-1.667		1.345	**	0.688	**	-0.778		0.2804	2.063	0.013908	64
98/03-98/05	-0.757		1.325	**	0.288		-0.170		0.2547	2.281	0.012295	65
98/04-98/06	1.640		0.685		0.383	*	1.225	#	0.1840	2.340	0.013616	65
98/05-98/07	0.380		0.476		0.250	#	0.510		0.0926	2.313	0.010424	66
98/06-98/08	1.591		0.516	#	0.346	*	0.709		0.2861	2.237	0.010688	66
98/07-98/09	0.402		1.000	**	0.225	*	0.081		0.5322	1.665	0.007322	66
98/08-98/10	-0.383		1.022	**	0.167	*	0.085		0.6208	1.604	0.007639	65
98/09-98/11	-1.430		1.076	**	0.148	*	-0.030		0.6214	2.089	0.007045	65

98/10-98/12	-1.405	#	1.089	**	0.122	#	-0.226		0.6481	2.075	0.006533	66
98/11-99/01	-0.536		0.930	**	0.339	**	-0.376		0.6443	2.331	0.006621	65
98/12-99/02	-0.003		0.783	**	0.264	**	-0.092		0.6547	1.874	0.006136	64
99/01-99/03	-0.298		0.767	**	0.248	**	-0.026		0.6419	1.904	0.005649	64
99/02-99/04	-0.136		0.944	**	0.147	*	0.036		0.5786	1.838	0.004426	65
99/03-99/05	-0.381		0.903	**	0.133	*	-0.059		0.7383	2.351	0.002914	66
99/04-99/06	-0.252		1.015	**	0.063		-0.125		0.8036	2.138	0.002700	65
99/05-99/07	0.183		0.994	**	0.006		0.037		0.8116	1.915	0.002899	65
99/06-99/08	0.676	#	0.914	**	0.007		0.183	*	0.8185	2.351	0.003008	66
99/07-99/09	1.151	*	0.903	**	0.019		0.263	*	0.7878	2.364	0.004004	66
99/08-99/10	0.607		0.869	**	0.010		0.218		0.6713	2.203	0.005336	65
99/09-99/11	0.503		1.023	**	-0.011		0.018		0.6817	2.158	0.005043	65
99/10-99/12	-0.311		0.965	**	-0.032		-0.141		0.6739	2.075	0.004024	66

Note: Double asterisks (**), a single asterisk (*) and a pound (#) indicate that the estimated coefficients are statistically significant at the 1%, 5%, and 10% levels, respectively.

(h) Thai Baht

Period	Const	USD		JY		EURO		R2-adj	D.W.	Std-res	No. obs.
90/01-90/03	0.143	0.938	**	0.006		0.067	#	0.9712	1.927	0.001412	64
90/02-90/04	0.252	0.976	**	0.019		-0.003		0.9573	1.739	0.001231	63
90/03-90/05	0.060	1.007	**	-0.002		-0.064		0.9431	2.025	0.001484	66
90/04-90/06	-0.047	1.002	**	0.006		-0.050		0.9470	1.956	0.001475	65
90/05-90/07	-0.294	1.022	**	0.010		-0.003		0.9456	2.056	0.001734	66
90/06-90/08	-0.158	0.997	**	0.064	#	0.001		0.9674	1.966	0.001483	66
90/07-90/09	-0.286	1.006	**	0.042		-0.019		0.9673	1.945	0.001666	65
90/08-90/10	-0.191	0.953	**	0.051		-0.060		0.9478	2.023	0.002005	66
90/09-90/11	-0.263	0.966	**	-0.001		-0.054		0.9327	1.975	0.001987	65
90/10-90/12	0.058	0.928	**	-0.014		0.028		0.9142	1.900	0.002260	66
90/11-91/01	0.073	0.923	**	0.015		0.080		0.9383	2.058	0.001820	66
90/12-91/02	0.125	0.892	**	0.051		0.108	*	0.9363	2.016	0.001923	64
91/01-91/03	0.001	0.896	**	0.056	#	0.076	*	0.9511	2.131	0.001601	64
91/02-91/04	0.352	0.967	**	0.065		0.064	#	0.9564	2.084	0.002046	63
91/03-91/05	0.293	0.999	**	0.064		0.042		0.9677	2.016	0.001888	66
91/04-91/06	0.237	1.002	**	0.065		0.040		0.9639	1.989	0.001906	65
91/05-91/07	0.032	0.990	**	0.049	#	0.012		0.9879	1.961	0.001012	66
91/06-91/08	0.103	0.949	**	0.058	*	0.082	**	0.9895	2.034	0.000904	65
91/07-91/09	-0.070	0.968	**	0.009		0.080	**	0.9926	1.935	0.000729	66
91/08-91/10	0.002	0.918	**	0.066	**	0.064	**	0.9896	1.691	0.000728	66
91/09-91/11	-0.108	0.911	**	0.063	**	0.068	**	0.9906	1.691	0.000654	65
91/10-91/12	-0.034	0.883	**	0.039		0.063		0.9038	2.030	0.002093	66
91/11-92/01	-0.091	0.930	**	0.029		0.039		0.9403	2.060	0.002199	66
91/12-92/02	0.074	0.944	**	0.032		0.027		0.9343	2.003	0.002441	65
92/01-92/03	0.202	0.965	**	0.070	#	0.026		0.9797	1.961	0.001384	65
92/02-92/04	0.189	1.003	**	0.022		0.010		0.9661	2.019	0.001396	64
92/03-92/05	-0.026	0.975	**	0.032		0.003		0.9816	1.999	0.001027	65
92/04-92/06	-0.142	0.962	**	0.007		0.026		0.9806	1.994	0.001005	65
92/05-92/07	-0.198	0.973	**	0.043		0.021		0.9838	2.064	0.001079	66
92/06-92/08	-0.165	0.961	**	0.020		0.042		0.9810	1.895	0.001112	66
92/07-92/09	-0.007	0.979	**	-0.011		0.028		0.9878	2.113	0.001176	66
92/08-92/10	-0.100	0.984	**	-0.028		0.049	*	0.9854	1.976	0.001392	65
92/09-92/11	0.134	0.990	**	-0.030		0.046	*	0.9863	1.995	0.001367	65
92/10-92/12	0.067	0.972	**	-0.007		0.057	*	0.9856	1.853	0.001225	66
92/11-93/01	0.080	0.927	**	0.047	*	0.023	#	0.9953	1.400	0.000613	65
92/12-93/02	-0.041	0.921	**	0.050	*	-0.014		0.9931	1.752	0.000702	64
93/01-93/03	-0.045	0.926	**	0.035		-0.034		0.9836	1.734	0.000950	64
93/02-93/04	-0.118	0.920	**	0.024		-0.019		0.9776	1.730	0.001066	65
93/03-93/05	-0.054	0.965	**	0.021		0.005		0.9805	1.846	0.001041	66
93/04-93/06	-0.067	0.964	**	0.027		0.033		0.9708	2.114	0.001426	65
93/05-93/07	0.138	0.987	**	0.035		0.008		0.9648	1.964	0.001450	65
93/06-93/08	-0.066	0.976	**	0.015		-0.001		0.9669	1.871	0.001435	66
93/07-93/09	0.014	0.993	**	0.003		-0.014		0.9863	1.934	0.000886	66
93/08-93/10	0.026	0.983	**	0.005		-0.031		0.9862	1.877	0.000929	65
93/09-93/11	0.186	1.023	**	-0.007		-0.017		0.9737	2.034	0.001117	65
93/10-93/12	0.142	0.999	**	-0.001		0.010		0.9730	2.044	0.001086	66
93/11-94/01	0.093	1.034	**	0.017		-0.047		0.9811	1.969	0.000908	66
93/12-94/02	-0.082	1.017	**	0.006		-0.030		0.9835	1.813	0.000892	64
94/01-94/03	-0.153	1.032	**	0.009		-0.035		0.9792	1.902	0.000913	64
94/02-94/04	-0.165	1.018	**	-0.005		0.001		0.9808	2.066	0.000867	64
94/03-94/05	-0.049	0.996	**	0.000		0.014		0.9842	2.021	0.000732	66

94/04-94/06	-0.090		0.926	**	-0.010		0.085	**	0.9804	2.106	0.000813		65
94/05-94/07	-0.093		0.936	**	0.005		0.076	**	0.9862	2.203	0.000821		65
94/06-94/08	-0.056		0.923	**	0.029		0.062	**	0.9870	2.282	0.000846		66
94/07-94/09	-0.052		0.965	**	0.014		0.009		0.9904	2.088	0.000723		66
94/08-94/10	-0.002		0.936	**	0.016		0.013		0.9765	2.101	0.000930		66
94/09-94/11	0.001		0.940	**	-0.013		0.028		0.9780	2.098	0.000877		65
94/10-94/12	0.095		0.921	**	0.002		0.060	*	0.9728	2.211	0.000976		65
94/11-95/01	0.085		0.979	**	-0.025		0.038		0.9811	2.044	0.000868		66
94/12-95/02	-0.052		1.000	**	-0.025		0.020		0.9761	2.268	0.000904		64
95/01-95/03	-0.106		0.880	**	0.071	**	0.082	**	0.9894	2.484	0.001020		65
95/02-95/04	-0.059		0.872	**	0.068	**	0.060	**	0.9920	2.724	0.000963		63
95/03-95/05	0.026		0.850	**	0.072	**	0.069	**	0.9945	2.464	0.000923		66
95/04-95/06	0.039		0.844	**	0.064	**	0.041	**	0.9943	2.559	0.000705		65
95/05-95/07	0.056		0.844	**	0.063	**	0.044	**	0.9939	2.571	0.000637		66
95/06-95/08	0.043		0.858	**	0.069	**	0.037	#	0.9864	2.684	0.000758		66
95/07-95/09	0.033		0.862	**	0.084	**	0.045	*	0.9930	2.633	0.000665		65
95/08-95/10	0.028		0.864	**	0.089	**	0.054	*	0.9911	2.617	0.000775		66
95/09-95/11	-0.006		0.861	**	0.104	**	0.060	**	0.9911	2.529	0.000662		65
95/10-95/12	-0.024		0.873	**	0.113	**	0.040		0.9835	2.495	0.000686		65
95/11-96/01	0.013		0.881	**	0.101	**	0.019		0.9758	1.955	0.000726		66
95/12-96/02	-0.032		0.894	**	0.070	**	0.015		0.9730	1.910	0.000804		65
96/01-96/03	-0.009		0.890	**	0.063	#	0.065		0.9426	2.316	0.001083		65
96/02-96/04	-0.036		0.887	**	0.055		0.087	#	0.9431	2.476	0.001110		64
96/03-96/05	0.068		0.916	**	0.037		0.105	*	0.9461	2.658	0.001013		66
96/04-96/06	0.088		0.934	**	0.042	*	0.048		0.9736	2.431	0.000751		65
96/05-96/07	0.054		0.852	**	0.058	*	0.122	*	0.9713	2.666	0.000928		66
96/06-96/08	-0.015		0.847	**	0.120	**	0.088	#	0.9752	2.714	0.000888		65
96/07-96/09	0.005		0.889	**	0.072	*	0.065		0.9726	2.459	0.000976		66
96/08-96/10	0.131		0.963	**	0.034		0.031		0.9838	2.563	0.000621		66
96/09-96/11	0.091		0.890	**	0.049	*	0.061	#	0.9843	2.778	0.000655		65
96/10-96/12	0.147	#	0.874	**	0.073	**	0.076	**	0.9848	2.158	0.000676		66
96/11-97/01	0.123		0.860	**	0.095	**	0.084	**	0.9827	2.132	0.000820		66
96/12-97/02	0.105		0.850	**	0.112	**	0.087	**	0.9787	1.957	0.000889		65
97/01-97/03	-0.013		0.834	**	0.099	**	0.083	**	0.9814	1.956	0.000816		64
97/02-97/04	-0.011		0.815	**	0.101	**	0.078	**	0.9874	1.985	0.000638		63
97/03-97/05	-0.597		0.871	**	0.297	*	-0.053		0.5920	1.937	0.005798		65
97/04-97/06	-0.370		0.780	*	0.420		0.412		0.2304	2.029	0.015178		65
97/05-97/07	1.945		-0.108		-0.040		1.641	#	0.0498	1.975	0.027020		66
97/06-97/08	4.804		0.687		0.021		0.890		0.0110	2.006	0.027541		65
97/07-97/09	5.794	#	0.548		-0.121		0.061		-0.0312	2.000	0.025349		66
97/08-97/10	3.402	#	1.011	**	0.162		-0.360		0.1324	2.276	0.015976		66
97/09-97/11	2.926		1.066	*	-0.118		-0.273		0.0599	2.104	0.017146		65
97/10-97/12	4.232	#	0.771		0.187		-0.013		0.0624	2.083	0.018082		66
97/11-98/01	3.789		0.498		0.706	#	-0.404		0.0667	1.612	0.020796		65
97/12-98/02	1.336		0.502		1.087	*	-0.257		0.1132	1.648	0.023928		65
98/01-98/03	-3.458		0.421		0.846	#	-0.710		0.0337	1.672	0.024130		64
98/02-98/04	-5.727	*	0.569		0.598		-0.772		0.0251	1.821	0.019430		64
98/03-98/05	-1.409		0.044		0.297		0.323		-0.0054	1.871	0.014450		65
98/04-98/06	0.749		0.686	#	0.682	**	0.396		0.3039	1.942	0.010698		65
98/05-98/07	0.042		0.210		0.630	**	0.142		0.2702	1.958	0.009397		66
98/06-98/08	0.354		0.368		0.669	**	0.209		0.4246	1.624	0.008776		66
98/07-98/09	-1.088		0.536	**	0.260	**	0.638	*	0.4875	1.846	0.007462		66
98/08-98/10	-1.237		0.896	**	0.174	**	0.251		0.6210	1.834	0.007449		65
98/09-98/11	-1.960	*	0.819	**	0.132	*	0.374	*	0.6105	1.801	0.006696		65

98/10-98/12	-0.706		0.956	**	0.092		0.024	0.7158	1.934	0.005527	66
98/11-99/01	-0.050		0.595	**	0.246	*	0.297	0.5532	2.544	0.007933	65
98/12-99/02	0.523		0.703	**	0.204	*	0.195	0.5711	2.560	0.007779	64
99/01-99/03	0.195		0.740	**	0.184	*	0.109	0.5111	2.700	0.007383	64
99/02-99/04	0.191		0.981	**	0.095	#	0.086	0.6841	1.954	0.003679	65
99/03-99/05	-0.066		0.953	**	0.127	#	0.038	0.6726	2.194	0.003745	66
99/04-99/06	-0.339		0.895	**	0.092		0.086	0.7228	2.122	0.003287	65
99/05-99/07	0.043		0.890	**	0.026		-0.018	0.7494	2.166	0.003122	65
99/06-99/08	0.507		0.904	**	-0.009		0.076	0.8156	1.901	0.002858	66
99/07-99/09	1.803	*	0.831	**	0.100		0.215	0.6340	2.117	0.005629	66
99/08-99/10	0.699		0.711	**	0.116		0.180	0.3878	1.897	0.008398	65
99/09-99/11	0.306		0.743	**	0.126		0.189	0.3777	1.892	0.008471	65
99/10-99/12	-1.470	#	0.631	**	0.090		0.064	0.3107	1.914	0.006712	66

Note: Double asterisks (**), a single asterisk (*) and a pound (#) indicate that the estimated coefficients are statistically significant at the 1%, 5%, and 10% levels, respectively.

(i) Chinese Ren Min Bi

Period	Const	USD	JY	EURO	R2-adj	D.W.	Std-res	No. obs.
90/01-90/03	0.005	0.996 **	0.005 *	0.001	0.9999	1.935	0.000090	64
90/02-90/04	-0.010	0.993 **	0.006	0.002	0.9994	1.381	0.000139	63
90/03-90/05	-0.002	0.994 **	0.004	0.004	0.9995	1.899	0.000138	66
90/04-90/06	-0.007	0.997 **	0.001	0.003	0.9997	1.994	0.000115	65
90/05-90/07	0.006	0.999 **	0.000	0.003 *	1.0000	2.084	0.000038	66
90/06-90/08	0.000	1.000 **	0.000	0.000	1.0000	2.877	0.000000	66
90/07-90/09	-0.007	0.999 **	-0.002	0.001	0.9999	1.802	0.000064	65
90/08-90/10	-0.009	0.998 **	-0.002	0.001	1.0000	1.821	0.000063	66
90/09-90/11	1.467	1.030 **	-0.116	0.073	0.2603	2.024	0.012803	65
90/10-90/12	1.599	0.996 **	-0.183	0.151	0.2649	2.026	0.012665	66
90/11-91/01	1.637	1.014 **	-0.176	0.068	0.2409	2.027	0.012668	66
90/12-91/02	0.000	1.000 **	0.000	0.000	1.0000	3.017	0.000000	64
91/01-91/03	-0.026	1.004 **	-0.006	-0.007 #	0.9994	1.962	0.000184	64
91/02-91/04	0.163	1.040 **	-0.056 #	0.001	0.9843	2.008	0.001202	63
91/03-91/05	0.260	1.045 **	-0.049	-0.005	0.9839	2.055	0.001282	66
91/04-91/06	0.408 *	1.020 **	0.007	0.011	0.9736	2.050	0.001583	65
91/05-91/07	0.216	0.960 **	0.076 **	0.038	0.9864	2.018	0.001065	66
91/06-91/08	0.134	0.956 **	0.083 **	0.016	0.9887	2.082	0.000949	65
91/07-91/09	0.056	1.004 **	0.015	0.002	0.9937	1.920	0.000688	66
91/08-91/10	0.093	1.004 **	0.013	0.007	0.9929	2.058	0.000628	66
91/09-91/11	0.112	1.001 **	0.014	0.016	0.9898	2.063	0.000712	65
91/10-91/12	0.106	0.965 **	0.032	0.026	0.9675	2.401	0.001256	66
91/11-92/01	0.169	1.043 **	-0.030	-0.022	0.9544	2.391	0.002041	66
91/12-92/02	0.194	1.056 **	-0.045	-0.037	0.9581	2.393	0.002033	65
92/01-92/03	0.252	1.074 **	-0.061	-0.046	0.9724	2.062	0.001652	65
92/02-92/04	0.188	1.010 **	-0.007	-0.037	0.9682	2.035	0.001316	64
92/03-92/05	0.099	0.986 **	0.016	-0.029	0.9687	2.004	0.001336	65
92/04-92/06	0.059	0.969 **	-0.028	0.029	0.9628	1.963	0.001390	65
92/05-92/07	-0.101	0.976 **	-0.003	0.041 *	0.9943	2.090	0.000625	66
92/06-92/08	-0.147	1.007 **	-0.027	0.021	0.9821	2.093	0.001083	66
92/07-92/09	0.217	1.083 **	-0.100	-0.035	0.9361	2.213	0.002809	66
92/08-92/10	0.131	1.059 **	-0.072	-0.036	0.9400	2.145	0.002931	65
92/09-92/11	0.254	1.056 **	-0.065	-0.032	0.9471	2.159	0.002775	65
92/10-92/12	0.869	1.148 **	-0.124	-0.112	0.6820	2.026	0.006998	66
92/11-93/01	0.834	1.172 **	-0.179	-0.093	0.6350	2.015	0.007013	65
92/12-93/02	0.793	1.119 **	-0.087	-0.132	0.6124	2.031	0.007081	64
93/01-93/03	-0.466	1.037 **	-0.090	-0.039	0.8954	2.045	0.002617	64
93/02-93/04	-0.426	1.048 **	-0.080	-0.061	0.8902	2.019	0.002601	65
93/03-93/05	-0.365	1.044 **	-0.084	-0.058	0.8907	2.013	0.002581	66
93/04-93/06	0.000	1.000 **	0.000	0.000 **	1.0000	2.660	0.000000	65
93/05-93/07	0.000	1.000 **	0.000	0.000	1.0000	2.796	0.000000	65
93/06-93/08	0.000	1.000 **	0.000	0.000	1.0000	2.774	0.000000	66
93/07-93/09	0.000	1.000 **	0.000	0.000 **	1.0000	2.738	0.000000	66
93/08-93/10	0.150	0.974 **	0.001	-0.007	0.9784	2.071	0.001156	65
93/09-93/11	0.182	0.965 **	0.005	0.000	0.9660	2.089	0.001219	65
93/10-93/12	0.196	0.937 **	0.022	0.021	0.9624	2.066	0.001239	66
93/11-94/01	5.719	0.508	0.752	0.542	-0.0084	2.041	0.049101	66
93/12-94/02	6.246	0.745	0.515	0.430	-0.0115	2.046	0.049933	64
94/01-94/03	6.578	0.933	0.543	0.318	-0.0130	2.054	0.049890	64
94/02-94/04	-0.021	1.004 **	-0.003	-0.006	0.9992	2.394	0.000173	64
94/03-94/05	-0.013	1.009 **	0.000	-0.011 #	0.9987	2.313	0.000205	66

94/04-94/06	-0.033		0.983	**	0.012		0.020	•	0.9968	2.104	0.000334	65
94/05-94/07	-0.020		0.980	**	0.015	•	0.027	**	0.9982	1.945	0.000304	65
94/06-94/08	-0.029		0.982	**	0.010		0.021	**	0.9987	2.149	0.000278	66
94/07-94/09	0.000		1.000	**	0.000		0.000		1.0000	2.842	0.000000	66
94/08-94/10	0.000		1.000	**	0.000		0.000		1.0000	2.561	0.000000	66
94/09-94/11	-0.311		1.132	**	-0.008		-0.114		0.8846	1.979	0.002390	65
94/10-94/12	-0.402		1.152	**	0.003		-0.134	#	0.8798	1.940	0.002376	65
94/11-95/01	-0.387		1.172	**	-0.004		-0.154	•	0.8886	1.940	0.002345	66
94/12-95/02	-0.138	**	0.996	**	-0.002		-0.006		0.9982	1.194	0.000241	64
95/01-95/03	-0.034	**	1.000	**	0.002	•	-0.002		1.0000	1.449	0.000058	65
95/02-95/04	-0.062	**	1.003	**	-0.001		-0.004	#	0.9999	0.648	0.000128	63
95/03-95/05	-0.264	•	1.044	**	-0.016		-0.044	•	0.9948	2.335	0.000997	66
95/04-95/06	-0.239	#	1.057	**	-0.019		-0.050	•	0.9911	2.326	0.001011	65
95/05-95/07	-0.185		1.073	**	-0.036		-0.068	**	0.9874	2.298	0.001067	66
95/06-95/08	0.018		0.999	**	0.005		0.005		0.9955	2.692	0.000490	66
95/07-95/09	-0.003		1.001	**	0.013		0.016		0.9941	2.608	0.000694	65
95/08-95/10	-0.002		1.002	**	0.009		0.009		0.9964	2.413	0.000547	66
95/09-95/11	-0.029		1.006	**	0.007		0.011		0.9951	2.471	0.000542	65
95/10-95/12	0.001		0.992	**	0.001		0.002		0.9979	2.921	0.000251	65
95/11-96/01	-0.048		0.959	**	-0.028		0.010		0.9210	2.511	0.001342	66
95/12-96/02	-0.026		1.020	**	-0.037		0.048		0.8477	2.588	0.002197	65
96/01-96/03	0.108		1.049	**	-0.064		0.077		0.8078	2.664	0.002337	65
96/02-96/04	0.021		1.037	**	0.066		0.029		0.7497	2.689	0.002910	64
96/03-96/05	0.084		0.974	**	0.022		-0.033		0.7126	2.826	0.002541	66
96/04-96/06	-0.043		1.010	**	0.011		-0.052		0.7657	2.912	0.002470	65
96/05-96/07	0.092		1.050	**	-0.033		-0.049		0.9600	1.438	0.001151	66
96/06-96/08	-0.022		1.063	**	-0.043	•	-0.017		0.9910	2.142	0.000559	65
96/07-96/09	-0.019		1.020	**	0.000		-0.013	•	0.9996	1.940	0.000120	66
96/08-96/10	0.007		1.008	**	-0.040		0.019		0.9664	2.924	0.000893	66
96/09-96/11	-0.016		0.969	**	-0.049		0.060		0.9454	2.924	0.001272	65
96/10-96/12	0.013		1.140	**	-0.107	#	-0.076		0.9179	2.801	0.001744	66
96/11-97/01	0.060		1.073	**	-0.039		-0.037		0.9485	2.960	0.001530	66
96/12-97/02	0.085		1.073	**	-0.022		-0.038		0.9651	2.973	0.001230	65
97/01-97/03	-0.009		0.997	**	0.001		-0.002		0.9997	2.637	0.000112	64
97/02-97/04	0.020		1.013	**	-0.002		-0.052	•	0.9905	2.826	0.000601	63
97/03-97/05	0.021		1.023	**	-0.001		-0.054	•	0.9940	2.821	0.000589	65
97/04-97/06	-0.012		1.018	**	0.004		-0.050	•	0.9915	2.505	0.000692	65
97/05-97/07	-0.059		1.003	**	-0.002		-0.009		0.9944	2.493	0.000536	66
97/06-97/08	-0.031		0.970	**	-0.007		0.019		0.9847	2.318	0.000712	65
97/07-97/09	0.021		0.976	**	-0.009		0.014		0.9900	1.741	0.000610	66
97/08-97/10	0.069		0.974	**	0.000		0.015		0.9948	1.547	0.000482	66
97/09-97/11	-0.018		1.000	**	0.003		-0.005		0.9996	2.723	0.000124	65
97/10-97/12	-0.012		1.000	**	0.003		-0.006	#	0.9996	2.714	0.000121	66
97/11-98/01	-0.029		0.971	**	0.031	#	-0.029		0.9768	2.365	0.000948	65
97/12-98/02	-0.040		1.002	**	0.022		-0.045		0.9591	2.482	0.001339	65
98/01-98/03	-0.060		1.007	**	0.024		-0.049		0.9623	2.472	0.001348	64
98/02-98/04	-0.069		1.032	**	-0.002		-0.031		0.9777	2.448	0.000930	64
98/03-98/05	0.001		1.000	**	0.000		0.001		1.0000	2.453	0.000036	65
98/04-98/06	0.001		1.000	**	0.000		0.002		0.9999	2.680	0.000044	65
98/05-98/07	0.003		1.000	**	0.000		0.002		0.9999	2.861	0.000044	66
98/06-98/08	0.001		1.000	**	0.000		0.001		1.0000	2.893	0.000040	66
98/07-98/09	-0.003		1.000	**	0.000		0.001		1.0000	2.628	0.000031	66
98/08-98/10	-0.004		1.000	**	0.000		0.001		1.0000	2.793	0.000032	65
98/09-98/11	-0.004		1.000	**	0.000		0.000		1.0000	2.634	0.000032	65

98/10-98/12	0.001	1.000	**	0.000		-0.002	#	1.0000	2.689	0.000032	66
98/11-99/01	-0.001	1.001	**	-0.001	#	0.000		1.0000	2.728	0.000037	65
98/12-99/02	0.002	1.001	**	-0.001	*	0.000		1.0000	2.459	0.000036	64
99/01-99/03	0.002	1.001	**	-0.001	*	0.001		1.0000	2.429	0.000036	64
99/02-99/04	0.002	1.000	**	-0.001		0.001		0.9999	2.315	0.000040	65
99/03-99/05	-0.003	1.000	**	-0.001		0.000		0.9999	2.416	0.000051	66
99/04-99/06	-0.004	1.000	**	-0.001		-0.001		0.9999	2.443	0.000055	65
99/05-99/07	-0.002	1.000	**	0.001		-0.003		0.9989	2.891	0.000196	65
99/06-99/08	0.001	1.001	**	0.002		-0.002		0.9991	2.898	0.000192	66
99/07-99/09	0.044	0.975	**	0.023		0.042		0.9797	2.891	0.001074	66
99/08-99/10	0.029	0.966	**	0.021		0.059	#	0.9821	2.864	0.001061	65
99/09-99/11	0.011	0.963	**	0.019		0.067	#	0.9797	2.857	0.001059	65
99/10-99/12	0.003	0.999	**	0.000		-0.001		1.0000	2.014	0.000022	66

Note: Double asterisks (**), a single asterisk (*) and a pound (#) indicate that the estimated coefficients are statistically significant at the 1%, 5%, and 10% levels, respectively.

(j) Vietnamese Don

Period	Const		USD		JY		EURO		R2-adj	D.W.	Std-res	No. Obs.
90/01-90/03	-0.271		0.174		-0.020		0.960	**	0.6584	2.310	0.005763	64
90/02-90/04	-0.051		0.048		0.046		1.069	**	0.5496	2.283	0.005879	63
90/03-90/05	-0.283		0.093		0.094		1.094	**	0.5649	2.341	0.006173	66
90/04-90/06	0.434		0.288		0.170		0.636	**	0.6122	1.779	0.004994	65
90/05-90/07	0.566		0.312		0.091		0.764	**	0.5115	2.098	0.006673	66
90/06-90/08	0.911		0.353	#	-0.010		0.603	**	0.4407	2.086	0.007097	66
90/07-90/09	0.918		0.205		-0.093		0.752	**	0.3357	2.375	0.008656	65
90/08-90/10	4.889		0.436		-0.741		1.043	#	0.0651	2.107	0.026394	66
90/09-90/11	5.285		0.111		-0.637		1.219	#	0.0598	2.068	0.026464	65
90/10-90/12	6.118	#	0.191		-0.745		1.152	#	0.0444	1.571	0.026126	66
90/11-91/01	1.180		0.538	**	-0.010		-0.071		0.0954	2.229	0.009796	66
90/12-91/02	1.779		0.661	**	-0.053		-0.111		0.1112	2.185	0.011657	64
91/01-91/03	1.337		0.775	**	-0.201		0.076		0.1683	2.161	0.011633	64
91/02-91/04	0.149		0.655	**	-0.598	*	0.545	**	0.3441	2.168	0.009581	63
91/03-91/05	-0.235		0.423	**	-0.523	*	0.640	**	0.3227	2.130	0.008744	66
91/04-91/06	0.505		0.272		-0.350	#	0.780	**	0.3062	2.045	0.008582	65
91/05-91/07	1.856		-0.236		0.359		1.069	**	0.1490	1.950	0.010128	66
91/06-91/08	1.585		0.211		0.219		0.180		0.0433	2.072	0.012079	65
91/07-91/09	3.913	#	0.439		0.400		-0.498		0.0456	1.601	0.018201	66
91/08-91/10	3.308		0.919	*	-0.247		-0.453		0.0591	1.943	0.017123	66
91/09-91/11	4.128		2.148	**	-0.054		-2.144	**	0.2035	1.963	0.024226	65
91/10-91/12	2.538		1.313	*	-0.102		-1.177	*	0.0691	1.922	0.022341	66
91/11-92/01	0.992		0.759		-0.236		-0.342		-0.0057	2.025	0.027285	66
91/12-92/02	-2.315		0.711		-0.879		0.939	*	0.1061	2.064	0.019337	65
92/01-92/03	-3.203		0.510		-0.785		1.177	*	0.1153	2.033	0.018984	65
92/02-92/04	-0.162		0.857	*	-0.844	#	1.023	*	0.1601	2.019	0.013854	64
92/03-92/05	0.288		0.259		-0.092		0.723	*	0.1969	1.987	0.007920	65
92/04-92/06	0.814		0.434	*	0.152		0.388		0.3386	2.237	0.007021	65
92/05-92/07	0.976		0.168		0.168		0.605	**	0.3406	2.117	0.006841	66
92/06-92/08	1.131		0.193		0.014		0.592	**	0.3155	2.070	0.006017	66
92/07-92/09	-0.383		-0.023		0.549		0.625	*	0.2272	2.469	0.013795	66
92/08-92/10	-0.782		0.465		0.101		0.555	*	0.2604	2.360	0.015037	65
92/09-92/11	-1.249		0.426		0.157		0.526	*	0.2588	2.397	0.015197	65
92/10-92/12	-0.801		0.848	**	-0.478		0.493	*	0.4416	2.141	0.009366	66
92/11-93/01	-0.754		0.728	*	-0.628		1.069	**	0.3197	1.885	0.012032	65
92/12-93/02	-1.125		0.828	*	-0.658		1.248	**	0.3699	1.807	0.013712	64
93/01-93/03	-1.043		0.587	#	-0.366		1.361	**	0.3110	1.732	0.014135	64
93/02-93/04	-0.697		0.685	*	-0.185		0.914	*	0.3054	1.610	0.011761	65
93/03-93/05	-0.026		0.426	#	-0.008		0.769	*	0.2497	1.888	0.009515	66
93/04-93/06	-0.175		0.414	*	-0.062		0.345		0.1482	2.120	0.008852	65
93/05-93/07	-0.480		0.362	*	-0.065		0.383	#	0.1602	1.881	0.008117	65
93/06-93/08	-0.653		-0.011		-0.169		0.452	*	0.0583	1.446	0.009250	66
93/07-93/09	1.295		-0.078		-0.157		0.460	**	0.0987	1.378	0.008576	66
93/08-93/10	0.220		0.051		-0.178		0.659	**	0.1473	1.323	0.008553	65
93/09-93/11	-0.222		0.216		-0.053		0.812	**	0.3302	1.995	0.006238	65
93/10-93/12	-0.620		0.247		0.053		0.880	**	0.4793	2.152	0.005496	66
93/11-94/01	0.003		0.402	*	0.019		0.527	**	0.5683	2.398	0.004449	66
93/12-94/02	0.205		0.490	**	0.010		0.437	*	0.4755	2.211	0.005886	64
94/01-94/03	0.482		0.431	**	0.006		0.512	**	0.5306	2.080	0.005081	64
94/02-94/04	0.397		0.453	**	0.014		0.490	**	0.4582	2.100	0.005764	64
94/03-94/05	0.397		0.473	**	-0.031		0.511	**	0.5671	2.217	0.004286	66

94/04-94/06	0.309		0.575	**	0.030		0.590	**	0.6210	2.299	0.004749	65
94/05-94/07	0.195		0.588	**	-0.025		0.663	**	0.6668	2.365	0.004904	65
94/06-94/08	0.388		0.619	**	-0.066		0.558	**	0.6894	2.311	0.004810	66
94/07-94/09	0.002		0.644	**	-0.087		0.445	**	0.5981	2.063	0.005240	66
94/08-94/10	0.480		0.436	*	0.082		0.130		0.1582	2.027	0.007195	66
94/09-94/11	-0.128		0.174		0.215		0.470	#	0.1574	2.119	0.007940	65
94/10-94/12	0.179		-0.063		0.329		0.649	**	0.2516	2.037	0.007336	65
94/11-95/01	0.010		0.162		0.186		0.862	**	0.6734	2.162	0.004591	66
94/12-95/02	0.584		0.314		0.100		0.618	**	0.5426	2.094	0.004955	64
95/01-95/03	0.321		0.870	**	-0.179		0.183		0.7448	2.340	0.005752	65
95/02-95/04	0.340		0.743	**	-0.113		0.319	**	0.7596	2.227	0.006003	63
95/03-95/05	0.230		0.835	**	-0.148		0.209	#	0.7723	2.502	0.006789	66
95/04-95/06	-0.318		0.695	**	-0.119		0.331	*	0.6351	2.463	0.006734	65
95/05-95/07	-0.025		0.775	**	-0.236		0.248	#	0.6051	2.547	0.006199	66
95/06-95/08	-0.660		0.444	**	0.007		0.695	**	0.6389	2.389	0.004913	66
95/07-95/09	-0.282		0.475	**	0.030		0.590	**	0.7202	2.430	0.004486	65
95/08-95/10	-0.312		0.536	**	0.008		0.503	**	0.7378	2.399	0.004538	66
95/09-95/11	0.370		0.590	**	0.007		0.262	*	0.7160	2.214	0.003622	65
95/10-95/12	-0.204		0.481	**	0.137		0.459	**	0.5605	1.805	0.004514	65
95/11-96/01	-0.478		0.503	**	0.183		0.316	#	0.3699	1.960	0.005116	66
95/12-96/02	-0.388		0.574	**	0.297	*	0.084		0.4277	1.722	0.004878	65
96/01-96/03	-0.075		0.816	**	-0.058		0.042		0.4261	1.899	0.004154	65
96/02-96/04	0.119		0.710	**	-0.059		0.311	*	0.5710	1.737	0.003579	64
96/03-96/05	-0.206		0.421	*	0.060		0.721	**	0.5578	1.643	0.003937	66
96/04-96/06	0.003		0.251		0.152		0.816	**	0.6278	2.253	0.003704	65
96/05-96/07	0.256		0.326	*	0.069		0.827	**	0.6574	2.134	0.003724	66
96/06-96/08	0.203		0.771	**	-0.114		0.295	#	0.7760	2.599	0.002721	65
96/07-96/09	0.061		0.744	**	-0.100		0.341	**	0.8217	2.425	0.002493	66
96/08-96/10	-0.173		0.733	**	0.008		0.275	#	0.6694	2.513	0.003128	66
96/09-96/11	0.074		0.592	**	-0.024		0.488	*	0.5387	2.512	0.004535	65
96/10-96/12	0.194		0.379		-0.155		0.872	**	0.4403	2.218	0.006182	66
96/11-97/01	-0.098		0.414	#	-0.145		0.977	**	0.4372	1.878	0.007588	66
96/12-97/02	-0.578		0.492	*	-0.202		0.910	**	0.4674	1.892	0.007242	65
97/01-97/03	0.565		0.737	**	0.027		0.578	*	0.5128	2.009	0.006746	64
97/02-97/04	0.568		0.923	**	-0.043		0.297	#	0.6941	2.171	0.004432	63
97/03-97/05	0.656		0.993	**	0.127		-0.026		0.6947	2.828	0.005055	65
97/04-97/06	0.018		0.955	**	0.001		-0.001		0.7691	3.034	0.003923	65
97/05-97/07	0.017		0.948	**	0.003		0.002		0.7511	3.037	0.003890	66
97/06-97/08	0.047	#	0.998	**	-0.004		0.005		0.9989	2.748	0.000195	65
97/07-97/09	0.069	**	0.996	**	-0.003		0.001		0.9992	2.779	0.000173	66
97/08-97/10	0.707		0.949	**	0.006		0.036		0.5189	2.705	0.006198	66
97/09-97/11	0.634		1.096	**	0.038		-0.007		0.4857	2.758	0.007314	65
97/10-97/12	0.693		1.130	**	0.046		0.030		0.4988	2.747	0.007456	66
97/11-98/01	0.251		1.168	**	0.066		-0.002		0.7719	2.513	0.004120	65
97/12-98/02	0.912		1.093	**	0.039		-0.180		0.4954	2.021	0.006709	65
98/01-98/03	0.854		1.149	**	-0.008		-0.316		0.5290	1.908	0.006429	64
98/02-98/04	0.694		1.162	**	0.007		-0.357		0.4637	1.898	0.006427	64
98/03-98/05	0.017		1.003	**	-0.003		-0.001		0.9992	2.281	0.000158	65
98/04-98/06	0.003		0.998	**	0.002		-0.014		0.9917	2.930	0.000399	65
98/05-98/07	0.004		1.002	**	0.005		-0.015		0.9918	2.964	0.000403	66
98/06-98/08	0.996		0.874	**	0.137		0.053		0.3002	2.100	0.008454	66
98/07-98/09	1.106		0.870	**	0.100		-0.004		0.3191	2.129	0.008499	66
98/08-98/10	1.282		0.917	**	0.068		0.034		0.4675	2.124	0.008584	65
98/09-98/11	-0.048		1.019	**	-0.006		-0.031	*	0.9956	2.851	0.000545	65

98/10-98/12	-0.014		1.011	**	0.000		-0.012	#	0.9994	2.582	0.000221	66
98/11-99/01	-0.017		1.019	**	-0.003		-0.022	**	0.9994	2.616	0.000223	65
98/12-99/02	0.009		1.004	**	-0.002		-0.005		0.9997	1.803	0.000166	64
99/01-99/03	0.010		0.999	**	-0.002		0.000		0.9996	1.969	0.000167	64
99/02-99/04	0.032		1.001	**	0.000		0.000		0.9987	2.181	0.000182	65
99/03-99/05	0.026		1.003	**	0.002		-0.003		0.9990	2.456	0.000158	66
99/04-99/06	0.035		1.001	**	0.002		-0.008		0.9987	2.581	0.000193	65
99/05-99/07	0.048	*	0.996	**	0.004		-0.010	#	0.9991	2.592	0.000179	65
99/06-99/08	0.065	**	0.991	**	0.007	*	-0.007		0.9992	2.621	0.000180	66
99/07-99/09	0.075	**	0.990	**	0.003		0.005		0.9993	2.569	0.000194	66
99/08-99/10	0.066	**	0.989	**	0.000		0.013	*	0.9995	2.428	0.000177	65
99/09-99/11	0.051	*	0.994	**	-0.002		0.008		0.9995	2.297	0.000168	65
99/10-99/12	0.037	**	0.999	**	0.000		0.002		0.9998	2.213	0.000092	66

Note: Double asterisks (**), a single asterisk (*) and a pound (#) indicate that the estimated coefficients are statistically significant at the 1%, 5%, and 10% levels, respectively.

(k) Cambodia Riel

Period	Const	USD	JY	EURO	R2-adj	D.W.	Std-res	No. obs.
90/01-90/03	6.400	1.473	-0.467	-0.918	-0.0269	2.019	0.048691	64
90/02-90/04	6.846	1.439	-0.362	-1.023	-0.0370	2.024	0.049017	63
90/03-90/05	-0.032	0.177	0.093	0.702 **	0.4319	2.297	0.005925	66
90/04-90/06	0.465	0.397 *	0.145	0.354 *	0.5429	1.948	0.004787	65
90/05-90/07	0.582	0.310	0.137	0.458 *	0.4248	2.181	0.006240	66
90/06-90/08	16.565	-1.807	-3.217	4.012	0.0387	1.878	0.091920	66
90/07-90/09	13.054	-0.704	-2.172	1.855	0.0028	1.912	0.094403	65
90/08-90/10	11.019	-1.266	-1.887	2.399	0.0044	1.912	0.093830	66
90/09-90/11	0.560	-0.116	0.067	0.764 **	0.2620	2.254	0.008850	65
90/10-90/12	0.334	0.084	0.239	0.486 *	0.2547	2.342	0.008366	66
90/11-91/01	-0.043	0.390 **	0.235 *	-0.294	0.1591	2.264	0.006538	66
90/12-91/02	-0.322	0.449 **	0.189	-0.338 #	0.2184	2.376	0.006346	64
91/01-91/03	-0.768	0.493 **	0.055	-0.276 *	0.2268	2.396	0.005988	64
91/02-91/04	-2.067 *	0.451 **	-0.247	-0.159	0.1408	2.421	0.007062	63
91/03-91/05	-1.303	0.236	-0.148	-0.085	-0.0106	2.343	0.008803	66
91/04-91/06	3.405	0.528	0.005	-0.145	-0.0295	2.018	0.034526	65
91/05-91/07	9.347	-0.142	1.565	0.799	0.0174	1.937	0.048225	66
91/06-91/08	8.879	0.118	1.729	0.002	0.0237	1.941	0.048630	65
91/07-91/09	4.761	-0.625	2.432 #	-0.218	0.0457	1.907	0.035808	66
91/08-91/10	0.118	0.332	0.082	-0.218	0.0642	1.969	0.008084	66
91/09-91/11	4.010	0.561	0.123	-0.638	-0.0273	2.056	0.028261	65
91/10-91/12	-0.690	0.541	0.535	-0.671	-0.0280	2.026	0.043116	66
91/11-92/01	-0.314	0.179	0.482	-0.268	-0.0378	2.042	0.043544	66
91/12-92/02	-5.224	-0.091	0.515	-0.071	-0.0420	2.101	0.033871	65
92/01-92/03	-2.638	-0.027	-0.055	0.205	-0.0413	2.069	0.012905	65
92/02-92/04	-1.790	0.030	0.024	0.157	-0.0440	1.966	0.012359	64
92/03-92/05	-0.728	0.245	-0.037	0.666 #	0.0908	2.000	0.010843	65
92/04-92/06	3.900	0.705	-1.221	1.559 #	0.0490	1.990	0.025871	65
92/05-92/07	4.692	0.604	-1.221	1.365	0.0290	2.058	0.026065	66
92/06-92/08	4.934	0.827	-1.494 #	1.280	0.0296	1.069	0.025594	66
92/07-92/09	9.760	-0.253	0.879	-0.417	-0.0424	2.011	0.077183	66
92/08-92/10	14.276	0.513	0.584	-0.845	-0.0333	2.073	0.085540	65
92/09-92/11	14.086	0.673	0.552	-0.823	-0.0292	2.085	0.085658	65
92/10-92/12	4.908	1.113	-0.077	-0.766	0.0059	2.116	0.037428	66
92/11-93/01	-0.304	-0.251	0.708 *	0.336 #	0.1995	1.822	0.008617	65
92/12-93/02	0.243	0.195	0.261	0.524 *	0.1972	2.208	0.010862	64
93/01-93/03	14.076	-0.945	2.911	1.994	0.0240	2.070	0.081114	64
93/02-93/04	11.303	-0.961	2.386	2.364	0.0101	2.010	0.081213	65
93/03-93/05	10.141	-1.036	2.562	2.310	0.0079	2.014	0.080338	66
93/04-93/06	-1.608	0.219	-0.104	0.421	0.0332	2.129	0.009855	65
93/05-93/07	-0.775	0.219	0.014	0.329	0.0657	1.990	0.008665	65
93/06-93/08	-0.526	-0.231	-0.115	0.620 **	0.1055	1.479	0.009534	66
93/07-93/09	1.089	-0.190	-0.086	0.428 *	0.0836	1.468	0.008365	66
93/08-93/10	0.338	-0.008	-0.146	0.628 **	0.1175	1.477	0.008805	65
93/09-93/11	-0.839	0.272	0.031	0.220	0.0985	1.925	0.006665	65
93/10-93/12	-0.605	0.388	0.046	0.191	0.1798	1.934	0.006649	66
93/11-94/01	0.162	0.438 *	0.103	-0.152	0.1828	2.138	0.005266	66
93/12-94/02	0.474	0.563 **	0.151	-0.248	0.2272	1.956	0.006148	64
94/01-94/03	0.457	0.631 **	0.176 #	-0.255 #	0.2946	1.923	0.005291	64
94/02-94/04	0.173	0.660 **	0.114	-0.133	0.2656	1.941	0.005895	64
94/03-94/05	0.116	0.612 **	-0.053	0.016	0.3615	2.033	0.004480	66

94/04-94/06	0.269	0.749	**	0.058		-0.010		0.4831	2.160	0.004546	65
94/05-94/07	0.157	0.677	**	0.074		-0.046		0.4301	2.256	0.005564	65
94/06-94/08	0.468	0.697	**	0.019		-0.121		0.4174	2.395	0.005663	66
94/07-94/09	-4.351	1.380		-0.668		-0.375		-0.0106	1.022	0.038030	66
94/08-94/10	-4.341	1.405		-0.727		-0.489		-0.0171	2.016	0.038018	66
94/09-94/11	-4.917	1.580		-1.264		-0.132		-0.0156	2.028	0.038319	65
94/10-94/12	-0.126	0.458	*	0.196		-0.197		0.1370	2.353	0.005968	65
94/11-95/01	0.023	0.548	**	0.344	#	-0.205		0.3012	2.373	0.005363	66
94/12-95/02	0.309	0.617	**	0.176		-0.333	#	0.2004	2.452	0.004959	64
95/01-95/03	0.579	1.123	**	0.122		-0.610	**	0.5842	2.280	0.007286	65
95/02-95/04	-1.874	0.806	#	0.602	#	-0.192		0.1632	2.246	0.023387	63
95/03-95/05	-0.903	1.099	**	0.448		-0.626		0.1659	2.202	0.026485	66
95/04-95/06	-1.916	0.894	*	0.653		-0.593		0.0794	2.249	0.026267	65
95/05-95/07	1.065	1.360	**	-0.696	#	-0.776	*	0.2882	1.998	0.013197	66
95/06-95/08	-0.414	0.579	**	-0.001		0.143		0.5180	2.226	0.004512	66
95/07-95/09	-0.188	0.670	**	0.056		0.216	*	0.8094	2.014	0.003390	65
95/08-95/10	-0.150	0.705	**	0.025		0.133		0.7929	1.939	0.003604	66
95/09-95/11	0.460	0.807	**	-0.024		-0.065		0.7680	1.739	0.003180	65
95/10-95/12	-0.077	0.618	**	0.151		-0.014		0.3923	1.809	0.004539	65
95/11-96/01	-0.451	0.612	**	0.227	#	-0.112		0.2981	1.814	0.005072	66
95/12-96/02	-0.396	0.583	**	0.311	*	-0.213		0.3247	1.868	0.005092	65
96/01-96/03	-0.136	0.801	**	-0.052		-0.162		0.3259	1.949	0.004465	65
96/02-96/04	-0.037	0.651	**	-0.032		0.004		0.3137	2.029	0.004221	64
96/03-96/05	-0.377	0.399	#	0.067		0.240		0.2004	1.722	0.004818	66
96/04-96/06	-0.289	0.199		0.181		0.357	#	0.2620	2.224	0.004452	65
96/05-96/07	0.256	0.431	*	0.069		0.334		0.4296	1.887	0.004318	66
96/06-96/08	0.196	0.829	**	-0.089		0.004		0.6959	2.344	0.002925	65
96/07-96/09	-0.027	0.869	**	-0.053		-0.045		0.7406	2.173	0.002847	66
96/08-96/10	-0.378	0.869	**	0.017		-0.067		0.6028	2.420	0.003218	66
96/09-96/11	-0.204	0.716	**	-0.046		0.165		0.4323	2.393	0.004829	65
96/10-96/12	-0.024	0.438		-0.264		0.795	**	0.4086	2.407	0.006316	66
96/11-97/01	-0.512	0.357		-0.239		0.870	**	0.3486	1.903	0.007604	66
96/12-97/02	-1.079	0.395	#	-0.261		0.761	**	0.3542	1.920	0.007238	65
97/01-97/03	-0.320	0.556	**	-0.007		0.342		0.3696	1.807	0.006063	64
97/02-97/04	-0.165	0.783	**	0.012		0.114		0.6471	2.220	0.003876	63
97/03-97/05	3.526	1.977	**	0.257		-2.051	*	0.1257	2.013	0.021707	65
97/04-97/06	3.891	2.769	**	0.053		-2.808	*	0.1273	2.078	0.031061	65
97/05-97/07	4.998	2.710	**	-0.061		-2.623	*	0.1149	2.060	0.031047	66
97/06-97/08	2.041	1.827	**	-0.189		-0.706		0.0651	1.680	0.028525	65
97/07-97/09	1.992	0.903	*	0.306		-0.201		0.0817	1.953	0.018592	66
97/08-97/10	1.213	1.467	#	0.816		-2.176	*	0.1050	2.164	0.036906	66
97/09-97/11	0.725	1.569	#	0.868		-2.286	*	0.1182	2.239	0.033992	65
97/10-97/12	0.410	2.097	*	0.797		-2.921	**	0.1575	2.213	0.032325	66
97/11-98/01	0.789	0.934	**	0.102		0.150		0.2802	2.210	0.010293	65
97/12-98/02	0.871	1.302	**	-0.027		-0.569		0.1533	2.650	0.014947	65
98/01-98/03	0.627	1.238	**	-0.052		-0.565		0.1450	2.668	0.014721	64
98/02-98/04	-0.142	1.500	**	-0.115		-1.057	#	0.2015	2.683	0.012089	64
98/03-98/05	1.695 *	0.852	**	0.075		-0.041		0.4059	1.611	0.005521	65
98/04-98/06	1.506 *	0.861	**	0.096		-0.340		0.2242	2.052	0.005895	65
98/05-98/07	0.904	1.152	*	0.177		-0.071		0.0616	2.149	0.015794	66
98/06-98/08	-1.448	1.414	*	0.110		0.076		0.1174	2.030	0.021267	66
98/07-98/09	-1.320	1.386	**	-0.102		0.250		0.1246	2.094	0.021505	66
98/08-98/10	-0.243	1.070	**	-0.055		-0.247		0.1513	1.303	0.017089	65
98/09-98/11	0.126	0.905	**	-0.064		-0.454	*	0.3991	2.788	0.007528	65

98/10-98/12	0.125	1.016	**	-0.017	-0.456	*	0.4573	2.568	0.007439	66
98/11-99/01	-0.489	1.228	**	-0.080	-0.301		0.6738	2.249	0.006259	65
98/12-99/02	0.197	1.309	**	-0.055	-0.408	#	0.7051	2.470	0.005848	64
99/01-99/03	0.200	1.370	**	-0.078	-0.471	**	0.7506	2.398	0.004803	64
99/02-99/04	0.302	1.236	**	-0.061	-0.445	**	0.6717	2.715	0.003576	65
99/03-99/05	0.209	1.180	**	-0.056	-0.422	**	0.7700	2.450	0.002714	66
99/04-99/06	-0.104	0.897	**	-0.003	-0.360	**	0.6812	2.821	0.002952	65
99/05-99/07	0.100	0.917	**	0.000	-0.690	**	0.6492	2.626	0.003930	65
99/06-99/08	0.094	1.030	**	-0.049	-0.733	**	0.6703	2.441	0.004192	66
99/07-99/09	-0.101	1.173	**	-0.110	-0.436	**	0.6594	2.493	0.004880	66
99/08-99/10	-0.167	1.183	**	-0.138	* -0.216		0.7839	1.991	0.004047	65
99/09-99/11	-0.580	1.143	**	-0.204	* -0.149		0.5148	2.468	0.006637	65
99/10-99/12	-0.712	1.086	**	-0.298	* -0.155		0.4043	2.369	0.006607	66

Note: Double asterisks (**), a single asterisk (*) and a pound (#) indicate that the estimated coefficients are statistically significant at the 1%, 5%, and 10% levels, respectively.

(1) Laos Kip

Period	Const	USD	JY	EURO	R2-adj	D.W.	Std-res	No. obs.
90/01-90/03	2.573	0.967	0.191	-0.068	0.0470	2.074	0.027622	64
90/02-90/04	0.130	0.060	0.099	0.644 **	0.3060	2.393	0.006228	63
90/03-90/05	-0.083	0.130	0.119	0.814 **	0.4475	2.251	0.006299	66
90/04-90/06	0.473	0.313	0.145	0.467 **	0.5142	1.942	0.005141	65
90/05-90/07	0.643	0.260	0.125	0.601 *	0.4110	2.124	0.006866	66
90/06-90/08	0.688	0.309	0.199	0.222	0.3246	2.098	0.007137	66
90/07-90/09	0.876	0.233	0.019	0.313	0.1487	2.464	0.008859	65
90/08-90/10	0.718	0.004	0.019	0.622 **	0.2593	2.678	0.009007	66
90/09-90/11	0.281	-0.160	-0.006	0.849 **	0.2898	2.285	0.008475	65
90/10-90/12	-0.109	0.095	0.134	0.605 **	0.3241	2.463	0.007531	66
90/11-91/01	-0.241	0.371 **	0.208 #	-0.148	0.1654	2.225	0.006176	66
90/12-91/02	-0.282	0.415 **	0.140	-0.219	0.1761	2.270	0.006401	64
91/01-91/03	-0.455	0.466 **	0.080	-0.264 #	0.1826	2.271	0.006461	64
91/02-91/04	-2.098 *	0.457 **	-0.282 #	-0.142	0.1485	2.431	0.006920	63
91/03-91/05	-1.297	0.237	-0.146	-0.085	-0.0103	2.345	0.008796	66
91/04-91/06	-1.279	0.177	-0.210	0.016	-0.0305	2.203	0.009249	65
91/05-91/07	-0.262	-0.236	0.198	0.390	-0.0055	2.086	0.008104	66
91/06-91/08	-0.641	0.194	-0.012	-0.164	-0.0168	1.828	0.009092	65
91/07-91/09	0.702	0.096	0.321	-0.284	0.0489	2.042	0.008225	66
91/08-91/10	0.118	0.332	0.082	-0.218	0.0642	1.969	0.008084	66
91/09-91/11	0.653	0.608 **	0.082	-0.547 **	0.2538	2.102	0.006365	65
91/10-91/12	0.803	0.280	0.011	-0.243	0.0060	2.050	0.007666	66
91/11-92/01	0.657	0.217	-0.132	-0.063	-0.0216	2.086	0.008966	66
91/12-92/02	-1.050	0.112	-0.233	0.126	-0.0326	2.031	0.010048	65
92/01-92/03	-1.399	0.108	-0.180	0.021	-0.0414	2.051	0.009379	65
92/02-92/04	-0.549	0.271	-0.149	-0.184	-0.0273	1.794	0.008347	64
92/03-92/05	0.383	0.346 *	-0.039	0.341	0.2162	2.176	0.006217	65
92/04-92/06	0.665	0.438 **	0.203	0.264	0.3798	2.301	0.006172	65
92/05-92/07	1.390	0.224	0.299	0.222	0.2433	2.275	0.007345	66
92/06-92/08	1.332	0.460 *	0.082	-0.048	0.2309	2.055	0.006813	66
92/07-92/09	0.339	-0.003	0.515	0.447	0.1478	2.535	0.014693	66
92/08-92/10	-0.447	0.437	0.096	0.400	0.1800	2.412	0.015715	65
92/09-92/11	-1.285	0.212	0.294	0.416 #	0.1605	2.448	0.015716	65
92/10-92/12	-0.565	0.669 *	-0.182	0.087	0.2494	2.051	0.009881	66
92/11-93/01	-0.193	-0.244	0.716 *	0.304	0.1908	1.834	0.008716	65
92/12-93/02	0.128	0.352	0.055	0.605 *	0.2039	2.119	0.011729	64
93/01-93/03	-0.211	0.289	0.051	0.897 **	0.2233	1.950	0.011722	64
93/02-93/04	-0.498	0.652 *	0.011	0.563	0.2284	1.612	0.012067	65
93/03-93/05	0.242	0.400 #	0.176	0.377	0.1729	1.900	0.009891	66
93/04-93/06	0.016	0.323	0.065	0.178	0.0796	2.161	0.009699	65
93/05-93/07	-0.775	0.219	0.014	0.328	0.0656	1.989	0.008667	65
93/06-93/08	-0.847	-0.204	-0.086	0.472 *	0.0577	1.474	0.009145	66
93/07-93/09	1.139	-0.178	-0.060	0.313 *	0.0450	1.326	0.007801	66
93/08-93/10	0.300	-0.001	-0.103	0.480 *	0.0637	1.406	0.008382	65
93/09-93/11	-0.407	0.271	0.026	0.245	0.1029	2.074	0.006690	65
93/10-93/12	-0.604	0.389	0.047	0.188	0.1800	1.933	0.006648	66
93/11-94/01	0.162	0.438 *	0.103	-0.152	0.1830	2.138	0.005264	66
93/12-94/02	0.474	0.563 **	0.151	-0.248	0.2271	1.957	0.006147	64
94/01-94/03	0.456	0.631 **	0.176 #	-0.255 #	0.2945	1.923	0.005292	64
94/02-94/04	0.173	0.660 **	0.114	-0.134	0.2656	1.941	0.005895	64
94/03-94/05	0.116	0.611 **	-0.053	0.016	0.3619	2.033	0.004475	66

94/04-94/06	0.269	0.748	**	0.058		-0.010		0.4836	2.161	0.004541	65
94/05-94/07	0.157	0.677	**	0.074		-0.046		0.4305	2.257	0.005559	65
94/06-94/08	0.468	0.697	**	0.019		-0.121		0.4174	2.395	0.005663	66
94/07-94/09	0.198	0.575	**	0.032		-0.074		0.3480	2.362	0.005508	66
94/08-94/10	0.743	0.440	**	0.071		-0.167		0.1703	2.424	0.005020	66
94/09-94/11	0.033	0.336	#	0.364		-0.034		0.1908	2.363	0.006292	65
94/10-94/12	-0.149	0.474	*	0.202		-0.208		0.1264	2.335	0.006370	65
94/11-95/01	-0.021	0.582	**	0.340		-0.231		0.2798	2.335	0.005758	66
94/12-95/02	0.246	0.647	**	0.152		-0.344	#	0.1996	2.458	0.005063	64
95/01-95/03	0.551	1.129	**	0.119		-0.614	**	0.5842	2.284	0.007310	65
95/02-95/04	0.417	1.003	**	0.110		-0.422	**	0.5662	2.212	0.007945	63
95/03-95/05	0.642	1.046	**	0.051		-0.496	**	0.6296	2.252	0.008337	66
95/04-95/06	-0.280	0.803	**	-0.169		-0.143		0.5123	2.280	0.006701	65
95/05-95/07	0.265	0.955	**	-0.430	**	-0.271	*	0.5911	2.389	0.005577	66
95/06-95/08	2.148	0.768		0.638		0.444		0.0431	2.092	0.029083	66
95/07-95/09	2.280	0.723		0.478		0.603		0.0701	2.069	0.029094	65
95/08-95/10	2.300	0.842		0.425		0.258		0.0630	2.066	0.029011	66
95/09-95/11	0.460	0.807	**	-0.024		-0.065		0.7679	1.739	0.003180	65
95/10-95/12	-0.077	0.618	**	0.151		-0.014		0.3922	1.809	0.004539	65
95/11-96/01	-0.451	0.612	**	0.227	#	-0.112		0.2981	1.814	0.005072	66
95/12-96/02	-0.396	0.583	**	0.311	*	-0.213		0.3247	1.868	0.005092	65
96/01-96/03	-0.136	0.801	**	-0.052		-0.162		0.3260	1.949	0.004465	65
96/02-96/04	-0.037	0.651	**	-0.032		0.004		0.3138	2.029	0.004221	64
96/03-96/05	-0.377	0.399	#	0.067		0.240		0.2004	1.722	0.004818	66
96/04-96/06	-0.289	0.199		0.181		0.357	#	0.2620	2.224	0.004452	65
96/05-96/07	0.256	0.431	*	0.069		0.334		0.4296	1.888	0.004318	66
96/06-96/08	0.195	0.830	**	-0.089		0.004		0.6960	2.344	0.002925	65
96/07-96/09	-0.027	0.868	**	-0.053		-0.045		0.7406	2.173	0.002846	66
96/08-96/10	-0.378	0.869	**	0.017		-0.067		0.6027	2.420	0.003218	66
96/09-96/11	-0.204	0.716	**	-0.046		0.165		0.4323	2.393	0.004829	65
96/10-96/12	-0.024	0.438		-0.264		0.795	**	0.4085	2.407	0.006316	66
96/11-97/01	-0.512	0.357		-0.239		0.870	**	0.3486	1.903	0.007604	66
96/12-97/02	-1.079	0.395	#	-0.261		0.761	**	0.3542	1.920	0.007238	65
97/01-97/03	0.476	0.647	*	0.036		0.108		0.2092	1.817	0.008237	64
97/02-97/04	0.608	0.864	**	0.031		-0.097		0.3468	2.017	0.006756	63
97/03-97/05	1.013	1.114	**	0.199		-0.600	**	0.5130	2.147	0.006204	65
97/04-97/06	0.191	1.018	**	0.089		-0.345	**	0.7624	2.698	0.003584	65
97/05-97/07	0.194	1.023	**	0.059		-0.328	*	0.6894	2.670	0.004132	66
97/06-97/08	-0.019	0.920	**	0.032		-0.147		0.7212	2.759	0.003268	65
97/07-97/09	0.854	0.860	**	0.125		-0.140		0.3137	2.114	0.008009	66
97/08-97/10	3.027	0.975	**	-0.302		0.203		0.1100	2.093	0.015274	66
97/09-97/11	3.085	1.299	**	-0.503	#	0.202		0.1360	2.068	0.015348	65
97/10-97/12	2.305	1.364	**	-0.573	*	0.327		0.2126	1.983	0.013550	66
97/11-98/01	2.387	1.124		0.363		-2.201	*	0.0319	2.685	0.030220	65
97/12-98/02	8.465	-0.742		0.668		0.324		-0.0413	2.176	0.061547	65
98/01-98/03	8.251	-0.761		0.609		0.830		-0.0435	2.163	0.062071	64
98/02-98/04	8.320	-1.995		0.153		4.353	#	0.0085	1.899	0.052722	64
98/03-98/05	-0.226	1.040	**	0.056		-0.302	*	0.8169	2.837	0.002360	65
98/04-98/06	4.284	-0.813		-0.349		1.692		-0.0158	2.062	0.028509	65
98/05-98/07	4.422	-0.110		-0.263		0.948		-0.0340	2.091	0.029062	66
98/06-98/08	4.185	0.066		-0.198		0.895		-0.0296	2.065	0.029143	66
98/07-98/09	5.586	1.381	#	-1.051	**	-0.810		0.0977	2.134	0.033244	66
98/08-98/10	4.605	1.116		-0.614	#	-1.105		0.0532	2.070	0.035208	65
98/09-98/11	5.333	1.100		-0.558	#	-1.379		0.0541	2.087	0.036350	65

98/10-98/12	3.457	#	1.377	**	0.135		-1.032	*	0.2104	2.153	0.015567	66
98/11-99/01	2.172		1.439	**	0.077		-0.735	#	0.3649	2.197	0.012433	65
98/12-99/02	1.302		1.426	**	-0.078		-0.564	#	0.5074	2.317	0.008863	64
99/01-99/03	0.739		1.322	**	-0.111	*	-0.451	**	0.8169	2.693	0.003773	64
99/02-99/04	0.473		1.211	**	-0.073		-0.420	**	0.6326	2.694	0.003829	65
99/03-99/05	0.396		1.195	**	-0.077		-0.406	**	0.7383	2.512	0.002974	66
99/04-99/06	-0.103		0.903	**	-0.012		-0.360	**	0.6981	2.872	0.002841	65
99/05-99/07	9.450		0.589		-0.584		-3.383		-0.0057	1.980	0.072828	65
99/06-99/08	8.161		0.826		-0.375		-2.853		-0.0165	1.985	0.072760	66
99/07-99/09	8.419		1.124		-0.354		-1.910		-0.0324	2.000	0.073362	66
99/08-99/10	2.361		1.800	**	-0.500	#	-0.371		0.2556	1.353	0.017264	65
99/09-99/11	-2.728		2.516	#	-0.864		-1.503		0.0154	1.954	0.048396	65
99/10-99/12	-2.439		3.865	*	-1.683		-4.680	#	0.0347	1.810	0.065911	66

Note: Double asterisks (**), a single asterisk (*) and a pound (#) indicate that the estimated coefficients are statistically significant at the 1%, 5%, and 10% levels, respectively

Table 6
Shares of the United States, the European Union, Japan, and East Asia
in the Total International Transactions of the Individual East Asian Economies, 1996

(Percentage)

	Exports					Imports				
	United States	European Union	Japan	East Asia	Total	United States	European Union	Japan	East Asia	Total
Singapore	18.4	13.0	8.2	46.8	100.0	16.4	14.5	18.2	37.9	100.0
Hong Kong SAR	21.3	14.9	6.6	45.1	100.0	7.9	11.1	13.6	60.4	100.0
Taiwan POC	26.8	13.6	12.9	45.0	100.0	18.2	15.3	25.7	23.0	100.0
Korea	16.7	10.8	12.3	35.9	100.0	22.1	14.1	20.9	15.9	100.0
Malaysia	18.2	13.7	13.4	43.2	100.0	15.6	14.5	24.7	32.6	100.0
Thailand	18.0	16.0	16.8	32.7	100.0	12.6	14.5	27.8	24.3	100.0
Philippines	33.9	15.9	17.9	25.3	100.0	19.7	9.4	21.8	28.3	100.0
Indonesia	16.4	16.6	28.5	29.7	100.0	10.2	22.2	23.2	29.4	100.0
China	17.7	13.1	20.4	35.0	100.0	11.7	14.3	21.0	34.0	100.0
Vietnam	4.5	24.3	26.4	24.1	100.0	5.0	13.0	9.2	57.1	100.0
East Asia	19.8	13.7	13.5	40.0	100.0	14.3	14.0	20.3	35.1	100.0

	Foreign Direct Investment Inflows					Outstanding Loans from BIS-Reporting Banks (Year End)				
	United States	European Union	Japan	East Asia	Total	United States	European Union	Japan	East Asia	Total
Singapore	39.6	23.1	34.3	n.a.	100.0	3.0	54.3	31.1	n.a.	100.0
Hong Kong SAR	9.8	18.1	45.4	22.7	100.0	4.2	41.6	42.2	n.a.	100.0
Taiwan POC	19.3	5.0	22.2	18.6	100.0	12.4	56.6	12.0	n.a.	100.0
Korea	27.4	27.9	7.9	29.9	100.0	9.4	33.8	24.3	n.a.	100.0
Malaysia	17.0	5.1	27.0	36.8	100.0	10.5	41.4	36.9	n.a.	100.0
Thailand	21.1	16.3	47.2	44.3	100.0	7.2	27.3	53.5	n.a.	100.0
Philippines	3.4	17.5	6.0	41.0	100.0	29.4	47.6	11.7	n.a.	100.0
Indonesia	2.1	16.8	25.6	30.2	100.0	9.5	37.8	39.7	n.a.	100.0
China	8.3	6.6	8.8	68.7	100.0	4.9	47.4	32.3	n.a.	100.0
Vietnam	8.1	16.8	17.3	35.3	100.0	12.0	62.7	16.3	n.a.	100.0
East Asia	10.7	12.1	21.2	46.7	100.0	6.2	43.2	35.4	n.a.	100.0

Source: International Monetary Fund, Direction of Trade Yearbook 1997.
Japan External Trade Organization, Jetro White Papers on Foreign Direct Investment (1998).
Bank for International Settlement, The Maturity, Sectoral and Nationality Distribution of International Bank Lending. First Half 1997 (Basle, January, 1998).

Table 7 Currency Composition of Long-term External Debt, Selected East Asian Countries

	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988
Korea										
US Dollar	82.1	53.5	60.2	63.7	64.4	66.0	60.3	49.6	32.2	30.1
Japanese Yen	5.1	16.6	14.1	12.3	12.5	12.8	16.7	21.8	27.5	29.9
Deutsche Mark	7.2	3.7	2.6	2.2	1.8	1.2	1.6	2.7	3.8	3.3
UK Pound Sterling	1.4	3.3	2.3	1.7	1.5	1.5	1.7	1.5	2.1	2.3
French Franc	2.1	2.4	1.6	1.4	1.6	2.0	2.9	4.1	6.1	7.0
Multiple Currency	1.2	12.9	13.1	13.7	14.7	13.5	14.0	15.9	21.7	21.0
Other Currencies	0.9	7.6	6.1	5.0	3.5	3.0	2.8	4.4	6.6	6.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total PPG (US$ Mn)	1,816	15,933	18,361	20,191	22,176	23,833	28,279	29,351	23,890	20,023
Total L/T (US$ Mn)	1,991	18,236	21,517	23,643	26,951	29,107	34,893	35,920	29,992	25,935
Malaysia										
US Dollar	14.0	36.7	50.9	61.6	64.6	61.3	50.4	44.4	36.2	33.7
Japanese Yen	2.2	19.0	16.3	12.8	13.9	20.6	25.5	29.7	34.8	36.4
Deutsche Mark	6.9	3.3	2.1	2.4	3.2	2.4	6.0	7.0	8.5	9.1
UK Pound Sterling	37.8	3.6	2.2	1.3	1.5	1.0	1.8	1.6	1.8	1.5
French Franc	0.0	13.0	9.6	6.4	3.9	3.6	4.2	3.9	3.7	3.3
Multiple Currency	36.3	21.0	16.4	12.9	10.0	7.5	7.9	8.0	8.6	9.8
Other Currencies	2.8	3.4	2.5	2.6	2.9	3.6	4.2	5.4	6.4	6.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total PPG (US$ Mn)	390	4,008	5,698	8,158	11,462	13,169	14,506	16,277	17,884	14,632
Total L/T (US$ Mn)	440	5,256	7,335	11,357	14,193	15,945	17,466	19,168	20,494	16,972

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Korea										
US Dollar	35.3	33.0	39.3	45.1	45.7	38.5	38.5	47.8	59.9	74.2
Japanese Yen	27.1	31.5	31.4	29.7	32.0	34.1	38.2	32.4	22.9	17.1
Deutsche Mark	3.9	4.7	5.2	5.1	4.2	5.7	5.9	3.3	4.5	2.5
UK Pound Sterling	2.2	0.7	0.4	0.2	0.2	0.2	0.2	0.1	1.8	1.0
French Franc	7.2	8.0	6.4	5.1	4.1	5.0	4.0	3.9	2.3	0.5
Multiple Currency	21.0	18.8	14.8	12.8	12.1	15.0	12.0	8.8	5.4	3.1
Other Currencies	3.3	3.3	2.5	2.0	1.7	1.5	1.2	3.7	3.2	1.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total PPG (US$ Mn)	17,038	18,786	22,481	24,050	24,566	19,253	22,123	25,423	33,852	57,956
Total L/T (US$ Mn)	22,998	24,186	28,533	32,236	35,002	40,802	39,197	49,221	72,128	94,062
Malaysia										
US Dollar	32.6	31.8	29.8	27.7	29.4	35.1	48.5	55.6	55.8	58.7
Japanese Yen	33.9	36.5	36.1	35.4	37.5	37.5	34.6	28.2	26.5	29.6
Deutsche Mark	11.2	5.9	4.6	4.0	3.0	2.2	1.1	0.8	0.5	0.4
UK Pound Sterling	1.4	1.6	2.7	3.0	3.4	2.4	1.0	1.2	1.1	1.0
French Franc	3.1	2.8	1.5	1.0	0.8	0.7	0.6	0.5	0.4	0.4
Multiple Currency	11.2	15.0	20.2	24.9	23.0	18.7	10.7	11.5	15.0	9.7
Other Currencies	6.6	6.4	5.1	4.0	2.9	3.4	3.5	2.2	0.7	0.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total PPG (US$ Mn)	12,628	11,592	12,539	12,370	13,460	14,693	16,023	15,702	16,807	18,158
Total L/T (US$ Mn)	14,005	13,422	15,006	16,379	19,197	24,147	27,068	28,605	32,289	36,117

	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988
Thailand										
US Dollar	21.6	41.0	42.9	39.8	33.8	31.0	24.7	18.3	15.1	18.5
Japanese Yen	6.0	25.3	23.0	23.9	27.2	29.1	36.0	40.7	44.1	43.8
Deutsche Mark	17.6	4.7	4.8	4.1	3.1	2.6	2.5	2.6	2.4	2.9
UK Pound Sterling	2.4	0.2	0.4	0.4	0.5	0.6	0.6	0.5	0.5	0.5
French Franc	0.0	1.8	1.2	0.9	0.6	0.6	0.6	0.8	0.7	0.8
Multiple Currency	50.7	24.3	25.5	28.2	31.5	31.3	29.7	31.1	30.4	25.9
Other Currencies	1.7	2.7	2.2	2.7	3.3	4.8	5.9	6.0	6.8	7.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total PPG (US$ Mn)	324	3,943	5,017	6,034	6,902	7,186	9,854	11,520	13,912	13,285
Total L/T (US$ Mn)	726	5,646	7,116	8,351	9,557	10,558	13,224	14,628	16,749	16,301
Indonesia										
US Dollar	36.1	43.5	44.4	43.6	42.7	41.9	31.2	26.6	19.6	18.5
Japanese Yen	11.5	20.0	19.2	21.2	23.5	25.0	31.8	33.6	39.2	39.9
Deutsche Mark	3.9	7.8	8.8	8.3	7.1	5.9	6.3	7.0	6.4	5.5
UK Pound Sterling	2.2	0.8	0.5	0.6	1.9	2.0	2.1	2.2	1.9	1.9
French Franc	4.5	4.0	3.3	2.7	2.8	2.5	3.5	3.6	3.4	2.9
Multiple Currency	0.0	8.6	10.4	11.9	12.7	13.9	16.7	18.7	21.4	23.8
Other Currencies	41.8	15.3	13.4	11.7	9.3	8.8	8.4	8.3	8.1	7.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total PPG (US$ Mn)	2,487	15,021	15,908	18,317	21,493	22,274	26,784	32,621	40,847	41,183
Total L/T (US$ Mn)	2,948	18,163	19,487	21,517	25,145	26,204	30,620	36,399	45,418	46,728

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Thailand										
US Dollar	21.7	15.8	17.9	21.7	21.6	22.8	27.1	32.4	47.0	49.0
Japanese Yen	41.3	42.9	45.4	47.0	49.9	50.8	47.9	44.7	38.8	40.0
Deutsche Mark	3.1	3.6	3.7	3.8	2.3	2.3	2.4	2.1	1.4	1.3
UK Pound Sterling	0.3	0.4	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1
French Franc	1.0	1.0	1.0	1.3	1.2	1.2	1.2	1.1	0.8	0.6
Multiple Currency	25.0	28.1	24.8	19.7	19.7	18.5	19.2	17.7	10.8	8.0
Other Currencies	7.6	8.2	6.8	6.2	5.1	4.2	2.0	1.9	1.1	1.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total PPG (US$ Mn)	12,512	12,531	13,309	13,363	14,776	16,266	16,880	16,929	22,324	28,113
Total L/T (US$ Mn)	17,152	19,842	25,280	27,138	30,083	36,417	41,998	53,164	56,466	59,410
Indonesia										
US Dollar	24.6	20.9	19.4	19.9	19.9	20.0	21.5	24.3	27.2	47.3
Japanese Yen	34.4	34.6	35.7	36.4	37.6	38.0	35.3	34.5	32.9	32.6
Deutsche Mark	5.2	5.0	4.9	4.7	4.1	4.8	4.9	4.8	4.7	4.3
UK Pound Sterling	1.5	1.4	1.2	1.0	0.9	0.9	0.8	1.2	1.8	1.6
French Franc	2.8	3.4	3.6	3.7	3.3	3.3	3.7	3.7	3.3	2.8
Multiple Currency	24.6	27.3	28.0	27.6	28.0	26.7	27.2	24.7	23.3	5.4
Other Currencies	6.9	7.4	7.2	6.7	6.2	6.3	6.6	6.8	6.8	6.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total PPG (US$ Mn)	44,262	47,982	51,891	53,664	57,156	63,926	65,309	60,016	55,869	66,944
Total L/T (US$ Mn)	50,818	58,242	65,067	69,945	71,185	88,367	98,432	96,710	100,338	121,672

	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988
Philippines										
US Dollar	62.1	51.6	51.1	53.7	51.0	52.3	48.9	48.9	42.8	41.0
Japanese Yen	2.7	21.9	20.6	18.9	19.9	19.9	22.7	24.0	29.7	32.0
Deutsche Mark	12.0	2.0	1.4	1.2	1.0	0.7	0.7	1.0	1.2	1.4
UK Pound Sterling	0.0	0.2	0.2	0.2	0.1	0.3	0.2	0.5	0.7	0.7
French Franc	0.2	2.2	1.5	1.1	0.7	0.7	0.7	1.2	1.3	1.2
Multiple Currency	19.2	19.0	22.7	22.0	24.6	22.5	22.8	19.7	20.0	19.4
Other Currencies	3.8	3.1	2.5	2.9	2.7	3.6	4.0	4.7	4.3	4.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total PPG (US$ Mn)	625	6,363	7,471	8,859	10,571	11,300	13,712	19,263	22,894	22,362
Total L/T (US$ Mn)	1,544	8,817	10,232	12,088	13,696	14,011	16,311	21,557	24,728	23,973
China										
US Dollar	..	..	11.7	12.1	13.6	14.3	23.8	26.6	27.6	31.4
Japanese Yen	..	..	27.6	38.7	47.5	46.4	49.7	51.3	47.7	40.8
Deutsche Mark	..	..	7.2	6.9	6.1	5.2	6.0	4.5	4.5	3.4
UK Pound Sterling	..	..	1.0	1.5	1.3	0.7	0.8	0.4	0.3	0.1
French Franc	..	..	1.9	2.0	1.8	1.6	1.3	1.0	0.6	0.3
Multiple Currency	..	..	44.4	33.6	25.1	26.1	11.4	10.4	14.9	19.2
Other Currencies	..	..	6.2	5.2	4.6	5.7	7.0	5.8	4.4	4.8
Total	..	..	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total PPG (US$ Mn)	..	..	4,913	5,220	5,301	6,179	9,937	16,571	25,963	32,620
Total L/T (US$ Mn)	..	..	4,913	5,220	5,301	6,179	9,937	16,571	25,963	32,620

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Philippines										
US Dollar	40.6	36.2	32.9	33.9	30.4	28.0	27.5	29.8	33.9	33.9
Japanese Yen	30.6	31.0	34.3	34.6	38.2	40.4	39.5	38.1	36.8	38.6
Deutsche Mark	1.6	1.5	1.6	1.5	1.4	1.4	1.5	1.7	1.5	1.4
UK Pound Sterling	0.8	1.0	1.0	0.3	0.3	0.3	0.2	0.2	0.3	0.2
French Franc	1.4	1.5	1.1	0.9	0.8	0.8	0.8	0.9	0.8	0.9
Multiple Currency	20.2	23.6	24.0	24.3	25.2	25.4	26.9	26.0	24.1	22.8
Other Currencies	4.8	5.2	5.1	4.5	3.7	3.7	3.6	3.3	2.6	2.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total PPG (US$ Mn)	22,333	24,040	25,058	25,618	27,482	29,687	28,292	26,868	26,199	28,189
Total L/T (US$ Mn)	23,522	25,241	26,421	26,649	29,691	32,632	31,823	31,770	33,033	39,064
China										
US Dollar	30.4	29.1	36.4	48.3	54.3	53.6	58.1	65.0	74.6	20.4
Japanese Yen	33.2	30.4	28.4	22.6	21.0	23.2	20.7	15.9	11.8	14.8
Deutsche Mark	3.2	3.1	2.7	1.6	1.0	1.7	1.7	1.4	1.2	2.3
UK Pound Sterling	0.3	0.7	0.6	0.4	0.3	0.3	0.2	0.2	0.2	0.1
French Franc	0.2	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2	2.9
Multiple Currency	27.9	31.2	27.0	23.3	20.5	18.7	17.1	15.6	10.8	6.2
Other Currencies	4.8	5.1	4.5	3.4	2.6	2.2	1.9	1.6	1.2	53.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total PPG (US$ Mn)	37,118	45,515	49,479	58,463	70,076	82,391	94,675	102,260	112,821	99,424
Total L/T (US$ Mn)	37,118	45,515	49,479	58,663	70,632	82,974	95,764	103,410	115,233	126,667

East Asia and Pacific	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988
US Dollar	49.0	46.1	47.4	50.0	50.0	49.7	42.6	36.6	28.0	27.6
Japanese Yen	6.7	19.8	18.6	18.5	20.0	21.7	27.2	31.4	36.6	36.9
Deutsche Mark	7.8	5.0	4.8	4.3	3.8	3.1	3.9	4.5	4.8	4.4
UK Pound Sterling	3.9	1.9	1.4	1.2	1.4	1.3	1.5	1.4	1.4	1.3
French Franc	2.2	3.7	2.8	2.3	2.0	2.0	2.5	2.8	2.8	2.6
Multiple Currency	10.9	14.4	17.6	17.2	17.2	16.6	16.5	16.9	19.2	20.2
Other Currencies	19.5	9.0	7.5	6.5	5.5	5.6	5.8	6.5	7.0	7.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total PPG (US$ Mn)	5,806	47,730	60,295	70,231	81,879	88,067	108,163	131,872	152,848	151,974
Total L/T (US$ Mn)	7,986	58,784	73,961	86,381	99,744	107,119	128,520	151,287	171,636	171,354

East Asia and Pacific	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
US Dollar	27.1	24.4	25.9	30.1	32.2	31.6	35.1	40.7	50.1	44.2
Japanese Yen	29.7	30.1	31.2	30.5	31.6	33.2	31.5	28.7	24.9	25.3
Deutsche Mark	4.2	3.8	3.7	3.3	2.6	3.1	3.1	2.6	2.6	2.5
UK Pound Sterling	1.0	1.0	0.9	0.7	0.6	0.6	0.4	0.5	0.9	0.7
French Franc	2.3	2.5	2.2	2.1	1.7	1.9	1.8	1.8	1.5	1.7
Multiple Currency	20.3	22.8	22.0	20.9	20.2	19.7	18.9	17.0	13.9	7.3
Other Currencies	15.4	15.4	14.0	12.5	11.1	9.9	9.1	8.6	6.1	18.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total PPG (US$ Mn)	174,009	191,834	206,432	220,130	240,615	260,665	277,173	280,707	297,958	330,669
Total L/T (US$ Mn)	194,653	218,870	242,503	265,417	290,367	340,876	368,981	397,366	440,705	510,030

Note: (a) The data represent percentage shares of public and publicly guaranteed debt (PPG), which includes both official and private debt, fixed-rate as well as variable-rate debt.

(b) For reference, the total stock of long-term external debt (Total PPG) is also shown below the total stock of public and publicly guaranteed debt (Total L/T).

(c) East Asia and Pacific includes Cambodia, China, Fiji, Indonesia, Korea, Lao, Malaysia, Mongolia, Myanmar, Papua New Guinea, Philippines, Solomon Islands, Thailand, Tonga, Vanuatu, Vietnam, and Samoa.

Source: International Bank for Reconstruction and Development, World Development Indicators and Global Development Finance 2000.

Trade Regimes, Taxes and Finance

Modern Trade Policies for the Global Economy*

Frank Flatters**

I. INTRODUCTION

The almost unprecedented period of globalization that marked the latter part of the twentieth century was characterized by, among other things:

- Vast increases in the level and in the volatility of flows of international financial capital, spurred by improvements in communication, liberalization of trade in financial services, elimination of many domestic regulatory restrictions on international capital movements, and the development of new financial instruments.

- Major increases in the international division of labour in global manufacturing production, arising from and reinforcing the international spread of knowledge, and facilitated by improvements in communication, reduced transport costs, and liberalization of trade and investment.

---

*Paper prepared for CIDA-funded MIER/Queen's University conference on *Globalization and the Knowledge Economy*, Kuala Lumpur, Malaysia, January 30-31, 2001.

**Professor of Economics, Queen's University, Kingston, Ontario, Canada
< ff@thai.com >.

This paper focuses primarily on the second set of phenomena, related to the spread of the international division of labour through trade and investment. Our particular interest is how these phenomena relate to domestic policies and international regimes for the regulation and taxation of international trade. The central question of the paper is what, if any, are the implications of recent trends in globalization for domestic trade policies and the international trade policy regime. The question is asked in both the positive and the normative sense. The positive question refers to the actual and likely future evolution of policies during the recent phase of globalization, and the normative one to the policy adjustments that might be called for as a result of globalization.

As a prelude to dealing with these questions, we briefly review international experiences of globalization, with special reference to how they relate to policy regimes.

II. GLOBALIZATION: WINNERS, LOSERS AND POLICY IMPLICATIONS

Not all countries have fared equally well during the period of globalization in the last several decades of the twentieth century. Nor have all groups of people in any given country shared the same experiences arising from globalization. It is on these differences, both within and between countries, that a great deal of attention has focused in anti-globalization protests that now seem to be a fixture at all major international meetings, such as the December 1999 WTO ministerial meetings in Seattle and the IMF/World Bank meetings in Prague last year.

The Asian Financial Crisis

The Asian financial crisis was an important element in catalyzing political and, to a certain extent, intellectual opposition to globalization. The speed with which reversals of short term capital flows to Thailand, South Korea and Indonesia (and to a much lesser extent Malaysia and the Philippines) and ensuing contagion effects triggered the loss of several years of economic growth in these countries showed the vulnerability of the global financial system to reversals of investors' sentiments.

This was primarily a financial crisis and had little, if anything to do with trade and tax policies. It revealed critical weaknesses both in the international financial architecture and in domestic policies, regulatory frameworks and institutions in the directly affected countries. Weaknesses included:

- inappropriate monetary, fiscal and exchange rate policies (especially in Thailand in the period leading up to the crisis),

- premature liberalization and encouragement of short term capital inflows in the absence of adequate prudential rules and means of enforcement in the financial sector, and

- weak bankruptcy and foreclosure laws, corporate governance practices, accounting standards, and risk management practices.

There are few, if any, direct lessons from this financial crisis for trade policies. However, the general conclusion, that domestic policies and institutions interact with international regimes to determine the effects of globalization on the domestic economy, certainly carries over to the case of trade policies. Whether countries benefit or suffer as a result of globalization depends crucially on their domestic policy environments. Globalization imposes stern disciplines on domestic policies and capabilities. Both the costs and the benefits of domestic policy decisions with respect to opportunities for economic development and income growth are magnified by recent globalization trends.

Liberalization and Expansion of World Trade

The freeing of international trade through reductions in tariff and non-tariff restrictions on trade over the past three decades has resulted in very rapid increases in trade in goods and services and in flows of international direct investment. Successive rounds of multilateral GATT tariff reduction programs and the more recent formation of the WTO, enshrining and establishing rules and institutions for the preservation of free trade, have played a major role in the freeing and rapid growth of international trade.

Despite the long-standing presumption and well-developed economic arguments about the gains from international trade, opponents of globalization have argued that the gains from the recent expansion of world trade have been very unevenly distributed. Among the most important criticisms have been that:

- Free trade has increased inequality in rich countries, with poorer workers suffering from falling wages and rising unemployment as a result of increased competition from developing countries.

- Free trade has resulted in a "race to the bottom" as social and environmental policies in richer and more socially enlightened countries have been degraded due to the need to compete with poorer and less enlightened countries. Poorer countries sometimes argue, on the other hand, that freeing of trade has led to accelerated environmental destruction in their own countries as resources are exploited at an increased rate to feed rich country export markets, and as environmentally-unfriendly activities (dirty manufacturing industries and

waste disposal) are moved to poorer countries with greater tolerance for pollution and lesser capabilities of enforcing environmental laws. International trading of carbon emission permits is a prime example.

- Free trade has benefited only a small subgroup of countries, to the detriment especially of poorer countries that have been left behind by and stagnated under the forces of globalization.

The question of trends in and causes of inequality, poverty and unemployment in rich countries is complex. However, reductions in trade barriers have not been a major source of any worrisome trends in these variables; nor are increases in protection a viable long-term solution to such problems. Long run changes in income distribution in rich countries are due to much more fundamental causes such as changes in technology and investment in human resources.

Some proponents of trade liberalization, for instance in debates over North American Free Trade, have tended to oversell free trade as a source of new jobs. A more accurate statement of the case for free trade in such contexts is that it will provide opportunities for better jobs, but not necessarily more jobs. But productivity improvements such as those being witnessed with the growth of the "new economy" create employment and income opportunities for those with appropriate skills. Long-run changes in income distribution are driven by productivity growth and by investments in human skills as well as physical capital. The role of trade policy is a supportive one – to be part of a policy environment that promotes and rewards competition and innovation, the underlying sources of long term growth of opportunities and incomes.

The development of the new economy and its implications for long term growth and distribution of incomes is dealt with in much more detail in presentations by Rick Harris at this and a previous conference (Harris, 2000, 2001). Similarly, issues related to the effects of globalization on the environment are discussed in Olewiler (2001). The latter shows, in particular, that there is little evidence to support the contention that globalization harms the environment.

The remainder of this section, therefore, focuses on the role of globalization of international trade and investment in shaping global inequality among nations.

Doubts about the beneficial effects of globalization of world trade and investment have been fostered by the observation of wide inter-country disparities in economic performance over the final decades of the twentieth century. Most discouraging has been the fact that while many of the world's richest countries appear to have benefited from globalization through continuing high growth, many of the poorest countries have languished in slow growth. The growth of world trade and investment, it is concluded, has been of benefit primarily to rich

countries and has not brought the hoped-for acceleration of growth of poor countries and the resulting convergence of world per capita incomes.

Sachs and Warner (1995) examined this hypothesis in a simple but highly instructive review of international data on per capita income levels, growth rates and indicators of openness of trade policy regimes. Overall data on income levels and growth rates seems to show no relationship between initial income levels and growth rates over the latter part of the twentieth century. That is, there appears to have been no systematic convergence or divergence of incomes between rich and poor countries over this period of rapid trade and investment growth, thus giving some confirmation to the globalization sceptics.

However, when countries were divided into those that had relatively open trade policy regimes over the study period, and those with less open trade policy regimes, two important conclusions emerged. First, countries with open trade policy regimes enjoyed uniformly higher growth than those with inward-oriented, or closed trade policies. Second, within the group of countries with open trade policies, there was significant convergence of per capita income levels. That is, among the set of countries with open trade policy regimes, not only were growth rates higher than in countries with closed trade policies, but those with lowest initial levels of per capita income tended to have the highest growth rates of all.

For a variety of reasons, the Sachs and Warner findings are far from conclusive. Nevertheless, they provide powerful evidence in support of traditional economic arguments in favour of freer trade. They indicate, in particular, that countries with open trade policy regimes have benefited significantly from globalization in the latter part of the twentieth century. Meanwhile, countries that have resisted the forces of globalization through inward-looking and restrictive trade and investment policies have paid a high price by not availing themselves of the opportunities made available by access to world markets.

As with the Asian financial crisis, an important lesson from the experience of trade liberalization over recent decades is that domestic policies play a key role in determining whether countries benefit or suffer from the forces of globalization. In this important sense, globalization has not emerged as a threat to national sovereignty.

Trade and investment policies are only one element in the policy and institutional framework that determines the success of countries in achieving their development goals in the global economy. Recent work in a variety of places has attempted to deepen our knowledge and understanding of the role of trade policies in this broader framework of strategies for economic development.

The World Bank's most recent *World Development Report* (World Bank, 2000b) presents the results of a large volume of in-house and commissioned research on the determinants of economic development and poverty reduction. One of the principal background papers (Dollar and Kraay, 2000) extended the

work of Sachs and Warner to examine the effects of a variety of economic policies on economic growth, and in particular on the incomes of the poorest groups in each country. Their cross-country comparisons led them to conclude that:

> "Income of the poor rises one-for-one with overall growth .... The effect of growth on the income of the poor is no different in poor countries than in rich ones .... Policy-induced growth is as good for the poor as it is for the overall economy. Openness to international trade benefits the poor to the same extent that it benefits the whole economy. Good rule of law and fiscal discipline are other factors that benefit the poor to the same extent as the whole economy. Avoidance of high inflation is "super-pro-poor"." (Dollar and Kraay, 2000, p. 1).

The World Development Report 2000/2001 (World Bank, 2000b) addressed the specific theme of "Attacking Poverty" (the subtitle of the report). While it dealt with a broad array of themes related to poverty reduction, it still concluded that open trade policies are a central element of any strategy for poverty reduction:

> "All countries that have had major reductions in income poverty have made use of international trade .... A more pro-poor [trade] liberalization is not necessarily a slower one; moving fast can create more opportunities for the poor" (World Bank, 2000b, p. 8).

This simple lesson appears to have been lost in many of the recent confrontations over the WTO and globalization. Part of the blame lies with the World Bank itself which could well be argued to have gone too far in the direction of stressing non-market aspects of poverty reduction strategies and in paying excessive lip-service to processes whereby poverty reduction strategies are designed and agreed upon. In many of their recent activities and much of their recent research work, the Bretton Woods institutions have paid considerable attention to issues of governance and the design of participatory processes for policy design and implementation. This is especially true of its most recent major study in this area entitled *The Quality of Growth* (Thomas *et al.*, 2000), and in the development poverty reduction strategy papers as a condition for World Bank and IMF assistance. While governance issues have been too much neglected in much of the previous work on policy reform, there is now a danger of going too far in the opposite direction and losing sight of some of the standard and fundamental economic lessons about market-based reforms.

The recent UK Government White Paper on international development (Secretary of State, 2000) provides a particularly useful and balanced view of the role market-opening and other developmental policies in the promotion of development. While recognizing the importance of a wide variety of governance, and human, physical and natural capital investment policies, it recognizes the central role of trade policies in harnessing the forces of globalization for the benefit of the poor.

> "Everywhere it is clear that openness is a necessary – though not sufficient – condition for national prosperity. No developed country is closed. The initially poor countries that have been most successful in catching up in recent decades – the newly industrialising east Asian countries and China – seized the opportunity offered by more open world markets to build strong export sectors and to attract inward investment. This contributed, along with massive investment in education, to the largest reduction in abject poverty that the world has ever seen" (Secretary of State, 2000, p. 17).

In common with Sachs and Warner, Dollar and Kraay, the World Bank and other researchers and organizations, the White Paper stresses the key role of sovereign domestic policy decisions in the promotion of open trade and investment as major determinants of the effects of globalization in individual countries.

Despite differences in approaches, methods and interests, almost all of the serious research on recent effects of globalization concludes that liberal trade and investment policies, accompanied by prudent macroeconomic policies, the development of appropriate institutional and legal frameworks, and productive investments in human, physical and natural capital, holds the key to participating in and maximizing the benefits from the global economy. The factors that have led to "globalization" of the world economy present great opportunities for countries at all levels of development. Globalization also exposes countries and their citizens to higher levels of risk. The effects of globalization in any particular country – whether they are malign or beneficial – depend primarily on domestic policy choices made in that country.

III. THE MULTILATERAL WTO TRADE REGIME

The WTO-based multilateral trade regime has been the focus of much of the attention of anti-globalization protests. This is because the WTO represents the achievements of several decades of multilateral trade liberalization, and their culmination in an organization that coordinates, supports and enforces the rules-

based trade regime that was the outcome of the most recent Uruguay Round of trade negotiations.

"Free Trade" Under the WTO

Despite the accusation (by anti-globalization protesters) that the WTO represents all the dangers and evils of free trade, it is still a far way from having achieved complete freedom of international trade. In fact, this is one of the greatest grievances of free trade advocates with respect to the current world trade regime. Weaknesses in the WTO are not the main topic of this paper, and so we will focus here only on some of the more important issues from a policy perspective in developing countries.

Remaining Protection in Developed Country Markets

The conclusion of the Uruguay Round left several major gaps in the free trade agenda. From the perspective of developing countries, the most important were in agriculture and in certain manufacturing sectors of special interest to poorer countries.

Powerful agricultural lobbies in Japan, the US and Canada, and most importantly the EU, succeeded in preserving high levels of protection for a number of major agricultural sectors in which some developing countries are potentially highly competitive. The result of this protection is a loss of export opportunities, and a significant decline in the terms of trade of potential exporters of such products.

Similarly, failure to dismantle the Multi Fibre Agreement (MFA) has cut off the most important potential sources of labour-intensive manufacturing growth in developing countries. By preserving market shares through MFA quota arrangements, of course, it is felt that certain developing countries actually benefit from these trade restrictions. But in aggregate, there can be no question that the MFA is harmful to developing countries, and is especially harmful to the interests of low and semi-skilled labour in these countries.

The Uruguay Round agreement included provision for continued liberalization of agricultural trade and for dismantling the MFA by 2005. There has been virtually no progress on either of these fronts since the completion of the Uruguay Round, and it remains to be seen whether these commitments will be honored. It has been estimated that OECD agricultural protection causes losses of almost $20 billion annually to developing countries, which is equivalent to about 40 percent of aid to these countries in 1998 (World Bank, 2000b, p. 11).

Special and Differential Status for Developing Countries

It is not only developed countries that have an unfinished trade liberalization agenda. Developing countries have been given "special and differential status" in two important respects, not only in the WTO framework, but also in a wide range of regional and other plurilateral and bilateral trading arrangements. This special status takes two different forms; provision of special access to developed country markets and allowance for exception to and/or delays in implementation of WTO market-opening measures in their own countries. (See Whalley, 1999 and Pangestu, 2000.)

Special access is provided through exemption from the MFN treatment requirement for a range of exports to developed country markets. Exemption of developed countries from MFN requirements on imports from developing countries allows developed countries to provide preferential access to their domestic markets for imports from poorer countries, on a non-reciprocal basis.

This preferential access has been provided primarily through the vehicle of the Generalized System of Preferences (GSP). GSP access is usually conditional, subject to annual approvals, often governed by very restrictive rules of origin, and quota-restricted. Among the most important sets of GSP measures for many developing countries have been those granted to so-called ACP (Africa, Caribbean and Pacific) countries by the EU, especially through the Lomé Convention. Many of the goods of greatest interest to developing countries under the Lomé Convention have been agricultural products which otherwise are heavily protected under the EU Common Agricultural Policy (CAP).

A very recent innovation in GSP arrangements for developing countries is the Africa Growth and Opportunity Act (AGOA) that was passed by the US Congress in 2000. AGOA is unusual in that it provides tariff and quota free access for a much-expanded GSP list of goods for a period of five years (i.e., not subject to annual approval) to a large number of qualifying African countries. The eligibility relate to both some relatively basic indicators of rule of law and human rights policies, and to basic economic policies indicating a commitment to market-oriented policy reforms.

The second form of special and differential treatment offered to developing countries since the beginning of the GATT process has been exemption from or delays in implementing a wide variety of market-opening measures. The concessions have related to, among other things, removal of NTBs, the requirement to bind tariff offers, and the ability to maintain high levels of protection for industrial development or revenue purposes. The Uruguay Round was the first time in which all agreements were embodied in a single undertaking signed by all members, developed and less developed. However, developing countries were given longer time periods to adjust to many new liberalization measures.

Special and differential treatment offered to developing countries, at least in the forms used in the GATT/WTO context, is a peculiar concept, and reveals what is really a fundamental contradiction in the post World War II multilateral trade liberalization process. The special market access provisions in developed country markets reveals a failure of five decades of trade liberalization to open markets in many products (agricultural and labour intensive manufactures) of the greatest direct interest to developing countries. And the relaxation of liberalization requirements of developing countries in order for them to continue with various forms of infant industry protection contradicts the underlying developmental objectives of trade liberalization that is supposed to underlie the GATT/WTO processes.

Fortunately the Uruguay Round negotiations saw some retreat from the near unanimity of developing country support for special and differential status. In the last quarter of the twentieth century, a significant number of developing countries had pursued unilateral policies of trade liberalization as a key part of their development strategies, and, as observed earlier, these tended to be the most successful performers among developing countries over that period. This experience had a salutary effect on negotiators in dealing with the special status and needs of developing countries. At the same time, there remains a great deal of unfinished business in liberalizing trade in developed country markets for goods of the most interest to many developing countries.[1]

Anti-Dumping and Safeguard Measures

Safeguards and anti-dumping procedures were introduced into the GATT/WTO process by developed countries to provide security against harmful surges of imports and "unfair" trade practices of foreign suppliers taking advantage of freer access to domestic markets following trade liberalization. Although the use of these measures has been enshrined in the multilateral trading system, it is developed countries that have been by far their greatest users, and developing country suppliers have often been the targets.

These procedures are generally agreed to have become one of the principal forms of GATT/WTO sanctioned protectionism used by developed economies. By design, they take a narrow perspective that considers the effects of protection only on the protected industry, and not on consumers or industrial users of the goods produced by the protected sectors. It should not be surprising, therefore, that safeguard and anti-dumping procedures have been captured by vested interests aimed at preserving protection against import competition. Recent

[1] For further discussion of special and differential treatment in the WTO see Pangestu, 2000 and Whalley, 1999.

proposals in the US to use anti-dumping duty revenues as a further subsidy to injured domestic producers would add another dimension to and incentive to use anti-dumping mechanisms.

The principal beneficiary of any anti-dumping or safeguard action is the sector given temporary protection by such measures. The principal losers are domestic consumers and users of imported products affected by the actions. In the many cases in which action has been taken against basic industrial products, it is downstream domestic industries that are hurt by rising costs that make them less competitive in domestic and international markets. In developing countries, it is exactly these sectors that should be the major source of income and employment growth through outward-looking industrialization.

In light of these lessons from developed countries, it is unfortunate that developing countries are now becoming the most rapidly growing users of safeguards and especially anti-dumping actions. Most developing countries will be even more vulnerable to the use of such measures by narrow vested interests using the rhetoric of infant industry protection and job creation to create special privileges for themselves. Through these WTO-sanctioned procedures, they will slip through the back door protectionist measures that will counteract the hard-won benefits of trade liberalization that have been achieved in recent decades, and slow the pace and neutralize the benefits of badly needed further trade policy reforms.

The greatest threat to developing countries arising from anti-dumping and safeguard procedures is not any harm that might accrue from their use by developed countries. Rather, it is the damage that developing countries will do to themselves through their own use of these actions.

Other Types of and Arguments for "New Protection"

Anti-dumping and safeguards have been part of the GATT/WTO environment for many decades. Other measures have emerged as newer types of potential protectionist threats. Among the more important, especially to developing countries, are sanitary and phyto-sanitary (SPS) and other kinds of "quality control" standards for internationally traded goods, and various kinds of measures being mooted to ensure enforcement of "labour standards" in developing countries.

In all commercial transactions, it is necessary for buyers and sellers to agree upon and be able to enforce agreements about the descriptions, quantities and quality of goods being bought and sold. When buyers and sellers are far apart and subject to different national jurisdictions, the problems are greater. Nevertheless, as long as there is a stable and reliable framework of commercial law in the relevant jurisdictions, private markets are generally able to find cost-effective and reliable solutions to these problems. International buyers of textile goods, footwear and electronics, for instance, have put in place extensive

networks of sub-contracting, technical assistance and quality control assistance to ensure that they are able to obtain products needed for domestic markets. The international division of labour that has resulted from these networks has been of great benefit to developing and developed economies alike. The same phenomenon has been in place for some time, with similar results, in international commodity markets.

Through all of these arrangements, there has been little, if any, need for involvement of governments, other than to erect and maintain a stable commercial/legal environment. The commercial sector, by and large, has been able to find commercial solutions to informational problems arising from international trade.

Nevertheless, there is still a more active role for governments in the monitoring and sometimes in the regulation of quality control in the case of goods where there is deemed to be a broader public interest and it is judged that the private sector may give inadequate protection to legitimate concerns of consumers. This has been particularly true of pharmaceuticals and a variety of food products, where there is a long tradition of information and other quality control requirements imposed on domestic production and sales. In dealing with these kinds of issues, there is considerable international variety in the means chosen to deal with these regulatory issues.

When such goods are involved in international trade, it becomes necessary to find ways of extending domestic regulatory controls to imports and, less frequently, exports. The key issue in applying such measures to international trade is to ensure that they are not used, intentionally or inadvertently, as non-tariff trade barriers. This can be done either by applying stricter standards to imports than identical domestic goods, or by raising standards for goods which are available only from abroad in order to provide implicit protection for more distant domestic substitutes.

There is growing evidence that SPS requirements have been used, directly or indirectly, to provide protection in domestic markets. Malaysia, for instance, claimed to be the victim several years ago of a concerted lobbying campaign by US soybean producers to highlight health hazards from palm oil.

However, it is not only developing country producers that use and/or benefit from SPS measures to diminish foreign competition. Domestic pharmaceutical companies in Indonesia used SPS measures as well as tariffs and quotas to keep much less costly generic medicines out of the domestic market. This enriched a few domestic producers and their international partners at the great expense of Indonesian consumers requiring medical treatment. An even more interesting and subtle case was that of Thailand when it recently investigated harm done in Europe and the US from increased SPS standards for processed fish products. To the surprise of the Thai investigators, it was discovered that these measures benefited Thailand by keeping out new competition from up-and-coming

producers in other countries that did not have the advantage of Thailand's network of developed country buyers and experience to be able to adhere to changing standards. An unintended effect of increased SPS standards is to be a barrier to entry benefiting established sellers, in this case including Thailand.

A more subtle danger to developing countries is when SPS measures are used, not simply to protect domestic producers, but also to provide "unreasonable protection" to domestic consumers. A recent study of SPS requirements in the EU (Otsuki *et al.*, 2000) found that stricter food safety standards are a major threat to exports from developing countries. Implementation of a new European aflatoxin standard, which differs from currently agreed international requirements, will reduce health risk by approximately 1.4 deaths per billion a year. At the same time, it will reduce African exports of cereals, dried and preserved fruits, and nuts by approximately $700 million.

Labour standards are becoming an even more controversial source of disagreement and contention between developed and developing countries. Developed countries, especially the US, are insisting that enforcement of minimum labour standards, including strictures against child labour, enforcement of rights to organize, etc. be a requirement for developing countries to meet in order to participate in the WTO system. While argued to be for the benefit of workers in developing countries, the latter perceive these demands to be nothing other than thinly disguised protectionism, based on the "cheap labour" myth peddled by protectionists for untold decades, and discredited by economists several centuries ago.

As indicated earlier, the most effective way to integrate workers and the poor in developing countries in the global economy, and to promote their sustainable and equitable development as a result, is through open markets, both domestic and international. For vested interests in developed countries to close their own markets and encourage protectionism as a viable economic strategy creates the cruelest inconsistency for the poor of the developing world. While the need to pay lip service to domestic interests advocating such views may be a political reality in some developed countries, it is irresponsible for governments and NGOs to promote international labour standards as a strategy for global poverty reduction and equitable development.

The Mercantilist Paradox in Free Trade Negotiations

The first lesson about trade liberalization is that its principal beneficiaries are the citizens and residents of the country reducing barriers to its trade with the rest of the world. For a small country, i.e., one too small to have a significant impact on world markets through its participation in these markets, the benefits of its own trade liberalization measures accrue entirely to itself.

This simple fact stands in sharp contrast to a common myth of trade negotiation – i.e., that tariff reductions are concessions to one's trading partners. Perpetuation of this mercantilist myth is arguably one of the largest costs of the multilateral trade liberalization exercises of the past several decades. By depicting and treating tariff reductions as "concessions," they have become a massive source of disinformation to policy makers and observers.

The language and the behavior of many of the negotiators seems to be based on the understanding that the benefits of trade liberalization by any member country are enjoyed principally by other members, and the "costs" of granting market access are borne primarily by the liberalizing country. As a result, negotiators feel it is their job to resist making concessions that reduce barriers to imports in their own markets.

This interpretation of the effects of trade liberalization is contrary to economic theory and empirical evidence that has accumulated around the globe and over the past two hundred years. While there might be some political necessity for viewing trade liberalization in this distorted manner, there is a real danger that negotiators and the stakeholders in the participating countries come to believe this protectionist rhetoric and conduct themselves accordingly. Negotiators in regional trade agreements, for instance, appear to be proud to have secured agreement on preferential tariff rates that exceed their WTO MFN commitments. Similarly, Uruguay Round negotiators took similar pride in achieving WTO commitments to tariff rates that were far in excess of rates actually been levied at the time.

Trade liberalization by any small country (and virtually all developing countries certainly fall in this category for all or at least the vast majority of their trade) has a negligible effect on world prices and hence on the trading possibilities of its trading partners. However, by bringing domestic prices closer in line with world costs and prices, it ensures a more productive and efficient use of its domestic resources, and lays the strongest possible foundation for long-term development. In addition, trade liberalization increases the degree of actual or potential competition in domestic markets, and hence provides strong incentives to improve domestic productivity and competitiveness. This is a major long-term dynamic benefit of trade liberalization.

Why, then do countries persist in the apparently irrational fiction of pretending that trade liberalization is a concession to others?

Viewed from a national perspective, an open trade policy regime is a key element of a strategy for long-term development and for raising the incomes of a country's citizens. However, from the perspective of particular vested interests, protection of a domestic market from foreign competition can be an immediate and significant source of profits and of incomes. Furthermore, the special interest gains from (increases in) protection are generally highly concentrated, while its

costs are often much more widely dispersed. Hence, the political pressures for (increases in) protection are often much stronger than those for liberalization.

Trade liberalization agreements with other countries can serve a very useful purpose in this context. They can be described as a means of securing preferential access to the partners' markets - each member agrees to provide such access to its markets in exchange for reciprocal measures on the part of its partners. Trade liberalization can then be "sold" to domestic protectionist interests as a means of securing expanded market access for its own producers and sellers. Once entered into, such agreements then serve as a credible commitment to trade liberalization. The agreements can be a powerful tool, both to secure trade liberalization in the first place, and to resist domestic pressures for subsequent increases in protection.

The danger, however, is that perpetuation of the myth of trade liberalization as a concession to foreigners gives exactly the wrong message to the true stakeholders in economic reform - the domestic citizens who will benefit from the domestic impacts of liberalization. The economic argument for free trade is apparently subtle and non-intuitive. To muddy the waters with economic nonsense for short term political gain might have very serious long-term economic costs.

Regionalism

Regional preferential trading arrangements (PTAs) have a long history in global trade policies. The EU and the Canada-US free trade agreement are among the most important among developed economies. AFTA, Mercosur and many other actual and nascent arrangements have been entered into in recent years among developing countries. Largely and certainly initially at the behest of the EU, there has emerged a growing number of special arrangements between developed and developed economies. These have included both bilateral and plurilateral agreements, some reciprocal and some not. The Lomé arrangement between the EU and the so-called ACP (Africa, Caribbean and Pacific) countries has been a long-standing non-reciprocal preferential deal to give limited access of developing countries to European markets. This is now to be revised to encompass more reciprocal conditions under which developing countries will also have to offer tariff "concessions" to the EU.

It has long been recognized that formation of a PTA is not necessarily a movement in the direction of free trade, and that it might be welfare enhancing or welfare reducing for the participating countries. Despite this, the trend towards

PTAs of this sort has been one of the most important features of the world trading system, especially in the past decade.[1]

International experience has taught a number of simple lessons regarding the economic impacts of preferential trade liberalization schemes. Some lessons relate to the aggregate economic impacts of preferential trade liberalization, and others to the distribution of benefits and costs among member countries. There has also been considerable discussion, especially in recent years, of broader political and social impacts of regional trade liberalization. Among the more controversial and yet unresolved issues in this regard is whether regional and other preferential forms of trade liberalization promote or hinder MFN-based trade liberalization.

Unilateral, MFN-Based Liberalization Versus PTAs

As indicated earlier, the principal beneficiaries of trade liberalization are the citizens and residents of the country reducing barriers to its trade with the rest of the world.

Is there any economic benefit to be gained by liberalizing trade with respect to only a subset of its trading partners, as is done in a PTA? In strict economic terms, the answer is clearly no. There is no benefit from doing so, and there is a potential cost if it has the effect of inducing the country to import from a higher cost international supplier as a result of preferential tariff rates given to the higher cost source (see section 4.3 below). MFN-based (i.e., non-discriminatory) trade liberalization is always economically superior to preferential liberalization.

This is not to say that preferential trade liberalization is necessarily bad. There are two broad arguments for preferential trade liberalization.

The first is based on "second best" considerations. If for political or other domestic reasons, non-discriminatory liberalization is not possible, preferential liberalization *might* be a second best alternative. Whether preferential liberalization is economically preferable to the *status quo* depends on the circumstances in each case and, in particular, whether the trade creating effects of the measures undertaken outweigh their trade-diverting effects. The greater is the extent of trade diversion induced by a PTA, the greater is the chance that it will be inferior to no liberalization at all.

The second argument for preferential trade liberalization is that it can be used as a device either to secure preferential or otherwise improved access to external markets, or to bind domestic policy makers to enter into and maintain

[1] For a recent in-depth review of the economics of regional trading arrangements see World Bank, 2000a.

market opening measures with respect to their own market. In other words, collaborative trade liberalization among a set of countries can be used to ensure commitment to tariff reductions and other market opening measures, over the objections of domestic vested interests opposed to liberalization. This is discussed in the following section.

Regional Liberalization as a First Step to Freer Trade

If we accept the myth of trade liberalization as a concession to others, regional PTAs might be easier to sell than multilateral agreements or unilateral action. It can be described as a means of securing preferential access to the partners' markets without having to open up the domestic market to all potential foreign competitors. As with multilateral trade agreements, however, they do represent a first step towards opening of domestic markets, entered into with reciprocal commitments from one's partners, and hence difficult to abrogate.

Collaborative trade agreements differ in the degree of compulsion or conditionality attached to market access. Most agreements involve some kind of reciprocity requirement. AFTA, for instance, imposes a condition of sectoral reciprocity for a member to gain preferential market access under the agreement. That is, a country cannot gain preferential access to any sector in a partner country until it had already met its agreed liberalization targets for that sector. As issues have arisen in recent years concerning delays in the originally agreed implementation schedule, AFTA has also introduced punitive sanctions. Under these new provisions, a country which delays implementation of market opening commitments can be subject to countervailing penalties by any partners judged to be harmed by such actions.

APEC, on the other hand, is quite unusual in this respect. Tariff reductions and other trade liberalization measures "offered" under APEC are made available to all countries on an MFN basis. That is, market opening is provided on a non-preferential basis, to all countries in the world qualifying for MFN treatment, regardless of their membership in APEC. Under this non-preferential, voluntary trade liberalization scheme the only form of commitment is of a "moral" or self-interested nature on the part of any liberalizing member. In reality, APEC is primarily a "talk shop" in which members can discuss issues related to trade liberalization and provide mutual encouragement and demonstration effects in their individual efforts to achieve the benefits of opening their markets to international trade. Despite the absence of any kinds of sanctions or reciprocation requirement, APEC has been a remarkably effective commitment mechanism for governments wishing to pursue trade liberalization policies.

The APEC experience provides evidence regarding the extent to which regional and other forms of PTAs encourage or discourage the movement towards MFN-based, global free trade. APEC is clearly designed to encourage

multilateralism and openness. Do other more exclusive PTAs such as NAFTA, Mercosur, and the growing array of bilateral and plurilateral "free trade" deals do the same, or do they encourage balkanization of the global economy into isolated groups?

While most PTAs claim to be based on a commitment to "open regionalism," the evidence on their net effects is not yet clear. Nevertheless, the fact that this question is raised so frequently suggests at least a real danger that the proliferation of PTAs might be a stumbling block rather than a building block for global free trade.

Rules of Origin in PTAs

A special and unavoidable problem that is peculiar to PTAs and does not arise in connection with multilateral or unilateral free trade arises from the need for rules of origin. Rules of origin are necessary in a PTA in order to avoid "trade deflection," whereby foreign suppliers gain access to the markets of a high tariff member of the PTA by exporting initially to a lower tariff member.

Rules of origin are meant to prevent trade deflection by specifying minimum degrees of domestic content, processing or value added in order for an import from a member country to qualify for preferential treatment under the PTA. The problem is that any kind of domestic content requirement is a form of non tariff barrier to trade that provides protection to the value-added processes or activities specified by the rules of origin. At the same time, these rules provide negative protection to the users of goods being protected.

Recognizing this as a means to provide hidden protection within the context of a "free trade" agreement, negotiators in many PTAs create rules of origin that impose major distortions in trade incentives in order to create preferences and encouragement for the development of domestic industries within the PTA. This is directly opposed to the goal of trade liberalization, and as a result can often turn into a major stumbling block in the path to true trade liberalization.

Rules of origin have been a source of considerable contention in negotiating PTAs. These differences often result in a substantial tightening of initially-proposed rules of origin, with specific rules drawn up for a large number of significant manufacturing products. This is generally done in order both to achieve greater "clarity" of the regulations and to achieve industrial development goals. It is the use of rules of origin as instruments of industrial development, however, that is greatest importance from a trade policy perspective.

Many industries of interest to developing countries are now characterized by globalization of production for the world market. For industries such as garments and textiles, footwear, and electronics, production is dispersed across the globe according to differential costs at each stage of the process. This applies

to raw materials, capital goods, intermediate inputs and assembly and sub-assembly processes.

The stages of the process represented in any location depend on the availability and costs of the necessary locally sourced inputs, especially labour and local services. To participate at all, of course, requires smoothly functioning and relatively low cost trading infrastructure, including ports, customs services and domestic transport. High costs and/or low reliability of these basic trading services result in loss of production opportunities, and lower returns to the participating domestic factors of production.

For many developing countries, the usual entry point is in the assembly of final products or particular sub-components, based on availability of low cost, relatively unskilled labour. The most frequently observed examples are in the garments and textiles, electronics and footwear industries.

If production is aimed primarily at the protected domestic market, the process usually starts and ends with simple domestic assembly of final consumer products. However, if international markets are the targets of the investors, the picture is usually quite different.

First, the scale of operation for export-oriented production is generally much larger than would be the case of production aimed only at a protected domestic market. Most domestic markets and many regional markets are not large enough to support internationally competitive production plants.

Second, the assembled products in export-oriented production are just as likely to be components or intermediate products for use in production processes elsewhere, rather than final consumer goods. It is generally the goods at the most labour-intensive part of the production chain that are the first to be produced or assembled in developing country locations. In the case of garments and textiles, this often applies to final consumer products, where stitching and assembly are highly labour-intensive. However, in the case of electronics, the components and sub-components sectors can often be the most labour-intensive.

Third, in the case of successful and sustainable export-oriented production, the investment process is dynamic and continues to grow. Over time, expertise and skills in labour-intensive assembly improve. This is generally accompanied by a variety of scale and other factors that make it profitable to broaden the range of related products produced locally. Backward and forward linkages expand with the development of local supporting industries. As the process continues, the location might even lose its comparative advantage in the labour-intensive activities that characterized the initial investments.

The development and evolution of such industrial "clusters" is an ongoing process in successful export-oriented investments. The process has been observed in electronics, footwear, and garments and textiles in many parts of the world. In east and southeast Asia, this has become known as the "flying geese" pattern of industrial development. A similar process is now underway in the garments and

textiles industry in parts of southern Africa. Mauritius some time ago became an attractive center for investment in export-oriented garment production, especially in the form of labour-intensive knitwear and in cutting and sewing garments from imported cloth. From the beginning, investments in these activities were export-oriented and aimed at world markets.

Success of these export-oriented investments, together with accompanying experience and skills development, have led to rising wages and shifting patterns of Mauritian comparative advantage. Mauritius is now facing declining comparative advantage in labour-intensive garment production. At the same time, expertise and competitiveness are growing in textiles and in supervision and coordination of garment production in more labour abundant regional locations. Mauritian investors are now involved in garment production in Madagascar and a number of SADC countries, including Botswana, Lesotho, Malawi and South Africa. They are also involved in logistics and in the development, coordination and sourcing of textiles from Mauritius, South Africa and international markets. Mauritian workers are shifting towards more skill-intensive, higher wage activities, in other sectors as well as the skill-intensive parts of the garments and textiles sector.[2]

The changing patterns of production, trade and investment in this sector are similar to and just as dynamic as those seen in east and southeast Asia over the past two or three decades.

The export-oriented flying geese model of east and southeast Asia (and Mauritius) is quite different from the inward-oriented model being pursued through vigourous application of strict rules of origin under many PTAs. The approach is often superficially similar to the flying geese model inasmuch as strict rules of origin are meant to encourage the evolution and development of supporting industries in a number of manufacturing sectors, including garments and textiles, motor vehicles, and electronics.

The key difference, however, is in the extent of outward orientation. The rules of origin are a requirement that must be met for preferential access of finished goods to the protected market of the PTA members. As is often the case, however, the PTA market is too small to support globally competitive scales of

---

[2] This process presents some important domestic policy challenges in Mauritius. A number of sectors of the economy remain heavily protected from external competition. Some parts are heavily dependent on imported labour. The economy continues to be shaped by special arrangements for the sugar sector, without which it would be far less competitive internationally. The longer run challenges for Mauritius in making the transitions discussed here relate to both a continuation of deregulation and reduced dependence on protection, and programs to enhance human skills and the strength and flexibility of its market economy. For further discussion of regional integration issues in southern African development, see Flatters, 2000.

production in most, if not all, upstream or downstream industrial sectors. This is especially so in the case of PTAs among developing countries.

The danger, especially for the lesser developed members of such a PTA, is that by orienting themselves to the rules of origin bound, inward-looking development model, they will be doomed to perpetual lack of international competitiveness and to correspondingly low incomes and development prospects.

Many of the dangers of the rule-of-origin-based, forced industrialization model can be avoided if the members are sufficiently outward-oriented in their trade relations with the rest of the world. If the members pursue vigourous programs of MFN-based trade liberalization in parallel with and at a similar speed to their preferential tariff reductions and other trade facilitation measures under the PTA, international competition will reduce the dangers of the development of small-scale, uncompetitive supporting industries. Access to inputs and raw materials on internationally competitive terms would permit investors to gain access to world markets, and not become reliant on small regional markets. A virtuous cycle could be created in which the region becomes a dynamic and competitive part of the global economy.

Trade Creation and Trade Diversion

As indicated earlier, preferential trade liberalization has some effects that are efficiency and growth enhancing and others that are efficiency and growth reducing. The former, known as *trade creation* effects, improve efficiency and increase growth by bringing domestic prices more in line with world prices and increasing competition in the domestic market. This is the principal effect of non-discriminatory trade liberalization.

In the case of discriminatory trade liberalization, however, there is an additional effect. As a result of preferential treatment of partner imports, there is an incentive to source imports from higher cost partners rather than from their lowest cost international source. This *trade diversion* reduces tariff revenues with only a partial (or maybe no) offsetting cost reduction to consumers or industrial users of imported goods. The difference between the loss of tariff revenues and (smaller) reduction in import costs is a net loss to the economy.

Because of the potential for trade diversion, PTAs are economically inferior to non-discriminatory trade liberalization, and might actually be worse than no liberalization. A key consideration in engaging in a PTA, therefore, is to minimize the dangers of trade diversion. The potential for and costs of trade diversion are greater the higher are the costs of imports from one's trading partners, and the greater are the differences between preferential and non-preferential tariff rates.

Differences between a country's preferential and non-preferential tariff rates are much more controllable than are differences between costs of its PTA

partners and non-partners. This has important policy implications. To maximize the benefits and minimize the dangers of preferential trade liberalization, a country should ensure that its MFN tariff rates remain as close as possible to preferential rates it offers to its PTA partners. If MFN rates are liberalized in parallel with PTA rates, trade diversion will not occur. Furthermore, under this strategy, a country's economic self-interest ensures that regional/preferential tariff reform is a major building block for multilateral trade liberalization.

Intra-Industry Trade and Deeper Integration

Trade liberalization - reduced tariffs, removal of non-tariff import barriers, and measures to improve trade facilitation - improves economic welfare by lowering the cost of imported goods. This is of direct benefit to consumers. However, the largest users of imported goods in most economies are producers, who import intermediate goods, raw materials, and capital goods as inputs in domestic production. Trade liberalization, therefore, has a major impact on domestic producers by increasing competition and lowering costs in markets for their raw material and intermediate inputs. This is one of the important avenues through which trade liberalization improves international competitiveness of domestic producers in countries engaging in trade liberalization.

Intra-industry trade in intermediate inputs as well as final products has been a major source of the success of effective regional PTAs in both lesser and more developed regions of the globe. The EU and NAFTA have both had enormous success in facilitating integration of markets at all stages of manufacturing production. AFTA has been predicated largely on the goal of supporting the free trade of raw materials and components among member countries and with the outside world. The result has been specialization in production of components for sectors such as electronics and motor vehicles to increase not just the regional but more importantly the international competitiveness of these sectors. This is being achieved, not through inward looking industrial and trade policies and restrictive rules of origin, but rather through facilitating free and efficient trade in all industrial goods, and especially in raw materials and components.

Successful intra-industry trade of this sort requires far more than relaxation of tariff barriers. It requires much deeper economic integration, starting with domestic market institutions and strong, stable and transparent investment environments. For developing countries, this usually demands action on a broad range of areas aimed at improving market institutions and regulatory performance. Deeper integration requires the provision of trade infrastructure and services at international standards. This means regulatory reform and promotion of domestic and international competition; it requires world-class performance by

public and private sector actors, from transportation companies to port and customs services.

Deeper integration and a broadened scope for intra-industry trade go hand-in-hand with open regionalism in making for successful, outward-looking regional integration.

Distribution of Benefits Among Members

Among the generally agreed findings about trade liberalization are:

- it is mutually beneficial to all trading partners (i.e., trade liberalization is a positive sum game), and

- small countries have more to gain from trade liberalization than do larger countries.

Furthermore, open trade regimes generally promote more rapid and equitable development of poor countries than do inward looking protectionist policies. However, as has been apparent in some of the preceding discussion, regional trade liberalization is sometimes more complex than unilateral or MFN-based multilateral liberalization.

There is considerable experience to suggest that regional/preferential trade liberalization has many of the same effects as non-preferential free trade, and in particular that it promotes the development interests of poorer countries. Spain, Ireland and Portugal have been major beneficiaries of European integration; the same is true of Mexico in NAFTA.

However, there are exceptions to these findings (see ch. 3.3 of World Bank, 2000a and Venables, 1999). Within regional groupings with richer countries, poorer members have benefited much less if they have lagged in implementing broader market-based domestic reforms. The absence of such reforms has reduced Greece's benefits from participating in the EU, and has caused it to lag behind the pace of European development. The lesson here is that trade liberalization, regional or MFN-based, is most effective when conducted in a market-friendly economic environment.

Within south-south regional agreements, there is a danger that the relatively poorer and less-developed members of the group might suffer at the expense of richer members. It is argued, for instance, that Tanzania and Uganda stagnated while Kenya derived most of the industrial development benefits from the East African Economic Community.

This asymmetry in the distribution of benefits from regional integration arises primarily from a combination of differences in structures of comparative advantage and policy-induced trade diversion. The argument is as follows. As less

developed countries, the members of a regional PTA among poorer countries all tend to have a comparative disadvantage, relative to the rest of the world, in many manufacturing sectors. These are the same sectors that are often heavily protected in the member countries. Within the grouping, however, the relatively more developed members tend to have less of a comparative disadvantage in these sectors than the poorest members.

In these circumstances, the formation of a regional PTA can give rise to considerable trade diversion, in which members substitute imports of manufactures from other member states for imports that previously came from outside the group. With their relative comparative advantage in these sectors within the group, the richer members become the main source of these diverted imports. While this drives the richer members into trading and production patterns that are out of line with their global comparative advantage, there can still be a net benefit for them, arising from their increased access to intra-group markets. On the other hand, the poorer members can be made worse off as a result of this trade diversion of manufactured imports from low cost international sources to higher cost suppliers within the PTA.

Two conditions are necessary for this undesirable outcome of a regional PTA. First, the richer members must have a relative comparative advantage in all or at least most of the heavily protected manufacturing industries represented in the membership of the group. There is no natural reason for this to be the case. Second, there must be substantial differences between preferential tariff rates on these goods within the PTA and the external tariffs on imports of the same goods from the rest of the world. In an outward-looking PTA, in which regional integration is part of a general strategy for global integration, high external tariffs will be eliminated, and the general level of external protection will diminish in parallel with the process of regional integration. This is sufficient to prevent the type of harmful trade diversion described here.

For a small or poor country worried about the prospects of being harmed by participation in programs of regional integration, there is a simple lesson from all the cases considered here - make sure that regional integration does not get in the way of more important programs for global integration, MFN-based trade liberalization, and domestic market reforms.

IV. MODERN TRADE POLICIES IN A GLOBAL ECONOMY

The focus of attention in this discussion is on policy issues at the national level. Despite vastly increased interdependence that has come with globalization in recent decades, sovereignty over almost all important policy decisions continues to reside with national governments. Membership in the WTO and in other bilateral and plurilateral agreements and organizations places some constraints on

national decision-making. However, participation in such agreements is itself a sovereign national decision. Furthermore, these agreements still leave enormous scope for policy decisions at the national level on almost all important trade policy issues.

The simple conclusion of this paper is that globalization has not led to any qualitative change in the prescriptions for "good" trade policy. Outward-looking trade policies are a key element of a strategy for sustainable and equitable development in the global economy. The standard policy prescriptions continue to hold. Countries should not distort production, consumption and investment incentives by utilizing non-tariff barriers to international trade – on imports or exports. Import tariff structures should be simple and transparent. A good tariff structure is one with low and uniform rates, and with minimal use of exemptions or special rates based on end uses or users. The tariff structure should be stable and should not be subject to influence due to the special pleadings of vested interests. Anti-dumping and other trade remedy measures should be utilized with extreme caution, and all decisions with respect to their use should take account of the interests not only of producers in the sector at hand, but also of domestic consumers and industrial users of these goods.

In negotiating international trade agreements with other countries or groups of countries, national governments should be guided first and most importantly by the national interest in liberalization of its own trade. Trade policy reform should not be delayed for fear of granting unnecessary "concessions" to other countries. Entering regional PTAs makes it even more important to proceed as speedily as possible with MFN-based tariff reductions, in order to avoid the dangers that arise from divergences between MFN and preferential rates.

In developing countries, import tariffs serve an important revenue-raising role due to the underdevelopment of capacities and mechanisms for collecting revenues from other sources. As revenue raising capabilities improve, countries are able to replace import duties with less distorting revenue collections from taxes on income and consumption. Income taxes raise particular difficulties in developing countries due to both the large share of incomes that are generated in kind from owner-operated businesses, and due to the insufficiently developed accounting systems. Corporate income tax systems are often further compromised by the tendency to grant tax holidays and other similar incentives to attract foreign and domestic investment. Such incentives create a hole in revenue-raising capabilities at the same time as creating costly, unintended and non-transparent distortions in investment incentives. (See Boadway, Chua and Flatters, 1995 and Boadway, Flatters and Wen, 1996.)

The goals of neutrality and of administrative transparency and simplicity in revenue collection call for simple tariff structures, with relatively low and uniform rates. As countries improve their domestic tax systems, it might even be possible and desirable to do away entirely with import taxes and rely entirely on

a (higher) single rate VAT. A very large proportion of VAT collections in most tax systems, especially in developing countries, is collected initially at the border, and so share with import duties the administrative simplicity of border tax collections. Revenue neutral reductions in tariff rates and simultaneous increases in the VAT rate will reduce the anti-trade distortions imposed by import duties and almost certainly increase the neutrality of the overall tax system.

While the qualitative conclusions about trade policies are not changed by globalization, the quantitative implications of domestic policy decisions in this regard are almost certainly larger. Globalization has magnified the opportunities to participate in and benefit from international trade and investment. The rewards from following "good" trade policies are almost certainly greater in a more tightly integrated global economy. At the same time, the costs of bad trade policies are also greater in the era of globalization.

As indicated earlier, good trade policies are only one element in the set of policies required to promote sustainable and equitable development in a global economy. As is the case of trade policies, the benefits of good complementary policies are also magnified by globalization. Patterns and rates of long-term growth depend on levels and the efficiency of investment in physical, human and natural capital. Such investments are the underlying determinants of productivity growth. Regulatory frameworks that promote efficient capital markets, together with education, and environmental and resource management policies are critical to long-term development prospects. Good trade policies are a vehicle to ensure that the economy is best equipped to take advantage of the global opportunities for making use of such investments in the global environment.

V. MALAYSIAN LESSONS

Over the final quarter of the twentieth century, Malaysia has provided an excellent model of how a country can benefit from globalization. The hallmarks of Malaysian policy have been:

- liberalization of merchandise trade through elimination of NTBs, lowering and reducing the range of import duties, and streamlining customs, ports, and tax procedures for importers and exporters,

- openness to inward and outward bound foreign investment and creation of a stable market-friendly investment environment, and

- stable macroeconomic policies, characterized by prudent fiscal and monetary policies, a steadily improving and generally well designed and administered tax system, and an open and realistically valued exchange rate regime. (See Boadway, 2001 for a more detailed review of tax policy issues.)

These macroeconomic framework policies have provided an environment that has encouraged foreign and domestic investment and provided a backdrop against which large private and public investments in education have been able to bear appropriate rewards for Malaysian citizens.

For its relatively small size, Malaysia has received a remarkable amount of attention on the world stage as a model of appropriate policy responses to globalization. This is especially true in developing countries, particularly in Africa, where the Malaysian model is held up as being especially useful for other small developing countries. Given the success of the Malaysian experience, this should not be surprising.

What is surprising and somewhat alarming, however, is that the Malaysian model is often held up as one for resisting the forces of globalization. While this is largely a result of the rhetoric surrounding Malaysia's "unorthodox" approach to the Asian financial crisis, the lessons being drawn are much larger. In many African countries, for instance, Malaysia is referred to as showing how a country can prosper by resisting the forces of globalization, and is used to justify targeted industrial policies, domestic and foreign capital market interventions, and resistance to trade liberalization.

These are not the lessons that most persons would draw from the Malaysian experience over the past quarter century. In fact, if one were to look for negative lessons from Malaysia's experience, they would be exactly in the areas where Malaysia has engaged in targeted industrial policies, selective import restrictions and tax incentives, and capital market interventions aimed at frustrating and compensating for "adverse" effects of market outcomes.

Malaysia's success over the past quarter century provides a model for how to approach the new global environment of the "knowledge economy." Openness to trade and investment, continued development of market institutions, especially in capital markets, and continued investment in human capital provide the keys to continued growth of productivity and incomes in Malaysia. Repetition of earlier mistakes in selective industrialization and capital market interventions to fulfill the fantasies or special interests of particular groups would benefit these groups at the expense of longer-term national development. It would also provide the wrong example for poorer countries that look up to Malaysia as a model for policy-making in the global economy.

REFERENCES

Boadway, Robin (2001), "National Tax Policies in an International Economy" presented at CIDA-funded MIER/Queen's University conference on *Globalization and the Knowledge Economy*, Kuala Lumpur, Malaysia, January 30-31.

Boadway, Robin, Dale Chua and Frank Flatters (1995), "Investment Incentives and the Corporate Tax System in Malaysia" in Anwar Shah (ed.), *Fiscal Incentives for Investment in Developing Countries* (New York: Oxford University Press).

Boadway, Robin, Frank Flatters and Jean-François Wen (1996), "Are Investment Incentives Biased Against Small Firms in Thailand?," *Journal of Developing Areas*, October.

Dollar, David and Aart Kraay (2000), *Growth Is Good for the Poor* (Washington DC: The World Bank) March.

Flatters, Frank (2000), "The SADC Trade Protocol: Impacts, Issues and the Way Ahead," mimeo.

Harris, Richard G. (2000), "The Knowledge-Based Economy: Facts and Theories" presented at CIDA-funded MIER/Queen's University *National Economic Outlook Conference*, Kuala Lumpur, Malaysia, November 20-22.

_____ (2001), "The New Economy, Globalization and Regional Trade Agreements" presented at CIDA-funded MIER/Queen's University conference on *Globalization and the Knowledge Economy*, Kuala Lumpur, Malaysia, January 30-31.

Olewiler, Nancy (2001), "Globalization and Environmental Quality" presented at CIDA-funded MIER/Queen's University conference on *Globalization and the Knowledge Economy*, Kuala Lumpur, Malaysia, January 30-31.

Otsuki, Tsunehiro, John S. Wilson, Mirvat Sewadeh (2000), *Saving Two in a Billion: A Case Study to Quantify the Trade Effect of European Food Safety Standards on African Exports* (Washington DC: The World Bank). (http://www1.worldbank.org/wbiep/trade/Standards.html)

Pangestu, Mari (2000), "Special and Differential Treatment in the Millennium Round: Special for Whom and How Different?," *The World Economy* 23 (9) September, pp. 1285-1302.

Sachs, Jeffrey and Andrew Warner (1995), "Economic Reform and the Process of Global Economic Integration," *Brookings Papers on Economic Activity*, August, pp.1-118.

Secretary of State for International Development (2000), *Eliminating World Poverty: Making Globalisation Work for the Poor (White Paper on International Development)* (London: Her Majesty's Stationery Office).

Thomas, Vinod, Mansoor Dailami, Ashok Dareshwar, Daniel Kaufmann, Nalin Kishor, Ramon Lopez, and Yan Wang (2000), *The Quality of Growth* (New York: Oxford University Press for the World Bank).

Venables, Anthony J. (1999), "Integration Agreements: A Force for Convergence or Divergence?," *Proceedings of the World Bank ABCDE Conference*, World Bank Policy Research Working Papers Series no. 2260.

Whalley, John (1999), "Special and Differential Treatment in the Millennium Round," *The World Economy* 22 (8) pp. 1065-1093.

World Bank (2000a), *Trade Blocs* (London and New York: Oxford University Press).

_____ (2000b), *World Development Report 2000/2001: Attacking Poverty* (London and New York: Oxford University Press).

The New Economy, Globalization and Regional Trade Agreements

Richard G. Harris

I. INTRODUCTION

The past decade has seen a surge of research in three related but distinct areas: the phenomena of globalization as measured by increased trade and investment, the impact of skill-biased technological change on developed country wage distributions, and most recently, the "New Economy" phenomena in the United States. The latter is thought by some to be the current and most prominent example of large scale and temporally concentrated shifts in the entire technological system based on innovations in information technology. The introduction of steam and railways in the last century, electrification early in this century, and later Fordism or mass production methods would be examples, as is the current ICT revolution. They are all examples of a general purpose technology (or GPT). This topic has been explored intensively at the Canadian Institute for Advanced Research, and the recent volume edited by Elhanan and Helpman (1998) covers the topic in

detail [1] This paper explores the implication of the "New Economy" hypothesis for those economies that participate in preferential regional trade agreements (PRTA) but are also manufacturing exporters to the major industrial country markets in Europe, North America, and Japan of which the ASEAN economies are the major example.

Promises of a new "golden age" of high productivity growth in the United States has attracted an enormous amount of attention over the last few years to the New Economy hypothesis. Some large international organizations such as the OECD (1999) have enthusiastically endorsed the ICT vision of the New Economy. The recent evidence is certainly impressive in the case of the US economy. Average labour productivity grew at an annualized rate of 2.15 percent from 1995 through the first quarter of 1999, after growing at just over 1 percent from 1972 to 1995. Does this herald the return to the golden age of productivity growth witnessed in the 1950 to 1970 period, in which productivity grew at a rate in excess of 2.5 percent? If so the impact would be remarkable both on the real incomes of workers and on the ability of government to fund program spending. Greenwood and Jovanovic (1999) have argued using stock market data that the New Economy is largely about ICT. Within the business press there has been a virtual deluge of material on the New Economy hypothesis. Academics have been somewhat more reticent. Moreover there are doubters, and their arguments are impressive. Robert Gordon (1999) of Northwestern University notes that the entire pickup is predicated on one remarkable fact – the significant drop in computer prices over the last few years. Growth in computer manufacturing proceeded at an astounding rate of 42 percent over the 1995Q4–1999Q1 period. This sector alone managed to raise the aggregate growth rate even though computer manufacturing accounts for just 1.2 percent of total output in the United States. Productivity growth in non-computer manufacturing (durables and non-durables) actually declined during 1995–99 relative to 1972–95.

Nevertheless the US expansion and productivity growth has been remarkable. It raises the obvious question as to whether the New Economy will diffuse internationally, and if so the implications for trade, investment and incomes. The familiar concerns about wage inequality and globalization have been partially overcome by the New Economy growth optimism. It seems clear, however, that the firmly established trends and forces giving rise to both globalization and growth in wage inequality in the industrial countries have not disappeared. How they will

[1] The introduction of GPTs is characterized by long lags between the date of introduction and ultimate productivity gains. There is also considerable initial uncertainty as to the ultimate effect of a new GPT. Growth based on a new GPT is to be contrasted with technological innovation that is thought to be continuous and incremental in nature. The ICT revolution based on computerization and low-cost electronic networks that are used in virtually all sectors of the economy are better described by the GPT concept than the incremental approach to technological change.

interact with the forces driving the New Economy remains to be seen. Of particular note are the potential impacts on wages. Thus far in the US, the income benefits of the New Economy have fallen on those occupations who were strategically placed to benefit from the ICT revolution - IT workers in particular. There remains an active debate as to how widely the productivity gains will be shared. In the US debate, however, the role of trade has generally been dismissed and interactions between trade and the New Economy drivers have been ignored. For the economies of interest in this paper, exactly the opposite is the case. How trade interacts with the major technology drivers is likely to figure prominently in the distributional impact of the New Economy.

The paper uses two benchmark models of international trade, both familiar to international trade economists, in order to examine these questions. Of particular interest is the potential impact of the New Economy on pre-existing free trade agreements for groupings outside of the United States. Examples would include ASEAN, Mercosur, the Australia-New Zealand CER agreement, and of course the EU and NAFTA. In all of these cases, these regional trade agreements have led to liberalized trade in goods but not necessarily on services or investment. There is a large and active debate on the impact of regional trade agreements - in particular, whether they have on average been economically beneficial or not. See for example World Bank (2000), Kreuger (1997), and Laird (1999). A distinctive characteristic of the New Economy technologies is their potential impact on the production and distribution of what are traditionally service activities, many largely non-traded. Examples include financial services, accounting, market, engineering services, media, telecommunications, and transport services. Partial liberalization in these areas has been attempted in most of the regional FTA's with mixed success. It is widely claimed that the next stage of liberalization is all about services, both at the regional and multilateral levels.[2] The New Economy impacts on this next stage by raising the potential efficiency gains that liberalization brings. Moreover the actual success of the New Economy in these other regions will be either enhanced or slowed by the trade policy response in these sectors. Catherine Mann *et al.* (2000) have recently highlighted some of the policy issues for developing country RPTA's specifically with respect to e-commerce and the Internet. It is clear we are in the early days of what will be active trade policy debate.

There is yet another dimension to this debate. The emergence of the New Economy in North American has signaled yet another shift in the available sources of new economic growth. A comparative advantage approach to growth might suggest that the US will take the lead in New Economy service exports and the follower countries will shift into the areas the US has traditionally exported in, such

[2] The next WTO round was intended to deal with multilateral service liberalization with a possible extension of the GATS agreement. The Seattle "failure" has cast considerable doubt on this process.

as capital goods equipment. Alternatively if trade is based on scale economies, product differentiation and specialization, then the global diffusion of "New Economy" might mean greater two-way trade and a parallel development in specialized service exports from all regions. For middle income trade groupings such as ASEAN, the appropriate policy response may hinge on which of these two trade theory paradigms is appropriate. Part of the policy debate is the extent to which there is, or is not, a bias against the development of New Economy activities in small open economies whose own service markets suffer from limitations of size.

Many of the services in the New Economy are thought to characterized by localization economies – that is physical proximity of buyers and sellers is a necessary feature for these to develop. In a large economy or city, these would usually be non-traded services. The same is true in isolated small economies. However, the emergence of the ICT-GPT means that it may be possible to integrate these service markets across a number of regionally linked small economies when the constraints of distance are not prohibitive. For example, in the case of all the RPTA's mentioned above, one could imagine that the countries involved are sufficiently close to one another that an ICT-GPT would allow for trade among the member countries in these services, but it might not allow for genuinely global trade as is the case in most goods markets where storage and durability of the goods is possible. For these reasons, the New Economy may have greater policy impact on regional trade than on global trade. This in turn raises the prospect that RPTA's may play a more important role in future liberalization than was the case prior to the emergence of the New Economy.

Two international trade models of factor returns and virtual service market integration within an existing regional free trade area are presented. The RPTA is assume to consist of a number of small price taking open economies that export manufactured goods and import a generic service good. The first is a Hecksher-Ohlin model in which all markets are competitive and trade is determined by factor endowments. The New Economy arrives in the form of a new communications network – an Internet – that allows for virtual regional integration of a subset of the regional service markets.[3] One type of service is subject to strong localization effects and thus trade can only occur within the region. An Internet, by opening up trade in regional services subject to localization changes the relative demands for IT workers and the extent of trade in the New Economy services. The H-O framework is lacking in its ability to explicitly handle the product differentiation, network and scale effects that trade on electronic networks is thought to be subject to. These issues are addressed in a modification of the model of factor returns with an Internet on business services developed in Harris (1997; 1995), applied here to

[3] The "Internet" also allows for global linkages in the areas of computerized manufacturing, for example. The general presumption of these models is that effect will either be similar across all economies such as to leave basic trade patterns unaffected.

the case of regionally based economic integration. Both models are "stripped down" and ignore a number of issues, such as consumption externalities in network use, investment by firms and individuals in adapting to the network, and the dynamic consequences of obsolescence. The models are "stripped down" and bury any details on the supply side of the Internet.[4]

II. A HECKSHER-OHLIN MODEL OF REGIONAL TRADE AND VIRTUAL SERVICE MARKET INTEGRATION

In this section a modified form of Hecksher-Ohlin model of trade is used to consider the impact of a virtual economic integration of the regional service markets on a pre-existing RPTA which covers trade in goods. That is, we assume that initially there is free trade among the member countries in goods, but trade in some services is not technologically feasible. Moreover, the RPTA is "small" in the usual sense of being a price taker in the market for manufactured goods. There is no established model in the international trade literature of either service trade, or of Internet commerce. The neo-classical model of a small open economy is amended such as to deal with some of these issues. Given the importance of this theory for most economists who think about such issues, this can be regarded as a "first pass" attempt on developing some intuition as to the impact of the New Economy on RPTA's.

A Model

There are three commodities and three factors. Commodities indexed n and s are services, while commodity m is a manufactured export good. The primary factors consists of capital, basic labour and a particular type of labour input hereafter called IT labour. The latter can be thought of as those workers in occupations whose skills will be highly complementary with the New Economy innovations. Supplies of both factors are fixed. Service s is a generic internationally traded intermediate service input as well as a final service such as transport services, or import-export distribution services. Service n is a final good assumed to be initially non-traded but is subject to the New Economy innovations. A good example would be accounting, which is produced for local use (localization) by combining the generic international service good s with ICT labour inputs. A strong factor intensity assumption is made in that neither unskilled labour nor capital are used in the production of the initially non-traded service n. These services are explicitly thought of as New Economy services which are intensive in the use human capital and new technology. They do,

[4] For an overview of the policy implications of e-commerce see Harris and Globerman (1997).

however, require other basic services as an intermediate input. Service s, the generic traded intermediate service, is produced using local labour and other non-traded factor input (call it capital). Good m is the basic manufactured good produced using labour and capital, but not ICT workers.[5] Factors are mobile between industries (sectors) but not between countries. The three factors in each region are in fixed inelastic supply; ICT workers, T, labour L and capital K.

The RPTA consists of a number of identical small countries each endowed with the three factors and facing exogenous world prices in the two traded commodities - manufactured goods and generic intermediate services. Prior to virtual integration, there is (free) trade in s and m. Service n must be produced and delivered locally prior to virtual integration. The analysis is comparative static and looks at the representative country within the RPTA grouping. As is common, however, in the H-O literature we focus on the case of diversification with the economy producing both commodities s and m in equilibrium under regional free trade.

Let v, w and r be the factor prices of S, L and K respectively. It is convenient to take service good s, the generic traded service, as the numeraire good in the system ($p_s = 1$). With constant returns to scale and competition, the price equal average costs conditions are

$$\begin{aligned} p_n &= c_n(p_s, v) \\ p_s &= c_s(r, w) \\ p_m &= c_m(r, w)/a \end{aligned} \tag{1}$$

These conditions must hold in diversified equilibrium with factor market clearing. With free trade in goods s and m external shocks are transmitted through changes in the prices of s or m. Labour saving technological progress comes through changes in the manufacturing specific Hicks-neutral technology parameter a. The literature on wages and globalization has focused on whether, within the developing countries, shifts in p_m or a have been responsible for the decline in real wages.[6] An increase in a increases the productivity of all factors in manufacturing. Define the "effective price" of good m as

$$p_m^e = p_m a \tag{2}$$

By the Stolper Samuelson theorem, given the block decomposition structure of the

[5] The latter is a simplifying assumption. Most of the results derived will also hold if the share of ICT labour in manufacturing is sufficiently small relative to its share in the non-traded service sector.

[6] Slaughter and Swagel (1997) provides a survey of this large literature. Note that in this paper we are using a sector specific definition of skill biased technological change.

factor price side of the model (1), changes in either the price of manufactured goods or an increase in the TFP level of manufactured goods will reduce the returns to the intensive factor in manufacturing, which we shall assume to be unskilled labour in line with the work on trade and globalization.[7]

We shall assume that ICT workers can also work if necessary as unskilled labour so that S is strictly speaking derived from L by the development of new human capital. However, the supply of IT workers is sufficiently low such that $v > w$.

For given international prices, the model has a block decomposition structure. Factor market clearing for L and K determine the output of goods s and m, and the factor prices w and r are determined by the price equal cost conditions.

Let $Y_m(P)$ and $Y_s(P)$ denote the output of goods s and m in the economy where $P=(p_s,p_m)$. The model is closed by introducing the demand side and determining the market-clearing price for the New Economy service n produced via the localization process. In each country a representative consumer has tastes that are described by a utility function.

$U(C_n,C_s,C_m)$ or expenditure function $E(p_n,p_s,p_m,U)$. Production equilibrium is determined by the production sector solving the maximization problem

$$V_n = \max_Z p_n F_n(Z,S) - p_s Z \tag{3}$$

where Z is the total input of the generic service good used in the production of the New Economy service, F is the production function for n ad V_n is the restricted profit function for the n sector. The wages of IT labour, which are specific to the N sector are given by Hotelling's Lemma as

$$v = \frac{\partial V_n}{\partial S}. \tag{4}$$

GNP, and thus national income, is given by

$$GNP = n_n + p_s Y_s(P) + p_m Y_m(P). \tag{5}$$

The price of the n services p_n must adjust such that the market for that good clears locally; that is local prices and the level of utility must satisfy (using Shepherd's Lemma)

$$\begin{aligned} C_n &= E_1(p_n,P,U) = \frac{\partial V_n}{\partial p_n} \\ E(p_n,P,U) &= GNP. \end{aligned} \tag{6}$$

[7] See Slaughter and Swagel (1997) and Murphy *et al.* (1999) for a discussion of these issues.

Globalization Effects – Pre-New Economy

In this section, we examine how globalization defined as *either* a reduction in the price of manufacturing exports or as skill biased technical change affects trade and factor returns prior to the New Economy. The model has the structure that the returns to IT human capital are generated by the demand generated by localization of generic service goods. In fact the model can be simplified by assuming that for consumption purposes service good n is consumed but not service s – i.e., all final consumption services must by assumption be localized. Because of the non-traded nature of these localization services provided by S there will not be factor price equalization across economies in the diversified equilibrium on v – i.e., returns to IT workers will differ depending on the supplies of IT workers. Given identical technology and free trade, however, returns to capital and labour will be equalized. The effects of globalization on the returns to IT workers are primarily by a transmission process running from changes in the price of generic services, p_s to the price of localized services and then v. This will involve both the factor market clearing condition and the price-cost condition for localized goods. Thus both differences in tastes across regions for localized services, and differences in the supply of IT workers will impact on the wages of IT workers.

A decrease in the price of manufactured goods, p_m that leaves p_s unchanged will leave the supply of n unchanged. A decrease in p_m however, will shift demand toward manufacturing and away from services creating an excess supply of localized services. This results in a decline in their price p_n and consequently in the wages of IT workers. Hence

> *The impact of globalization pre-New Economy which occurs through a reduction in the relative price of manufactured goods will result in a fall in the relative price of localized services and a fall in the returns to both IT workers and unskilled labour.*

Now consider skill biased technological change defined as an increase in productivity in the manufacturing sector a, which is usually assumed to reduce the returns to labour, w in this model via the usual Stolper-Samuelson effect. From the block decomposition of the factor price side there is no Stolper-Samuelson effect on the wages of IT workers as the price of the traded service s is unaffected by the change in a. But on the demand side of the model, there is an impact via the income effect on GNP. The increased efficiency of labour and capital in manufacturing leads to an increase in GNP and thus an increase in the demand for both services and manufactured goods. Similar to demand boom in the Salter model of the real exchange rate, this produces an increase in the relative price of non-traded localized services p_n, and an increase in the specific factor to that sector – the wages of IT workers.

Skill biased technological change which occur pre-New Economy but which leaves the terms of trade unchanged will increase the relative price of localized services and increase the wages of IT workers while decreasing the real returns to generic labour.

An important issue is whether the real return to IT labour goes up in terms of the good they produce; i.e., does v rise by more or less (in percentage terms) than p_n. Assuming the price of s does not change it is immediate from (1) that v will rise by less than the increase in the price of n. Thus the "real increase" must be qualified - even IT workers labour loses in terms of the non-traded service they produce.

The trade volume effects of globalization are straightforward from conventional analysis. A fall in the price of manufactured goods will reduce the production and exports of manufactured goods. Skill biased technological change on the other hand increases the supply and exports of manufactured goods. Globalization pre-New Economy arrival therefore carries with it contradictory trends for both trade and wage patterns in small country manufacturing exporters.

The New Economy – Virtual Service Market Integration

We now turn to the impact of virtual integration as discussed in Harris (1995; 1998). In the neo-classical trade model, however, this is modeled in a very simple way. The arrival of the New Economy in the form of ICT technology is assumed to provide a technological means by which trade amongst the members of the RPTA in the localized service goods can occur. To simplify matters, we abstract from the production of the Internet technology or the dynamics that it is likely to give rise to. Imagine that a generic and universal type of public electronic network makes possible the trade in the localized service good n such as accounting services. Now the gap between reality and the model gets a bit large here. The New Economy's arrival is defined solely as a one time permanent change in the ability to trade previously non-traded goods. The impact on domestic transactions and distribution is assumed to be negligible.

In the context of the traditional trade model, this type of virtual integration that allows international exchange of services is economically equivalent to a type of factor market mobility. In line with Mundell's famous analysis of factor mobility, imagine a world where any person endowed with IT skills could sell their services in any market. In this case, the mobility of the services of IT workers together with free trade in s and m would eliminate differences across countries of service prices. One might imagine therefore that the ICT innovations of the New Economy actually allow for the exchange of the services of labour which are used intensively in the localized service activity, rather than the service activity itself. In a way this reflects the reality that with ICT it is meaningless to say where the

service is produced and consumed. Either I visit my accountant over the Web or he visits me - they are both equivalent.

Virtual regional integration increases the size of localized service markets for all services producers. To capture this in the model, assume the RPTA face a large third region (Rest-of-World). The ROW is assumed to be sufficiently large so that the prices of goods s and m exogenous to the integrating regions. *Virtual integration is equivalent in this model to the complete integration of the market for the New Economy service and the factor market for S.* This results in a convergence amongst all member countries regions of the prices of service n, and the returns to IT labour. Given our other assumptions, we thus have a case where complete factor price equalization is achieved after virtual integration via a complete integration of the services market. Localization has gone from the national level to the level of the RPTA. This is the case we shall consider in detail.

The effects of this integration hinge upon the structure of the initial equilibrium. The initial situation can be described as on in which relative factor abundance plays a large role. Imagine two countries that are identical in all respects except one region is more well endowed with S than the other. Call them A and B with $S_A > S_B$. What is the nature of the initial equilibrium in these two countries prior to virtual integration? There are no good ways to collapse a three-factor model into two but the use of relative supply and demand diagrams are useful. Let X denote a composite factor of Land K, and x the price of this composite factor. For given $P=(p_s,p_m)$ we know that x is given and we can define the relative supply and demand curves of S to X, with S/X on the horizontal axis and m/x on the vertical axis. For a single country these are depicted in Figure 1.[8] The relative supply curve is vertical. Under our assumptions, country A is abundant in IT labour and therefore will have a higher initial wage v than country. B. Integration of the two regions effectively produces a new region with a relative supply curve labeled I where

$$I = \frac{S_A + S_B}{X_A + X_B}.$$

The relative demand curve with homothetic and identical tastes is the same before and after integration.

As is common in these type of models, the new equilibrium with free trade in n, which is equivalent to free trade in S, results in an IT wage which lies between the two "autarkic" wages. Traditional comparative advantage analysis thus tells us that:

---

[8] These curves and their comparisons between countries will only work if tastes are homothetic and identical across countries.

Virtual integration of service markets results in a rise in the wage of IT workers, and a rise in the price of localized services in the country that is relatively abundant in IT labour.

It is straightforward to extend these results to the pattern of trade and the gains from trade.

New Economy virtual integration of service markets results in the country which is abundant in IT inputs becoming a net exporter of those services to other member countries within the RPTA. Those countries that are abundant in K and L relative to S will tend to increase their exports of manufactured goods and increase their imports of New Economy services.
All member countries of the RPTA gain from virtual integration.

Virtual integration will change the quantitative impact of both globalization and skill biased technical change on the wages and trade patterns. However, the basic transmission process remains the same except that the new economy service good is now only non-traded vis-a-vis the rest of the world.

The prior existence of the RPTA is crucial to these results, in particular, the proposition that all countries benefit from the resulting service market integration the New Economy gives rise to. Classic customs union theory has some straightforward implications in this model. If countries which are not currently members of a RPTA contemplate the formation one post-New Economy, the cost benefit calculation of the arrangement can change due to shifts in trade diversion costs. It is possible the trade diversion costs could rise in those cases where the imports subject to trade diversion rise as a consequence of the increased trade volumes induced by trade in New Economy services. Countries that are exporters of New Economy services within a potential RPTA are likely to be importers of manufactured goods produced by other member countries. If those goods were initially subject to tariffs but were purchased at a lower price from non-member sources, allowing duty free access may give rise to trade diversion costs. Somewhat ironically it will be those countries that stand the most to gain in terms of regional New Economy exports that are the most likely candidates to lose from the trade diverting effects of an RPTA.

The neo-classical model of trade in goods and factors can get one quite a long ways in the investigation of the impact of virtual regional economic integration of service markets. It does not, however, cover two important aspects of the problem: network externalities, product specialization and economies of scale. We now turn to these.

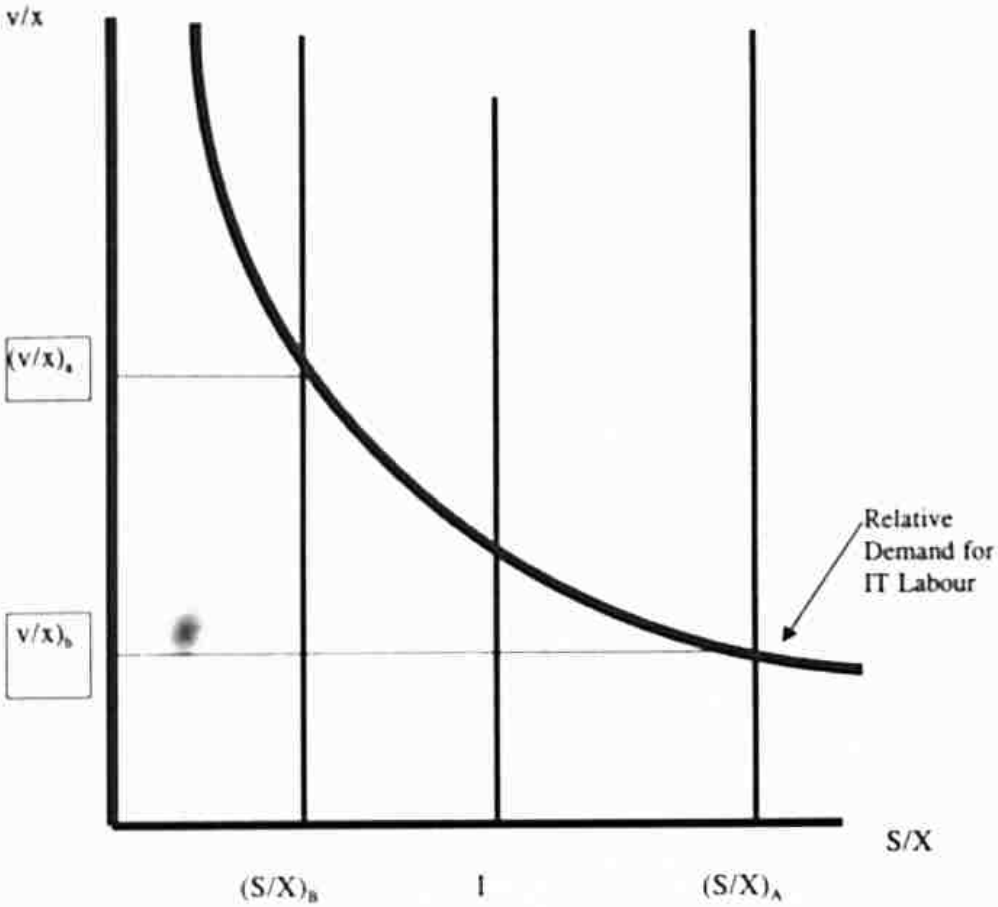


Figure 1
Convergence of Factor Price with
Virtual Service Market Integration

III. ECONOMIES OF SPECIALIZATION AND SCALE

In this section a monopolistic competition model of international trade is used to examine similar questions to those posed in Section II. In this well-known theory, trade is driven by scale and product differentiation. With economies of scale and specialization in business services regional service market integration, and the impacts of globalization and the New Economy take on a number of different features than in the traditional competitive Heckscher-Ohlin model. Trade in business service is facilitated by the introduction of a New Economy communications network linking all regions in the RPTA. Business services in this model (unlike the last) are treated solely as an intermediate input. In the initial situation that is pre-New Economy there are two factors of production - IT labour inputs and unskilled labour. IT inputs are necessarily used in the service sector and initially all business services are non-traded. IT labour inputs really stands as a proxy for a composite factor input which is endowed with the skills and capital necessary to use ICT technology. Pre-New Economy we can think of this labour as simply skilled labour and capital that can be used in either services or manufacturing production. After the arrival of the New Economy, this factor can be thought of as explicitly using these skills to facilitate intra-regional Internet transactions. In this model, as in the last, virtual service market integration results in a convergence of service prices and the returns to IT labour in all member countries of the RPTA, together with increased trade volumes in business services.

A variant on this model case looks at virtual integration of only two regions but with asymmetries country size. In each case, we look at how globalization and skill biased technological change affects the returns to the inputs to communication.

Intra-Regional Trade

The RPTA consists of m geographically distinct R regions (or cities), each of which trades two final goods and uses two factors, IT inputs and labour. The small customs union assumption of the last section is retained here. External prices are set in the Rest-of-World and integration among the regions does not change the terms of trade. Both IT labour and unskilled labour, S and L, is assumed to be immobile across regions. There are two traded goods produced in each region. One good will be referred to as the m good (also denoted as sector 2), or manufacturing good; production of this good uses both IT and unskilled labour. Unskilled labour is a factor input specific to manufacturing - thus we think of this sector as a catchall for traditional traded goods industries. The m sector is a competitive constant returns industry with a production function

$$Y_m = F(L, S_m) . \tag{7}$$

There is a second industry, indexed t, which will be referred to as the T-sector, or technology sector, which is competitive constant returns and uses *only* business services as inputs. Given an n-vector z of business services the output Y_t of the T-sector is given by

$$Y_t = \left(\sum_{i=1}^{n} z_i^{\rho} \right)^{1/\rho} \tag{8}$$

The third sector is Business Services indexed with a b (or the New Economy sector), which has a monopolistically competitive market structure of many firms each producing a differentiated business service inputs using as the only input, IT skilled labour. The production function in (8) has the property that as input differentiation increases productivity in the T sector increases. This effect is external to the firms using and supplying business services and thus is a genuine type of externality. A constraint perhaps implicit in (8) in that every pair of service providers must interact in order to supply a T-producer and thus have positive demand only if they can communicate with other service providers to the T-sector. This is initially possible only with a country. The arrival of the New Economy will allow this interaction to occur internationally.

The Production function for service good i (fixed and variable cost using only IT inputs) is given by

$$z_i = \begin{cases} \dfrac{1}{\beta} s_i \cdots if \cdots f > 0 \\ 0 \quad otherwise \end{cases} \tag{9}$$

where s_i is the variable input of IT labour to service input i and f is a fixed input of IT labour which is independent of the scale of output. Note that IT labour is used directly in business services, but only indirectly in the T sector as it is used to produce an intermediate input, business services. [9]

Consider a single member country with an endowment of unskilled labour L and IT inputs. Both m and t goods are sold at fixed world prices p_t and p_m. The price of service input i is q_i. The symmetric monopolistic competition equilibrium (MCE) has n business services produced in quantities $z_i = z$ and prices $q_i = q$. As price equals unit cost in the constant returns T sector

$$p_t = c_t = qn^{\lambda} . \tag{10}$$

[9] This specification follows that of Ethier (1979).

The wage paid IT inputs in services will be referred to as v. Under the assumption of a symmetric monopolistic competition equilibrium in Business Services, the price mark-up rule in the representative service firm is

$$q = \frac{1}{\rho}\beta v \tag{11}$$

since IT labour is the only variable input to services, substituting in (10) we have that

$$p_t = \frac{1}{\rho}\beta v\ n^{\lambda}\ . \tag{12}$$

Solving for service sector wages as a function of the price of T and degree of input differentiation gives

$$\log v_b = \log(\rho p_t / \beta) - \lambda \log n\ . \tag{13}$$

Equation (13) gives the value of the average product of IT labour in the service/technology sector and is increasing in the level of service input differentiation. Since it is also the case that under monopolistic competition with free entry there is a in zero profit equilibrium in which the number of service varieties, n, adjusts such that price equals average cost on each service input. Using the mark-up rule and price equal average cost, we solve for equilibrium scale z in the representative service sector

$$z = \frac{f}{\beta}\frac{\rho}{1-\rho}.$$

Total IT labour requirements in the service sector b is given by $S_b = nf + n\beta z$. Solving for the number of service varieties as a function of the IT labour used in services

$$n = \frac{S_b}{f}(1-\rho)\ . \tag{14}$$

Note that n is *linear* in the quantity of IT labour used in the service sector.[10] Substituting for n in the equation for v we have[11]

$$\log v_b = k - \lambda \log S_b - \lambda \log f \ .$$

L is a specific factor in sector m so we have wage equal marginal products condition (or price equal unit cost) in that sector

$$\begin{aligned} v_m &= p_m F_S(L, S_m) \\ w &= p_m F_L(L, S_m) \end{aligned} \tag{15}$$

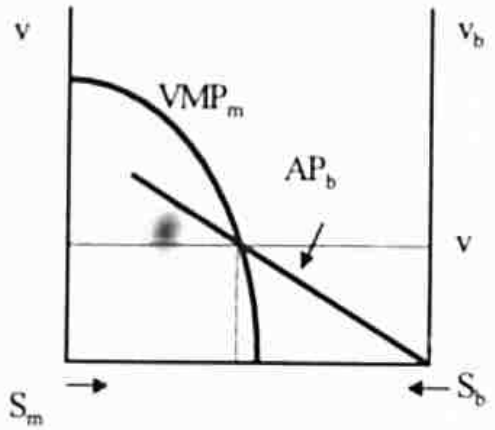


Figure 2

Factor market clearing with wages of IT inputs equalized across the m and b sectors is depicted in Figure 2 (the traditional specific factors diagram) with the horizontal axis representing the total available supply of IT labour in a country. On the left side, a downward sloping value marginal product of IT labour in manufacturing is drawn and on the right, a *rising* value of average product schedule for IT labour in the business service sector (AP_b). The equilibrium allocation of skilled labour is

[10] Note that for this model to make sense n must be greater than 1 which places a lower bound on S_b. The diagrams are drawn on a scale such that this problem is ignored so the productivity curves for sector 2 are zero for n=0. If f were very large then productivity in services would only be positive for some positive finite value of S_b sufficient to cover more than the fixed cost of setting up at least one firm.

[11] k is a constant equal to $\log(\rho p_1 / \beta)$.

determined by intersection of two. An increase in the quantity of IT labour allocated to services, raises the average product of skilled labour in services due to Smithian effect of increasing input specialization (larger n) in the service sector.[12]

Globalization, defined as a decrease in the relative price of manufactured goods, shifts the VMP_m curve down which reduces the wage to skilled labour but leads to an increase in the output of the manufacturing sector and a contraction in the business services sector. This is quite unlike the Stolper-Samuelson result of H-O model. A skill biased technological change defined as in the last section as a neutral increase in the productivity of traditional manufacturing raises the VMP_m curve. This in turn implies there is a reduction in the wages of IT labour, an increase in the output of manufactured goods, and an increase in the wage of unskilled workers. It is clear in this model that neutral productivity changes in basic manufacturing cannot explain falling wages to unskilled labour. One way to rescue the basic wage result is to resort to a factor bias approach although even here the result on unskilled wages is ambiguous. An alternative way to recover a prediction of falling unskilled wages is to assume that the technological change occurs in the business service sector. If β changes such as to raise the average product of IT labour in the b sector, then the resulting effect is to expand the service sector and lower the wage of unskilled labour manufacturing. This prediction of the model is consistent with the more general observation that globalization has brought not only growing wage inequality but continued growth in the relative size of the service sector.

The arrival of the New Economy and the Internet results in a *virtual service market integration* within the RPTA. In this model it is assumed that all firms earn long run zero profits. In the initial situation service firms, or more accurately the services they provide, are country specific. Thus due to the nature of their product they both sell their outputs and purchase their inputs in the same national market. With integration of service markets any T-sector firm can purchase a business service input from any other member country. Given the CES service

---

[12] An increase in the total amount of skilled labour will raise the price of skilled labour v and reduce the quantity of skilled labour used in the M sector, provided the economy produces both M and T. From the determination of w this would necessarily reduce the wage of unskilled labour. The argument hinges upon assuming a diversified equilibrium that requires that the VMP curve in sector m cuts the AP curve in sector b from above. Holding the stock of unskilled labour constant, a region with a larger supply of skilled labour will have a higher degree of specialization in services, a higher skilled wage and a lower unskilled wage. Holding the size of the skilled labour forces equal, the market with the larger unskilled labour force will have a lower skilled wage and a higher unskilled wage (assuming a non-specialized equilibrium). The model yields different predictions on the relationship between the factor price ratio v/w and factor supply ratio S/L than the standard competitive model. In a diversified equilibrium v/w is positively related to S/L. Thus regions with higher proportions of skilled labour will have a larger skill premium.

input aggregator (8) the T-sector will purchase all available varieties. The number of varieties of business services available in each country is now equal to $n^* = Rn$ assuming symmetry across countries. If all R countries each have exactly the same factor endowment of (L, S), the equilibrium will be one in which wages w and v are equal across all regions. Each country produces the same number of business service varieties and the prices of all services are equalized given the markup factor is the same in all countries.

The net effect of this integration is that the value of the average product of labour in services will be much higher due to a greater degree of service input specialization across the RPTA. In the case of R symmetric countries the average product of IT labour in a representative country services is given by

$$\log v_b = k - \lambda \log S_b + \lambda \log R - \lambda \log f$$

The effect of the New Economy therefore is to raise the wage to IT labour and thus to reduce the wage of unskilled labour in manufacturing. The service sector expands in all member countries and manufacturing contracts. In addition each country now exports and imports business service inputs among the member countries where this was not previously possible. The arrival of the New Economy leads to an increase in intra-regional service trade. The reduction in manufactured exports is offset by an increase in exports of high technology products to the ROW by all member countries.

The arrival of the New Economy in a symmetric RPTA has the following effects:

- *unskilled wages fall,*
- *wages and average productivity of IT inputs rise,*
- *basic manufacturing output and exports to the ROW contract in all member countries,*
- *output and exports of high technology goods to the ROW increase from all member countries, and*
- *there is an increase in intra-regional New Economy business service trade.*

Asymmetric Country Size

In the recent literature in international trade following Krugman (1992) there has been considerable pessimism about the impact of free trade on smaller regions with scale economies and imperfectly competitive market structures. With trade costs and a mobile factor, Krugman showed a small region integrating with a larger region could lose from free trade in his model. Since the New Economy essentially provides another form of factor mobility could the same effect arise in this model? Consider now the case of a two country RPTA but one country is much larger than

the other. Let A be the larger country and B be the smaller country. To keep matters simple assume that both have the same L endowment ratios but B has a small endowment of IT labour. Both are "small" in the price taking sense for the t and m goods. Prior to the arrival of the New Economy given that business services are non-traded the average product of IT labour will be smaller in the smaller country B. IT wages will be lower in B than A and unskilled wages will be higher in the smaller country. To prove this, imagine simply increasing the horizontal dimensions of the specific factors diagram in Figure 2 while holding the two productivity schedules unchanged. The larger box corresponds to the larger country. Starting from this situation, imagine that the New Economy now arrives. Trade in business service inputs is now possible between B and A. The total number of business service inputs in both countries now becomes $n^* = n_A + n_B$. This raises the productivity schedule of IT labour in both countries but proportionately the effect is larger in the small country. Post New Economy arrival wages of IT labour and service prices are equalized across both A and B. Moreover the small country B has the larger proportionate increase in the output of high technology manufactured goods. Given our assumptions that both A and B have the same endowment of unskilled labour L, the post New Economy outcome is one in which unskilled wages are equalized across countries as is the size of the m sector in both A and B. This occurs with a fall in unskilled wages in both the small and large country.[13]

The conclusion one draws from this is that the smaller country has the most to gain in terms of the aggregate impact of the New Economy. How distributionally these gains are biased toward IT inputs. The unskilled labour, the factor used intensively in manufacturing stands to lose the most. In the larger country similar conclusions follow, but quantitatively the effect is not as large. With respect to trade patterns it is the smaller country which has the larger increase in high technology exports, and as a proportion of total trade intra-regional business service trade is relatively more important for the smaller country.[14]

---

[13] This must be the case since post New Economy IT wages are higher in both countries. Since both have the same L endowment this can only occur if w fall in both countries.

[14] It is straightforward to extend the results to countries which differ in size as measured by the unskilled labour force holding the IT labour force constant. In this case, the results conform more closely to the neo-classical model. But as in the case analyzed above, the arrival of the New Economy leads to an expansion of high technology exports, a rise in IT wages, and an increase in intra-regional business service trade.

IV. CONCLUSION

The paper develops a comparative static analysis of a New Economy ICT GPT in the context of a pre-existing Regional Preferential Trading Area. A number of interesting conclusions with respect to wages, welfare and trade patterns that differ depending upon whether one uses a neo-classical or monopolistic competition-increasing return trade model. In both models fairly stark factor intensity assumptions were used as a means for developing sharp conclusions. By allowing for more general assumptions, the analytical sharpness of results would be lost. Nevertheless the general thrust of these results are unlikely to be changed provided one assumes the New Economy GPT is heavily biased toward increasing directly, or indirectly, the mobility of those occupations whose skills are complementary with the GPT. On the trade side, it is clear that the New Economy raises the potential gains to trade for within region service trade. The distributional effects of the New Economy are expected to be fairly strong, even if trade creating on average. It is important to note that the models predict that the distributional effects of the GPT can be avoided by failing to extend free trade in goods to free trade in business services. This suggests that the New Economy potential. Finally it is worth noting that as in the analysis of most preferential trading agreement, world free trade would likely dominate.

Empirically at this stage, it is too early to tell whether the New Economy has yet had must impact on the existing RPTA's. There is considerable policy discussion around the international implications of e-commerce and Internet infrastructure provision.[13] It is interesting that the models' results on factor returns conform to what has appeared have been the case in the US thus far. The New Economy led to wage increases precisely in those occupations whose skills were complementary to the new GPT. In particular, there have been numerous accounts of the skill shortages in the IT area in North America. One response to this by the US has been a large increase in the allowable immigration of IT professionals. This model suggests similar forces are likely to be seen in smaller countries in terms of the factor markets. An obvious next step would be an extension to a North-South model in which Internet access is asymmetric across regions with different development levels. One could then examine whether virtual integration would tend to promote inequality or global income convergence, across the leader and follower countries. We hope to pursue this in future research.

[13] See the recent book of Catherine Mann *et al.* (2000) for a discussion of these issues.

REFERENCES

Blomstrom, Magnus and Ari Kokko (1997), "Regional Integration and Foreign Direct Investment," *National Bureau of Economic Research*, Working Paper no. 6019.

Ethier, W. (1979), "Internationally Decreasing Costs and World Trade," *Journal of International Economics* 9, 1-24.

Gordon, Robert J. (1999), "Has the 'New Economy' Rendered the Productivity Slowdown Obsolete?," Northwestern University and NBER available on the web at http://faculty-web.at.nwu.edu/economics/gordon.

Greenwood, J. and B. Jovanovic (1999), "The IT Revolution and the Stock Market," *National Bureau of Economic Research*, Working Paper no. 6931 (Cambridge, MA: NBER).

Harris, R. and S. Globerman (1997), "Electronic Commerce: A Canadian Economic Policy Perspective," paper prepared for Industry Canada.

Harris, R. G. (1995a), "Communications Costs and Trade," *Canadian Journal of Economics*, Special Issue, S46-S75.

Harris, R. G. (1998), "The Internet as a GPT: Factor Market Implications," forthcoming in E. Helpman (ed.) *General Purpose Technologies*, (Cambridge: MIT Press).

Helpman, E. (1998), *General Purpose Technologies* (Cambridge: MIT Press).

Krueger, Anne O. (1997), "Problems with Overlapping Free Trade Areas," in *Regionalism versus Multilateral Trade Agreements*, Takatoshi Ito and Anne Krueger (eds.) (Chicago: The University of Chicago Press).

Krugman, P. (1992), *Geography and International Trade* (Cambridge: MIT Press).

Laird, S. (1999), "Regional Trade Agreements: Dangerous Liaisons?," *World Economy*, 1179-1200.

Mann, Catherine L. (2000), "Electronic Commerce in Developing Countries: Issues for Domestic Policy and WTO Negotiations," Working Paper, (Washington, DC: Institute for International Economics) March.

Mann, Catherine L., Sue E. Eckert, and Sarah Cleeland Knight (2000), *Global Electronic Commerce: A Policy Primer* (Washington, DC: Institute for International Economics).

Murphy, K., C. Riddell, and P. Romer (1998), "Wages and Technology in the United States and Canada," in E. Helpman (ed.) *General Purpose Technologies* (Cambridge, MA: M.I.T. Press).

Occupational Economics for the Centre of Development (1999), "The Economic and Social Impact of Electronic Commerce," at www.oecd.org/dsti/sti/it/ec/

Slaughter, Matthew J. and Phillip Swagel (1997), "The Effect of Globalization on Wages in the Advanced Economies," Working Paper WP/97/43 (Washington, DC: International Monetary Fund).

World Bank (2000), *Trade Blocs* (London, UK: Oxford University Press).

National Tax Policy in an International Economy

Robin Boadway

1. INTRODUCTION

The purpose of this paper is to discuss at the level of generality the sorts of principles and practices that should guide the design of national tax policies in today's globalized economy. The conditions of competitiveness that now exist make it mandatory for a country that wishes to participate fully in the international economy to adopt tax policies that are conducive to productivity growth, innovation and fulfilling the nation's true comparative advantage. This implies not only removing taxation from the list of factors that influences economic activity, but also making the policy environment friendly for investment, entrepreneurship and risk-taking. In what follows, we first discuss some general principles that should form the foundation for good tax policy. This is followed by a discussion of the choice of a broad tax base that should be the core source for the bulk of revenues raised. We then discuss some of the narrower tax bases that could be used to complement broad-based tax sources, and that typically fulfill objectives other than simple revenue raising. Finally, some specific issues that are particularly relevant for tax policy in an international setting are discussed.

II. SOME PRINCIPLES

Traditionally, the main objective of tax policy is to raise revenues for the financing of essential public goods, public services and transfers in a way that combines efficiency, fairness and administrative simplicity. More recently, emphasis has been put on role of tax system in promoting competitiveness, growth and innovation in the new global economy. Despite the emphasis that has traditionally been put on conflicts among these objectives, what is more striking is the fact that their implications for tax policy are often complementary.

Efficiency

To an economist, efficiency has a subtle meaning. Economic outcomes are efficient when they have exploited all mutually beneficial gains from trade. Gains in efficiency occur when incremental gains from trade are achieved. Efficiency is usually associated with letting the market allocate resources. Market prices are the best signals of efficiency because they reflect the information on preferences and technologies that are available to market participants, information which is not available to a government or planning agency. According to this view, the best tax system would be one that least interferes with the allocation of resources among activities that market prices would dictate.

The economic literature is rife with arguments about when market prices are not indicators of efficiency, or equivalently, when markets do not allocates resources efficiently. One of the reasons for government intervention is precisely to correct for the inefficiencies of market outcomes. These inefficiencies come from well-known sources. Free-rider problems inherent in public goods and externalities preclude private markets from allocating the efficient amount of resources to the products exhibiting these properties. Economies of scale and scope may preclude market outcomes from being competitive, in which case market prices will deviate from efficiency prices. Situations of asymmetric information between the two sides of a market will lead to market failure, or even to the non-existence of equilibrium. Markets themselves may be thin for various types of transactions, especially those involving intertemporal exchange. And, coordination problems may preclude some markets from clearing, resulting in situations of unemployment of resources, bottlenecks, inflation, etc.

In the face of these problems, it is tempting to be agnostic about the efficiency of the market economy, and to think of tax policy as having a major role in interfering with market allocations so as to correct market failures. There have been two important streams of argument in this regard. The first is the so-called second-best argument, which, roughly speaking, says that if there are distortions in the economy, market prices will generally not equal social shadow or efficiency prices. The second is that it is difficult, even impossible, to separate

efficiency from equity considerations. Virtually any policy that generates an efficiency gain from trade makes some persons better off and others worse off. This, too, causes social shadow prices to differ from market prices, and makes a prime facie case for intervention through the tax system.

There has developed a large literature devoted to devising tax systems that are optimal in the face of second-best distortions and equity concerns. This is the optimal tax literature, associated especially with the works of Atkinson, Diamond, Mirrlees and Stiglitz,[1] as well as its application to tax reform by Ahmad, Drèze, Stern and others.[2] Though this literature has been extremely influential from a scholarly point of view, it has one serious problem, and that is that its prescriptions are not really workable. For one thing, they are not workable because they are very demanding informationally. We simply do not have enough knowledge to be able to implement them. Moreover, errors are very costly. Roughly speaking, deviations from optimality have efficiency costs that increase with the square of the size of the deviation. Since it is as likely that attempts to change market prices via taxation will be in the wrong direction as in the right direction, the expected cost of deviating from market prices can be quite high. Perhaps more important, these arguments also invite intervention and the use of the tax system for incentive purposes where it is not really warranted.

The tax system that enhances efficiency most in expected terms is the one that interferes least with market prices. This is increasingly important in a globalized economic setting in which the ability to compete is a virtue. Competitiveness itself is a much misunderstood concept. It is not meaningful to apply it to the economy as a whole. One of the first tenets of economics is that trade depends on comparative advantage rather than absolute advantage. A truly competitive economy is one that exploits those lines of activity in which it has a comparative advantage. This implies that a tax system that is broad-based and neutral with respect to various activities is the one that enables the economy to best pursue its comparative advantage.

Unfortunately, the requirement to use taxes to raise revenues fairly for the financing of legitimate government activities implies that some distortions are inevitable. Lump-sum taxes, even though feasible, are not practical because they would be widely viewed as unfair. Instead, taxes must be based on some type of economic activity. Even a fully broad-based proportional tax on, say, consumption expenditures will distort the labour supply decision. This cannot be avoided. But we would argue that imposing a tax on the broadest base consistent

---

[1] Overviews of this technical literature may be found in Atkinson and Stiglitz (1980) and Tuomala (1990).

[2] See Ahmad and Stern (1991) and Drèze and Stern (1987).

with other objectives, and therefore at the lowest rates, will be potentially less harmful than using a tax that selectively distorts production decisions by industry.

Open economy considerations are also highly relevant here. The ability to exchange freely with the outside world puts significant constraints on the ability to extract tax revenues selectively from certain sources. Two examples include capital and knowledge embodied in individuals. Not only are these both highly mobile across national boundaries, they are also very important for the long-term success of the national economy, and the well-being of other members of that economy. Our prescriptions for tax policy will be heavily influenced by the benefits of encouraging the accumulation of capital and know-how within the nation's borders.

Fairness

The concept of fairness is an elusive one. It involves judging the extent to which one's ability to pay, special circumstances and needs, family obligations, benefits obtained from public spending, and so on should determine one's tax liability. Reasonable persons can certainly disagree with one another on this. It is useful and conventional to think of this issue in two dimensions - a horizontal and a vertical one. Horizontal fairness is concerned with treating fairly, persons who are at similar levels of well-being. This is very difficult to do perfectly, since such persons may have different tastes for leisure or other goods, or different needs; it is difficult to say when they are equally well off. Just like the optimal tax system for efficiency purposes would ideally treat different commodities differently, so the horizontally fair tax system would differentiate according to all sorts of personal circumstances. But this would be equally unworkable. There is simply not the level of social agreement, let alone of information about personal circumstances, to support a highly discriminating tax system, and mistakes are very costly. Here again, in the circumstances, the fairest tax system is the one that is the least discriminatory. There is little disagreement with efficiency on this account.

Where the most difficult problems arise is in determining fairness in the vertical dimension. Two issues are relevant here. How progressive or redistributive should the tax system be? How should redistribution be achieved in the tax system? As to the first question, only some form of consensus achieved by the domestic political system can decide this, and such consensus demonstrably differs across countries. It involves trading off social values with perceived efficiency costs of redistribution. These can only be perceived since there is no consensus on the equity-efficiency trade-off of tax progressivity. Indeed, there may well be some complementarity between efficiency and equity, at least over some range. More generally, no outsider can tell you how progressive the tax system should be. Different nations may choose differing degrees of

progressivity, constrained by the possibility of losing high-skilled workers to emigration.

As to the second question, redistribution can be achieved by applying a progressive rate structure to a broad, fair tax base. It can also be achieved by discriminating among different commodities according to their perceived effect on persons of different income groups. The same arguments that suggest that an efficient and horizontally fair tax system is a non-discriminatory one, also apply to a vertically fair tax system. Most economists would recommend achieving progressivity through the rate structure of the personal tax system rather than the preferential treatment of some commodities at the expense of others, assuming of course that the personal tax base is itself broad and non-discriminatory.

Administratively Simplicity

A significant constraint on tax design, along with imperfect information and international competition for capital and skilled workers, concerns administrative costs. These costs take several forms. Taxes may be simply costly to administer. The tax authorities have collection costs and the taxpayers have compliance costs. Both of these will be higher, the more complex the tax system is. They will also be higher, the more points of tax collection there are. Complexity also introduces an incentive to engage in costly, though legal, tax avoidance activities.

Perhaps most important, virtually all taxes suffer from some leakages due to evasion. Indeed, one could argue that a broad-based tax, which we have argued is to be preferred for reasons of efficiency and fairness, is especially prone to evasion. It is impossible to ensure compliance by the wide range of taxpayers that ideally should be included in the tax. Moreover, the higher the rates, the more evasion there is likely to be. One way to minimize the extent of evasion is to employ a mix of taxes. This has two effects. First, it keeps the rates on each tax lower so reduces the gains from evasion. Second, it brings into the tax net with one tax, some taxpayers who might be able to evade another (e.g., income and sales tax). Provided the bases are similar, the existence of a mix of taxes need not compromise efficiency and fairness.

Growth and Innovation

Improvements in individual well-being ultimately come from one of two sources - productivity growth and the discovery of new products. In turn, these are intimately related to investments of various kinds, as well as entrepreneurial activities. Capital investment itself improves the productivity of workers employed on it. But it is also often the wellspring of productivity improvements. New investment brings with it the latest technologies, and it also provides the experience (learning by doing) that generates new and improved ways of

producing products. Investment in human capital and in knowledge lead directly to improvements in productivity. And, many new ideas, processes and products are the invention of entrepreneurs left to their own devices in an open trading environment.

There are three features of investment and innovative activity that bear emphasizing. The first is that a defining trait of many sources of productivity growth and innovation is the creation of new knowledge. Given the public good nature of knowledge, it is very difficult for the creators of the knowledge to appropriate all its benefits; some of it inevitably goes to other parties. The consequence is that the social benefits of innovative activity, and of investments more generally, typically exceed the private benefits. Of course, by their very nature, it is difficult to measure the external benefits accruing from investment, so it is difficult to direct policies specifically to that end. However, at the very least, one might want to ensure that the tax system and other government policies do not discourage such activity.

The second feature of productivity-enhancing activities is that they are typically risky, sometimes exceedingly so where significant innovation is involved (e.g., new pharmaceuticals, R&D, biotechnology, information technology, etc.). This implies that tax systems should be designed specifically so as not to discourage risky activities. Tax systems all too frequently do precisely the opposite.

The final feature of innovative activities, especially those associated with entrepreneurship, is what economists refer to as the problem of asymmetric information. Different entrepreneurs will have different probabilities of success depending on their talents and other personal characteristics. The potential for an entrepreneur's success is typically much better known to the entrepreneur himself than to those from whom the entrepreneur seeks financing. The consequence is that good entrepreneurs have more difficulty obtaining financing on reasonable terms than would be the case if there were perfect information. There is little the government can do to overcome this, since it is no better informed and able to pick winners than are financial institutions, and quite likely much worse. Again, what governments can do is to ensure that their tax policies do not discourage activities of entrepreneurs who must rely on outside costly financing.

In summary, on the basis of all the main criteria for good tax design, a case can be made for the use of broad-based taxes, possibly a mix of them, with non-discriminatory features as the main revenue-raising instruments in the tax system. Moreover, the tax system should be structured so as to encourage investment in all its forms (including human capital and R&D), risk-taking and entrepreneurship. There will be other roles for the tax system, and other types of taxes to fulfill those roles. In later sections, we deal with some of those other roles, including the use of specific taxes for specific purposes, the use of the tax

system to achieve certain social objectives, the role of business taxes, and the raising of revenues by user fees and licenses.

III. THE CHOICE OF BROAD-BASED TAXES

Most countries employ a mix of broad-based taxes, although the relative reliance on different tax types, and their specific design features, can vary considerably. We outline here some of the main features that might be built into an ideal broad-based tax system. In reality, there are three main broad-based taxes that can be used - personal taxes, general sales taxes, and payroll taxes. It is possible to imagine others, such as wealth taxes, but they are not commonly used as important revenue-raisers, and for good reasons. For example, a wealth tax is actually difficult to administer, and its base is both much narrower and less attractive than the other broad taxes mentioned. For example, it discourages asset accumulation to the partial detriment of economic growth. The relative reliance on these three main taxes differs considerably across countries. In Canada, the United States and Australia, income taxes are the biggest revenue raisers. European countries tend to rely more on general sales taxes and in some cases payroll taxes, but still obtain significant revenues from income taxes. Many less developed countries rely much more heavily on sales taxes compared with the direct income and payroll taxes. This is done partly out of choice, and partly out of necessity.

Each of the broad taxes have one thing in common and that is that their tax bases overlap considerably. Before turning to each of the tax bases in turn, it is worth addressing the issue of the ideal tax base to which the broad taxes should conform. There are really three closely related candidates for broad based taxes - comprehensive income, consumption and, labour income.

Comprehensive income has been the time-honoured ideal tax base for those who wish to have the broadest definition of ability to pay. It can be looked on in two ways. On the use side of the household budget, comprehensive income includes all types of consumption plus net accruals of wealth (saving). Note that, in principle, consumption should include not just purchased items, but also imputed sources of consumption as well as leisure time. And, net accruals of wealth include not just capital and financial assets, but also consumer durables and even human capital. Equivalently, on the source side of the budget, comprehensive income comprises labour income (including household production) and all income from assets, including imputed forms of income such as services from consumer durables. As well, it should include inheritances and gifts received, perhaps net of bequests, and gifts given unless those are considered as acts of consumption.

A consumption tax base differs from comprehensive income as defined on the use side by excluding accruals of wealth. Otherwise all the components of consumption should be included, such as imputed consumption from durables and household production and leisure. Similarly, labour income differs from comprehensive consumption on the source side by excluding all forms of asset income. Moreover, in present value terms, consumption and labour income differ only by the present value of net inheritances and gifts.

There has been a long and ongoing debate in the literature over the case for one or the other of these three bases. Although different observers come down on different sides, there are, in my view, very strong arguments for consumption-based taxation as the most appropriate broad tax base in the conditions of today's globalized competitive international economy. This applies whether we are talking about direct taxation or indirect taxation. The arguments are based on each of the above criteria.

The administrative arguments are clear-cut. A comprehensive income tax is virtually impossible to implement given the difficulties of measuring many of the components of real asset income. Consumption bases, although themselves not without administrative difficulties, are much easier to apply. In fact, income tax systems used in practice are typically closer to consumption systems than to income systems.

The efficiency arguments are a bit more tenuous. Broadly speaking, consumption and labour income taxes impose a distortion on labour supply, whereas income taxes impose distortions on both labour supply and savings. However, income tax rates can be lower than either consumption or labour income tax rates since the tax base is larger. Thus, the choice is between a tax that imposes one distortion at a higher rate and one that imposes two distortions at lower rates. Second-best theory tells us that we cannot, in general, say which system is the most efficient.[3] However, there are many other factors that tend to favour consumption taxation rather than income taxation, especially in an open economy. As we have already mentioned, capturing the many forms of capital income in the tax system is very difficult. Inevitably an income tax system will introduce inter-asset distortions that will favour some activities at the expense of others. As well, capital income is very mobile in an open economy. This adds another difficulty in implementing an income tax. Perhaps most important, saving finances capital investment, and the argument that investment brings with it many external benefits is quite compelling. This might be the strongest argument for adopting consumption (or its equivalent, labour income) rather than income as the tax base.

---

[3] For a survey of second-best theory and its policy implications, see Boadway (1997).

The fairness argument is also ambiguous, but a case can be made for consumption on these grounds as well. The argument is one that goes back to an early forceful component of consumption taxation, Kaldor (1955), who himself was very much concerned with equity as an objective of the tax system. He argued that persons ought to be taxed, not according to what they contribute to the social pot (i.e., income), but what they take out of it (consumption). This argument is, however, misleading, since it ignores the fact that income can be viewed not only from its source side, but also from its use side. When this is done, the distinction between consumption and income taxation amounts to the fact that a consumption tax imposes the same rate on present as on future consumption, whereas an income tax, by virtue of the fact that it taxes capital income, effectively taxes future consumption at a higher rate than present consumption. While that might be regarded in itself as unfair, it must also be remembered that both tax bases exclude leisure. Thus, the technical debate around income versus consumption taxation has revolved around the question of whether it is justified to tax future consumption at a higher rate to compensate for the fact that leisure is going untaxed. That turns on whether future consumption is a closer complement with leisure than is present consumption. Unfortunately, we do not have the requisite information to judge that, nor are we likely to have in the future. It is just as likely that the opposite holds. In the absence of that knowledge, taxing consumption seems like a reasonable compromise. It should also be noted that virtually any degree of vertical fairness can be achieved whichever tax is used, since the rate structure can be chosen independently of the tax base.

Suppose, then, that we adopt the position that consumption is the desired base for taxation. Let us consider what this implies for the structure of the three main tax bases - personal, sales, and payroll.

Personal Taxes

There is a large literature devoted to the design of a personal tax to conform to consumption tax principles. Major tax reform studies in countries such as the United Kingdom, United States and Canada have advocated such a system.[4] The principle is to tax at the personal level aggregate consumption over the tax-paying year, and apply the rate structure at the personal level. Obviously, one cannot expect taxpayers to record the sum total of their actual consumption expenditures and report them once a year to the tax authorities. Instead, it must be done indirectly. The general approach is to start with income and deduct asset income or savings from it.

---

[4] See United States Treasury (1977), Institute for Fiscal Studies (1978), and Economic Council of Canada (1987).

In fact, there are two approaches to calculating a consumption tax base, and they differ according to the way in which assets are treated. One is called the *tax-prepaid method*. This method derives from the source side of the household's income budget. Households are asked to record their incomes from all sources, but are allowed to exclude asset income (e.g., interest, dividends, capital gains, etc.). What is left, roughly speaking, is labour income. The second approach, referred to as the *designated asset approach*, focuses on the use side of the budget. In this case, savings are deducted from total income, so what is left is consumption directly. When the assets and their accumulated interest are eventually used for consumption, the dissaving must be included in the tax base. This approach is sometimes also called the *cash-flow approach*. From the point of view of the way assets are treated, the differences are the following. Under the tax-prepaid approach, savings are not deducted from the tax base, but capital income is. Under the designated asset approach, savings are deducted, but capital income is not (at least to the extent that it is not saved). In present value terms, the two approaches are equivalent since savings today equals the present value of future interest plus eventual dissaving in the future when the savings are liquidated for consumption.

Both approaches are relevant since there is a need to use them both depending on the type of asset involved. For those assets whose asset income is difficult to measure, such as consumer durables, the tax-prepaid method is preferred since asset incomes need not be measured. For other assets whose returns can be measured but perhaps cannot be distinguished from other sources of income, the designated asset method is necessary. Examples might include unincorporated businesses for which capital and labour income are difficult to distinguish and where capital deductions are difficult to measure correctly, and human capital investment whose returns are hard to separate from ordinary capital income. Thus, proposed consumption tax systems must necessarily be a mix of the two approaches. Moreover, the ability of households to choose between the two approaches for their various assets allows them to engage in self-averaging over the life cycle, which itself contributes to fairness.

It is worth noting that many assets are currently treated on a consumption tax base in so-called income tax systems. Examples include savings for retirement, human capital investment, and consumer durables - assets that comprise a significant proportion of household wealth. That is why we have suggested that existing tax systems are closer to consumption tax systems than to income tax systems.

The personal tax system is the one that typically delivers much of the redistribution in the tax system, and that has certain implications for its design. A rate structure can be chosen to achieve the desired degree of progressivity. The latter is very much a matter of judgment, albeit judgment that is tempered by the adverse incentive effects that might result from high progressivity. There are

three main categories of such effects. The first is that high progressivity discourages effort of all sorts by higher income persons. It is well known that the overall effect of high tax rates on effort is ambiguous – there are offsetting income and substitution effects. Nonetheless, there is reason to believe that high-income earners will have a strong incentive to substitute low risk-low return activities that bear a lower tax burden, and this will be detrimental to productivity growth. Second, and perhaps more important, higher marginal tax rates lead to more tax avoidance and tax evasion activities, thereby defeating the purpose of the high rates. Indeed, given the fact that relatively little revenues are involved in having a highly progressive tax system, it is not clear what is to be gained. Third, in the international marketplace, highly skilled persons are very much in demand, and are potentially mobile among countries. High tax rates can have a deleterious effect on the brain drain. On the other hand, it is easy to overstate the case here. What is really at stake here is the average rate, rather than the marginal tax rate, faced by high-income earners, so progressivity per se is not the source of the brain drain.

Apart from the progressivity built into the rate structure, there are some structural issues to be addressed. The taxpaying unit – for example, family versus individual – must be decided. Deductions from the tax base to account for costs of earning income and expenditures deemed to be socially valuable (charitable donations, political donations) must be chosen. As well, the treatment of bequests and inheritances must be specified. Many of these things are matters of social, rather than economic, policy so there is little advice an economist can give.

However, there are two further points that should be made. The first is that it is always tempting for policy-makers to use the tax system for industrial or economic policy purposes by introducing special incentives for pet activities. An economist's advice is to resist this temptation because usually the incentives involve simply protecting a favoured line of activity where there is no clear social rationale for doing so.

The second point is that there are really two elements that determine the degree of progressivity of the tax. There is the structure of tax rates and tax brackets that apply to the tax base, and there are the credits that determine the cut-off level of tax liabilities. A good case can be made that these tax credits ought to be refundable, so that the tax system resembles a negative income tax system. Modern computer technology should make full refundability of tax credits feasible for most citizens. Not only does this make the tax system symmetric with respect to positive and negative tax liabilities, but it also avoids abrupt changes in the marginal tax rate for persons near the cut-off level.

General Sales Taxes

Somewhat different considerations apply to the design of a sales tax system. On the one hand, the sales tax system complements the income tax system, so the basic structures of the two should be compatible. On the other hand, the sales tax system is probably not well placed to achieve redistributive objectives, especially since attempts to do so can complicate the structure considerably. These considerations imply that the sales tax should be a fully general one on consumption with a uniform rate structure.

There is little disagreement about the ideal type of sales tax system that will achieve this objective. It is a broad-based value-added tax (VAT) with a single rate. A VAT has the advantage that, unlike with single-stage taxes, it can avoid cascading and can treat all goods and services on a par, including those produced abroad. Ideally the VAT should have the following features. Its base should be consumption expenditures, including all expenditures on goods and services. That implies that investment expenditures should be creditable. It should be levied all the way up to the retail level, if possible, despite the fact that this brings considerable more firms into the net. It should be levied on a destination basis, with imports fully taxed at the border and exports untaxed and with taxes on inputs fully credited. There should be as few exemptions as possible, the main exception being small firms for whom the administrative costs are relatively high compared with revenues raised. Of course, in countries that rely heavily on small retailers, this exemption can include a significant number of firms. Nonetheless, because it is a multi-stage tax, only the value-added of small firms at the retail level will be exempted (again, unlike with a single-stage tax). This difficulty of taxing small firms will be a problem with any sort of tax, so it is not really an argument against a broad-based approach to sales taxation.

A major concern with general sales taxation is that it is perceived as being an unfair tax. It is not progressive, and in fact may be somewhat regressive given that consumption as a proportion of income might fall with (permanent) income. This is not as much of a problem as it appears to be. Any perceived unfairness with the VAT can be adequately addressed by a system of refundable tax credits administered through the income tax system.

Payroll Taxes

Payroll taxes - taxes on labour income - are among the least appreciated broad tax bases. As mentioned, they are virtually equivalent to taxes on consumption in present value terms. The main difference is that they do not include consumption financed out of net bequests, a difference that in many countries can be remedied if need be by a separate tax on inheritances. Apart from that, payroll taxes are a nice complement to general sales and personal taxes. They are much easier to

administer since they can be collected by payroll deduction, and they are able to bring into the tax net some taxpayers who might otherwise be able to avoid paying sales taxes, and vice versa. Of course, there will always be some small businesses that can avoid payroll taxes, typically the same ones who will avoid paying sales taxes. That is unavoidable.

Some lessons can be learned about payroll taxation from their use in OECD countries. In these countries, payroll taxes are often identified with earmarked taxes used to finance social insurance programs. There are often good arguments for financing, say, mandatory retirement savings plans from payroll taxes. Contributions to such schemes can be dedicated to future retirement benefits. In such cases, there are no efficiency losses associated with the labour market effects of the tax.

On the other hand, in the case of programs with an insurance component, such as unemployment or disability insurance, the case for individual accounts is much weaker. As a consequence, the case for earmarked funding by payroll taxes is also weaker. When the benefits are not directly related to the taxpayer's contributions, there is no particular reason for the aggregate amount of contributions to equal program expenditures. The use of earmarked funding of social insurance programs often also leads to regressive payroll tax structures since there is often an upper limit on contributions. These problems can be avoided by using payroll taxes as a source of general revenue. In this case, there is no need for an upper bound on contributions. It might still be desirable to have a lower bound for low-wage or part-time workers.

One further aspect of payroll taxation that has received considerable attention in some countries, is its potential effect on employment. Payroll taxation has been dubbed by its detractors as a "tax on jobs." The idea is that taxes on labour income levied on employers increase the cost of hiring labour and therefore reduce the demand for it. However, this is a rather naïve argument. Elementary tax incidence theory suggests that the effect of the tax on demand and supply for a taxed transaction depends on the elasticities of demand and supply. In the case of the labour market, it is conceivable that the long-run elasticity of demand is much higher than the long-run elasticity of supply, especially in an open economy. In these circumstances, much of the payroll tax should be absorbed into lower-after-tax wage rates (unless labour market rigidities and minimum wages preclude that), and the effect on the demand for labour minimal. Any reduction in employment should reflect voluntary reductions resulting from less labour being supplied. In this respect, payroll taxation is really no different from consumption taxation; both impose a distortion on the labour-leisure choice of households.

IV. NARROW-BASED REVENUE SOURCES

While broad-based taxes should be relied on to generate the bulk of the tax revenues, tax systems inevitably include other narrower sources of tax revenue. Three of these are discussed in turn - business taxes, specific taxes, and user fees.

Taxes On Business

Direct taxes on business are a staple of all tax systems, and can take a myriad of forms, including income taxes on both corporations and unincorporated businesses, taxes on renewable and non-renewable resource use, capital taxes, and property taxes. Of all the tax types, these are the ones that must be chosen and designed with most care in a highly open economy. The source of the base for business taxes is highly mobile, encompassing not just the capital used in enterprises but also the entrepreneurs and high-skilled workers. As well, the contribution that businesses make to a dynamic economy depends very much on its taking on innovative, risky and knowledge-creating activities. These are all things that business taxes can affect.

It is useful to begin by asking what is the role of business taxes in the economy, especially one in which consumption-based taxes are relied on for the bulk of general government revenues. Consider business income taxes first. In the case of unincorporated businesses, an income tax is a natural component of a personal tax system based on income. To the extent that capital income is taxed at the personal level, that generated by individuals' businesses should be taxed as well. If the personal tax were to adopt consumption as its base, the case for taxing capital income generated from personal businesses would no longer exist. But, labour income implicitly earned by the business should be taxed. One way to accomplish this would be to tax the business on a cash-flow basis, which is effectively the same as treating unincorporated business assets as designated.

With corporate taxes, matters are more complicated. Corporations are owned by individuals so the income they generate should be taxed at the personal level. However, in some cases, that income can be deferred indefinitely (as in the case of earnings retained in the corporation) or can avoid taxation altogether (as in the case of foreign-owned corporations). The standard rationale for corporate taxation is to avoid these problems by withholding at source income generated within the corporation. This in turn implies that when the income eventually does become taxable in the hands of shareholders, the tax withheld should be credited, that is, the corporate tax should be integrated with the personal tax.

That traditional argument for the corporate tax is being increasingly questioned given the new realities of the global economy. For one thing, to the extent that the personal tax base is consumption, as we have argued it should be,

capital taxation at the personal level is untaxed so there is no need to withhold taxes using a corporate tax. Whether or not there is a need to withhold against foreign shareholders is another matter. One might think that in an open economy, it is impossible to extract tax revenue from foreign shareholders. International capital markets determine the rate of return they must receive after-tax, so any tax imposed on them would simply be shifted back to domestic factors. The one exception to this occurs if foreign governments give full tax credit for taxes paid by corporations abroad. In this case, taxing foreign corporations is a free source of tax revenues since it simply transfers tax revenues from foreign treasuries to the taxing country. However, the proportion of taxes levied on foreign corporations that can, in fact, be fully credited seems to be quite limited. In these circumstances, the case for a corporate tax dwindles.

Nor is it clear that the corporate tax is a very effective revenue-raising device. As mentioned above, the tax base is very mobile so the implicit cost of obtaining corporate tax revenues can be very high. Not only that, but corporations have an incentive to avoid corporate taxes by a variety of tax planning measures. It is not surprising to see a large number of tax haven countries in existence worldwide. Nor is it surprising to see corporate tax rates falling significantly, especially in selected countries. It is hard not to conclude that the corporate tax is really one that is beginning to outlive its usefulness.

Corporate taxes do still exist, however, partly because governments find it irresistible to tax accumulated stocks of capital for revenue purposes. Given that, it is worthwhile ensuring that these taxes are designed in a way that causes the least damage to the economy, especially to its ability to grow and innovate. Several principles suggest themselves. The tax system should be as non-discriminatory as possible so as to allow the market system, rather than the tax system, to determine the allocation of resources among industries. Thus, statutory rates should be uniform; deductions for capital costs should conform as closely as possible to true costs; and, special incentives and credits should be avoided. To ensure that risky activities are not discriminated against, positive and negative tax liabilities should be treated symmetrically. Ideally, this should be achieved by full refundability of losses, which would also mitigate the financing problems faced by risky and innovative firms. Special measures might be put in place to ensure that small businesses - which are often the source of innovation and employment creation - are able to compete with larger ones, who have enormous advantages in terms of inside sources of finance. As well, small corporations should be treated comparably to unincorporated businesses so as to avoid adverse incentives for incorporation. More generally, measures that discourage investment of any kind, such as capital taxes, should be avoided. To put it differently, marginal

effective tax rates (METRs) - those that apply on marginal investments - should be uniform across activities and as close to zero as possible.[5]

Designing the corporate tax system so that METRs are close to zero has an additional implication. It ensures that the corporate tax bases are rents or pure profits earned by the corporation. In principle, a tax on rents is a fully efficient tax since it imposes no distortions. However, in the context of a dynamic economy, the argument is not so simple. Innovating firms in effect generate their own rents. Attempts to tax corporate rents in general could reduce the incentive to innovate.

A stronger argument for taxing rents applies specifically to the natural resource industries. Here, the existence of true rents is less contentious. The case for taxing them lies with the notion that the rents are part of the common property of the nation. The design of a tax system for the natural resource industries that will enable the public sector to take a share of the rents, without at the same time distorting resource exploitation, is well known. A cash-flow tax, or one of its present value equivalents, will be suitable for the purpose.[6] This is the case whether the resource in question is renewable or non-renewable.

Specific Taxes

Policy-makers often resort to specific taxes to achieve particular objectives. These can be seemingly legitimate objectives like reducing the consumption of certain types of commodities for social reasons (alcohol, tobacco products), environmental reasons (petrol taxes) or redistributive reasons (luxuries). Specific taxes might also exist simply to raise revenues if they are on commodities with inelastic demands, or if they can be exported to non-residents (hotel taxes).

The problem with these arguments is that however legitimate they are in theory, the proper level of such taxes is impossible to ascertain. Moreover, such arguments might be used as a pretext for levying specific taxes where none is really warranted. A good example is the tendency to use specific excise taxes for redistributive purposes. By their nature, these are blunt redistributive devices. It should be much more effective to leave the task of redistribution to broader based taxes that are better suited for the purpose. Taxes might also be imposed purely for protective reasons, thereby distorting the long-run competitiveness of the economy.

At the same time, even well-motivated taxes can have adverse effects, sometimes unintentionally. Some of the best specific taxes for revenue-raising

---

[5] For a discussion of the definition and use of METRs, see Mintz (1996).

[6] The principles of resource taxation are outlined in Boadway and Flatters (1993).

purposes are also the most inequitable (lotteries, taxes on commodities in inelastic demands). Specific taxes might also be on commodities that are themselves used as inputs by domestic firms.

It is hard to be categorical about specific taxes, except that they should be used with caution. Perhaps the strongest arguments for them is as devices to counter the external effects of environmental pollution and of excessive alcohol and tobacco consumption. But, even in these cases, the optimal design is not obvious. If excise taxes are imposed only on petroleum products, other polluting materials (electricity, coal) might be overused. Similarly, harmful effects of alcohol consumption may only apply to heavy use. Moderate use might even be beneficial, but will also be discouraged by an excise tax.

With respect to other specific taxes, the case is harder to make. Taxes on lotteries, though universally used to raise revenues, are effectively substantial taxes on the poor. Taxes on luxuries might be thought to fulfill a purpose as a presumptive or redistributive tax, but they are prone to be used for protective purposes by targeting imported goods. Taxes on services like hotels are in the end distortionary taxes. To the extent that a strong broad-based tax system is in place, it should be possible to do away with most specific taxes, many of which were primarily useful as revenue-raising devices in the past.

User Fees

User fees are closely related to specific excises since they are imposed on a commodity-by-commodity basis. However, their rationale is quite different. Specific excise taxes are sources of revenue that simply go into general revenues. User fees are designed for one of three main purposes.

The first is to serve as a market pricing device to ration a marketable public good or service among consumers. This will be applicable in those instances where, for some reason, the public sector produces marketable products. These are most common at the local level in the case of water supply, refuse collection, libraries, parks and the like. In at least some of these cases, pricing need not cover costs. Marginal costs may be less than average costs for many of the services provided by the public sector. Alternatively, there may be equity arguments for not pricing even at marginal cost. For example, user fees charged for health services maybe well below marginal costs.

The second argument for user fees applies mainly to business inputs. Some services provided by the public sector may be necessary costs of providing certain commodities. For example, product inspections for health and safety represent a legitimate cost of providing the good, so it is proper to charge the industry for the services provided. Many regulatory functions of government might fall under this heading.

The third reason for imposing user prices applies more to the case of licenses. These may be vehicles by which the public sector obtains some of the rents accruing to publicly owned resources, as well as serving a rationing device. Television and radio licenses and resource royalties fall into this category.

While user fees are a legitimate source of revenues for government, by their very nature they are not likely to be a significant source of revenues.

V. SOME TAX ISSUES IN A GLOBAL ECONOMY

The above discussion was fairly general, and concerned mainly the case for different forms of taxation. There are a large number of issues of tax design that policy-makers must address. In this final section, we focus on some considerations that arise in the setting of international competitiveness in which countries now find themselves.

Tax Rates

The traditional concern about tax rates stems from the disincentive effect that they might have on economic activities of various sorts, and perhaps the incentive they would have for underground behavior. In an open economy, there is an additional consideration. Tax bases may be mobile across boundaries, and to that extent countries may be constrained by tax rates in neighbouring jurisdictions. Moreover, the existence of mobile tax bases itself provides an incentive for countries to compete tax rates down, perhaps inefficiently so.

The importance of international tax competition as a constraint on national tax policy depends upon how mobile is the tax base in question. It seems clear that capital, both financial and real, is highly mobile across borders (or at least it should be unless there are artificial measures in place to constraint it). Moreover, given the multinational nature of many corporations, the ability of them to shift profits from one country to another is significant. The implication of this is that taxes on capital income ought not diverge significantly from those abroad.

Two caveats are in order with respect to this prescription. The first is that from the point of view of the most mobile of capital tax bases - corporate profits - what is important is the statutory rate, not the average tax rate or the marginal tax rate. On the other hand, the average tax rate is relevant for new investments. The second point is that there are some types of profits for which the tax rate might not be as relevant. Pure rents generated from, say, natural resources should be relatively unaffected by taxes, provided the tax is designed only to capture a share of the rents and does not impinge upon capital income per se. Indeed, it is the nature of a tax on rents that it should not affect economic

activity. The implication of these two points is that statutory tax rates should not diverge much from those elsewhere in the international economy, and that tax systems should be designed so that marginal tax rates should be as close to zero as possible.

Other broad tax bases are much less mobile than capital. Broad-based taxes are typically borne by residents of the jurisdiction, and their mobility will be limited. The exception to this might be highly skilled persons and entrepreneurs, both of whom are in higher income tax brackets. The nature of the international economy has put them in high demand, and fears of a human capital drain naturally constrain governments not to impose high tax rates on these most mobile of individuals. Specific taxes can give rise to cross-border shopping problems in certain circumstances, and this too will impose a constraint on tax policy.

Progressivity of the Tax Structure

How progressive should the tax structure be? That question has been at the heart of the tax policy debate for decades. The traditional view is that the tax-transfer process is the main policy vehicle for redistribution, implying that the more progressive the rate structure, the fairer the tax system. Against that are several considerations.

First, virtually all studies of tax incidence that have been conducted in OECD countries show an overall pattern that is not too different from proportionality. For whatever reason, tax systems do not deliver progressivity on the scale that theoretical proponents typically recommend.

Second, much recent literature on optimal redistribution has come to the conclusion that the ideal degree of progressivity in the tax system is really quite limited. A classic study by Nobel Laureate James Mirrlees (1971) in fact argued that the optimal income tax system should have approximately constant marginal tax rates (the so-called linear progressive tax system). His argument was based solely on the disincentive effect of progressive taxes on labour supply. Once one adds the possibility of evasion, the case for progressivity becomes even weaker.

Third, and perhaps most telling, most important measures of redistribution take place through the expenditure side of the budget, and conversely much public spending is motivated by redistributive objectives.[1] These include expenditures in the areas of education, health care and social welfare. Evidence suggests that the lasting redistributive effects of these are much more significant than those achieved through the tax system. It is more effective to continue to concentrate redistributive effort in these areas than to try to do so through the tax system, which has been elusive in the past.

---

[1] See van de Walle and Nead (1995).

Universality versus Targeting

The fact that much public spending is largely redistributive in nature is of importance in the ongoing debate on the size of government, a debate that has been fuelled by the growing competitiveness of the international economy. Most industrialized nations established comprehensive welfare states in the early post-World War II period. In many cases, these provided comprehensive and universal benefits to all citizens. The universality of social programs has come under much scrutiny as budgetary and demographic pressures mount. An attractive response is to make social programs more targeted to those who truly need them.

This is easier said than done in many cases. For basic government transfers (welfare, family transfers, old age transfers), the mechanics are straightforward. In fact, targeting of such transfers is often readily done using refundable credits in the income tax system, thereby making it like a negative income tax system. Political resistance is the main drawback. Some argue that support for such transfers depends upon the middle classes having entitlements. In the case of social insurance programs, matters are more difficult. To the extent that programs like health care serve a pure insurance role independent of income, targeting is harder to justify.

Tax Mix

Different countries adopt very different mixes of income, sales and payroll taxes. From an economic point of view, relatively little is at stake here as long as the taxes are well designed. If all three adopt a consistent base (e.g., consumption or its equivalent) and are comprehensive in scope, their economic effects should be the same. Both payroll taxes and sales taxes distort the labour supply decision, as does the income tax if it is designed to be based on consumption. In any open economy context, all three forms of tax have similar incentives on international mobility. They affect mainly the mobility of persons rather than businesses. Countries may have different reasons for choosing different mixes of the three taxes, such as those based on administrative considerations. But from an economic point of view, this is a degree of freedom whose exercise has no big disadvantages.

Decentralization of Revenue Raising

Virtually every nation decentralizes the responsibility for the delivery of some public services to lower levels of government. This is true not only for federations in which the division of responsibilities is spelled out in a constitution, but also for so-called unitary states where local and regional governments provide many essential public services. The decentralization may be accompanied by varying

degrees of decision-making autonomy. Generally speaking, more autonomy is associated with more efficient and accountable service provision. But regardless of the extent of autonomy, revenue must be made available to the lower level jurisdictions. This can be either by transfers of funds (inter-governmental grants) or by the assignment of revenue-raising authority.

Conventional fiscal federalism principles suggest that accountability is enhanced if lower level governments are provided with enough revenue-raising authority to finance a considerable proportion of their expenditures. Moreover, all financing at the margin ought to come from local sources. In the case of federations, this implies that a broad source of revenue be made available to state jurisdictions. There are a number of ways to do this so that the state tax system is compatible with that being operated at the federal level. Of the three main tax bases, two are especially suitable for use at the state level - income taxes and payroll taxes. In the case of income taxes, it is important that there be some harmonization between state and national tax systems. This can be achieved in a way that retains the advantages of harmonization by allowing the states to piggyback on the federal income tax system. They can simply impose surtaxes at their chosen rates on the federal tax liabilities, thereby retaining the federal base and rate structure. Or they could in principle impose their own rate structure on the federal tax base. In either case, the retention of the federal base and a single tax collection authority are attractive features. For payroll taxes, given the relative ease of collection, the states could actually have their own independent systems rather than piggybacking into the federal system. In fact, responsibility for payroll taxation could be turned over entirely to the states.

Other tax sources might be useful for state or local governments. Property taxes are common revenue instruments at this level, as are user fees and licenses. As well, taxes on natural resources are good sources of state revenue given that the states are typically responsible for natural resource management and the provision of infrastructure.

While decentralization of revenue-raising responsibility is of great importance in enhancing the efficiency and accountability of public service provision, there is one potentially serious drawback. Different states will have different abilities to raise revenue. When revenue raising is decentralized, that implies they will have differences in the ability to provide given levels of public service. The standard argument in the literature is that such differences in fiscal capacity can result in an inefficient allocation of resources across states, as well as the horizontally inequitable treatment of citizens in different jurisdictions. Almost all nations therefore accompany fiscal decentralization with an effective system of equalization transfers intended to ensure that all lower-level jurisdictions have the ability to provide comparable levels of public service. This is no less true of unitary nations with local and regional autonomy than of federations. Comprehensive systems of equalization compensate both for

differences in revenue-raising capacity as well as differences in need for public expenditures arising from, say, demographic differences across jurisdictions.

Kindness to Investment, Innovation and Risk-Taking

Finally, it is worth re-iterating what is perhaps the most relevant imperative in the new global economy, and that is the importance of making the tax system friendly to investment, innovation and risk-taking. All three are key determinants of the rate of productivity growth and growth in per capita incomes, and are therefore indispensable for developing the ability of an economy and its government to provide a decent standard of living for all citizens. While it is difficult for governments to pick winners - and such attempts should be vigorously resisted - it is possible for the tax system to be designed so that investment is encouraged, as are individual entrepreneurial initiatives. Basing income on consumption is a key element in that strategy. Reforming the business tax system so that all business activities are put on a level playing field is important. Perhaps more important, the business tax system should reinforce rather than discourage the incentive to invest and innovate. This means that marginal tax rates should be as close to zero as possible. And, the system should treat positive and negative tax liabilities symmetrically so as to avoid discouraging risk and the growth of small enterprises. Full loss offsetting, achieved if possible by full refundability of losses, is essential. Statutory tax rates on highly skilled workers and businesses should be no higher than in competing countries so that the best and the brightest are retained.

REFERENCES

Ahmad, E. and N. Stern (1991), *The Theory and Practice of Tax Reform in Developing Countries* (Cambridge, UK: Cambridge University Press).

Atkinson, A.B. and J.E. Stiglitz (1980), *Lectures on Public Economics* (New York: McGraw-Hill).

Boadway, R.W. (1997), "The Role of Second-Best Theory in Public Economics," in B.C. Eaton and R.G. Harris (eds.), *Trade, Technology and Economics: Essays in Honour of Richard G. Lipsey* (Cheltenham, UK: Edward Elgar), pp. 3-25.

Boadway R.W. and F.R. Flatters (1993), "The Taxation of Natural Resources: Principles and Policy Issues," World Bank Policy Research Working Paper WPS 1210, No. 1993.

Drèze J. and N. Stern (1987), "The Theory of Cost-Benefit Analysis," in A.J. Auerbach and M.S. Feldstein (eds.), *Handbook of Public Economics, Volume II* (Amsterdam: North Holland), pp. 909-989.

Economic Council of Canada (1987), *Road Map for Tax Reform: The Taxation of Savings and Investment* (Ottawa: Supply and Services Canada).

Kaldor, N. (1955), *An Expenditure Tax* (London: Allen & Unwin).

Institute for Fiscal Studies (1978), *The Structure and Reform of Direct Taxation: Report of a Committee Chaired by Professor J.E. Meade* (London: Allen & Unwin).

Mintz, J. (1996), "The Corporation Tax," in M.P. Devereux (ed.), *The Economics of Tax Policy* (Oxford: Oxford University Press), pp. 137-187.

Mirrlees, J. (1971), "An Exploration in the Theory of Optimum Income Taxation," *Review of Economic Studies* 38, pp. 175-208.

Tuomala, M. (1990), *Optimal Income Tax and Redistribution* (Oxford: Clarendon Press).

United States Treasury (1977), *Blueprints for Basic Tax Reform* (Washington: US Government Printing Office).

van de Walle, D. and K. Nead (1995), *Public Spending and the Poor: Theory and Evidence* (Baltimore: Johns Hopkins University Press).

Economic Aspects of Foreign Financing

Glenn P. Jenkins*

I. INTRODUCTION

Large-scale, capital intensive projects frequently rely on foreign financing and as a result the foreign-owned segment of many sectors has grown considerably. New projects either reallocate the existing foreign investment within an economy or draw increment foreign investment into the country. Conventional methodologies for the economic appraisal of projects have usually recommended that the source of the funds used for financing of the project, either domestic or foreign be ignored. This assumption is increasingly being called into question as foreign investors and operators have increasingly dominated the private provision of public services. Many of these BOT and BOO contracts are far from being transparent capital market transactions. Hence, the form of the arrangement will have a different economic cost as they involve different flows of resources in and out of the host country. In this paper a methodology is outlined for estimating the nature and magnitude of the net economic benefits, which may result from the foreign financing of new investments; such net benefits should be included in the overall economic evaluation of a project.

*The author is Professor of Economics, Queens University and Institute Fellow Emeritus, Harvard University.

Public concern over foreign ownership has often focused on the issue of possible foreign control of a county's economy and interference with decision-making that would otherwise have been in the domestic economy's best interests.[1] Although we recognize the importance of such issues, we limit our examination to estimating the net economic benefits (costs) resulting from changes in the pool of capital resources available to a country due to the use of foreign financing for the project. Negative political externalities resulting from foreign control also may add to the economic costs arising from changes in foreign investment, as they might also cast a shadow over a project that would otherwise have created substantial net economic benefits for the country.

The economic benefits and costs of a project should initially be examined regardless of the source of financing. The economic opportunity cost of capital (EOCK) should be used as the economic discount rate for evaluating the economic costs and benefits that occur to the project overtime. The EOCK is the measure of the real opportunity cost of the funds that are drawn out of the pool of capital available to the country to finance investments. This pool of capital will include both domestic and foreign owned funds.

From a global perspective, if a new investment opportunity is financed from foreign sources, the net economic benefits from the project (discounted by the economic opportunity cost of capital) are going to be shared not only by the government (g) and the other residents of the country (p) but also by foreigner's (f). In net present value (NPV^e) terms we thus have:

$$NPV^e = B_g + B_p + B_f - C_g - C_p - C_f \qquad (1)$$

where B and C represent gross benefits and costs respectively. Benefits realized by the government (B_g) take the form of such items as taxes and fees paid to the treasury. Benefits realized by the foreign investors' (B_f) comprise the debt repayment, interest, and dividend payments. B_p denotes the benefits accruing to the non-government sectors of the host country. All valuables are expressed as present values. Since we want to evaluate the economic performance of the project from a perspective of the host country only, it is necessary to adjust the net economic benefits for the benefits and costs realized by foreigners.

To make this adjustment in the appropriate manner, however, we must also ascertain whether our project has simply reallocated the existing foreign capital in the country, or has it attracted incremental foreign investment into the country. A normal supply function of foreign financial capital to any country has a finite elasticity. The implication is that the use of foreign owned capital for a

---

[1] For an excellent discussion of some of the historical experience of conflict between foreign investors and sovereign governments, see Wells and Gleason (1995).

specific project makes additional foreign investment more expensive to attract. Some fraction of the foreign investment for our projects will thus result in a move away from foreign financing of other projects, and some fraction will likely be an incremental addition to the total quantity of foreign financing obtained by the country. The normal cost of these funds as measured by the capital market is included in the EOCK for a country. The estimate of the EOCK, however, does not capture the net economic benefits (costs) resulting from foreign investment that arise due to the special characteristics of the project and the idiosyncratic nature of the financial agreements that determine the ultimate return to the foreign investors.

II. MEASUREMENT OF THE BENEFITS FROM INCREMENTAL FOREIGN INVESTMENT

Foreign investment can be considered incremental to a host country when it is specific to a project, and when the project would not be undertaken unless the foreign capital was available. Furthermore, the attraction of foreign investment to this project does not affect the ability of the country to service its other foreign owned financial obligations. This suggests that the project is not available to other foreign investors and that the project itself will generate enough incremental foreign exchange to service this investment. In economic terms, the combination of this project and its funding causes the supply curve of foreign financing to the country to shift by an equal amount to the right. In this sense foreign financing of the project is incremental to what foreigners would otherwise invest in the host country.

If the foreign investment is incremental, then the host country should not be concerned over how much the foreigners put into or take out of the project. It should ensure, however, that the host country's resources, which are employed in the project along with the foreign capital, earn an economic rate of return at least as great as they could have earned in alternative uses. This is accomplished by evaluating all resources at their economic opportunity cost and by discounting all relevant costs and benefits by the economic opportunity cost of capital. Since our evaluation of a new investment opportunity adopts a host country point of view, we simply want to exclude C_f and B_f from equation (1) by adding ($C_f - B_f$) to it as follows:

$$NPV = NPV^x + (C_f - B_f) = B_g + B_p - C_g - C_p \qquad (2)$$

Since the incremental foreign capital (C_f) also provides incremental foreign exchange, the additional foreign investment carries an additional premium (ρ) to reflect the difference between the economic opportunity cost of foreign exchange and the market exchange rate (Jenkins and Kuo, 1998). By the same

token dividends, interest, and loan repayments made to foreign investors' (B_t) entail a loss of foreign exchange, which also results in a loss of the foreign exchange premium. Foreign owners of the capital in their return do not capture the net foreign exchange externality that accrues to the host country as a result of foreign investment. As the foreign exchange externality from foreign financing not included in the NPV* of net benefits from the project, we must add $\rho\,(C_t - B_t)$ to both sides of the equation (2) to yield the adjusted economic net present value NPV^*_a,

$$NPV^*_a = NPV^* + (1+\rho)\,(C_t - B_t) = B_g + B_p - C_g - C_p + (\rho)\,(C_t - B_t) \quad (3)$$

The total adjustment to equation (1) made necessary by incremental foreign investment, $(1+\rho)\,(C_t - B_t)$, will raise or lower the present value of net economic benefits to host country depending on whether $(1+\rho)(C_t - B_t)$ is positive or negative. If $B_t > C_t$, for example, the stream of dividends (net of withholding tax) plus interest and debt repayment is sufficient, when discounted at the EOCK, to permit foreigners to recapture their investment and to earn a rate of return greater than the EOCK. The result is that the economic net present value from the point of view of the host country will be less after making the adjustment for the cost of incremental foreign investment than before the adjustment is made. If after making the adjustment we find that the economic net present value NPV^*_a is greater than zero, the host country should permit the project. If on the other hand, the NPV^*_a is less than zero, the country is going to be made worse off by this project and it should not go forward.

III. THE BENEFIT FROM REALLOCATING FOREIGN INVESTMENT ALREADY PRESENT IN THE HOST COUNTRY

As noted above, a normal supply function of foreign financial capital to a host country has a finite elasticity. In the previous section, we adopted the extreme assumption of allowing all the foreign investment for a project to be incremental to the host country. In this section, we go to the opposite extreme by assuming that foreign investment for a project results only in a reallocation of foreign investment away from other projects in the host country. It is assumed that the project will go ahead even without the foreign investment, we then need to know whether the country is better off to use the foreign capital for this specific project rather than in alternative projects.

When none of the foreign investment for our project is incremental to the host country, but only reallocates the existing pool of foreign capital resources away from other projects, we must adjust equation (1) in a different fashion. As before, the present value of the benefits foreigners receive from their investment (B_t) is the stream of dividends, interest and loan repayments, discounted at the EOCK that

actually flows from the project. The relevant opportunity cost of the investment for the foreigners is the stream of benefits that they would have received from the alternative investment foregone (B^a_t).

The benefit to foreigners from alternative investment in the host country is equal to the present value of the real (net of inflation) returns these investments would have earned. Since foreign-owned capital is part of the host country's capital stock, it is reasonable to expect that foreign investors would earn a rate of return roughly equal to that earned on the total capital stock in the host country. We shall denote the private discount rate that makes the net present value of the net-of-tax net cash flow to total capital equal to zero as r_t.[2]

In the case where the foreign investment is non-incremental, a greater than normal return to foreigners represents a net cost to the economy. In contrast, a foreign investor may be willing to make an investment and receive a lower than normal rate of return (for example, if the investment is of great strategic importance to the firm). In this case the participation in the financing by this particular foreign investor will increase the economic net present value of the project.

The level of political risk that foreign investors face with a particular project may mean that they will require a higher or lower than normal rate of return from a particular project (Wells and Gleason, 1995). There is strong evidence that foreign investors considering investing in electricity projects in some countries have required higher than normal rates of return due to the perceived political risk they are likely to face in the future with such projects (Jenkins and Lim, 1998). In other cases, foreign investors might face restrictions on the length of the term of debt financing available for a project. This may mean that the price set for the project's service has to be set very high initially in order to make the debt service obligations. Over time the debt will be repaid, but the continuation of such pricing policies might cause the foreign equity holders to earn an extraordinary high rate of return (IIAS, 1998).

In either of these circumstances, the project might still have a positive economic NPV from the host country's point of view after making the adjustment for the higher than usual returns that have to be paid to these particular foreign investors. In such a situation, the host country evaluators of the project should first consider alternative methods of managing the risks or consider alternative financial structures, before giving final approval to the project.

If by investing in a specific project foreigners earn a real return just equal the average of r_t, then the ratio (Z) of the present value (discounted at r_t %) of the stream of foreign equity and debt invested in the project over the present value (discounted at r_t%) of the foreign dividends, debt repayment and interest received

[2] For example, in the Philippines the value of r_t has been estimated to be approximately 9.75 percent (see Jenkins and Kuo, 1998).

(equation 4) would equal 1. If this ratio (Z) were greater than 1, then foreigners would be earning less than a r_f% return by investing in the project; if the ratio were less than 1, then foreigners would be earning more than a r_f% real return.

$$Z = \left[\frac{\text{PV (foreign equity + foreign debt) at } r_f \text{ discount rate}}{\text{PV (foreign dividend + foreign interest + foreign repayment)for project at } r_f \text{ discount rate}} \right] \quad (4)$$

By multiplying this ratio times the actual stream B^t_f (where t = 0.....n) of dividends, debt repayment, and interest received from foreigners from the project, we can determine the stream of payment to foreigners which is below, above, or equal to what the normal stream would be B^{st}_f (where t = 0.....n)[3]. Discounting the difference between these two streams (B^{st}_f - B^t_f) by the EOCK for the country yields our estimate of the present value of the externality E_f enjoyed or (imposed) on the country because the foreign investment in this specific project will demand a return that is lower or (higher) than what is normal in the market.

Following the reasoning used in the previous section, the total adjustment we must make in this case is to add $(1+\rho)\ E_f$ to equation (1). Hence, equation (1) becomes:

$$NPV^s = B_g + B_p + B_f - C_g - C_p - C_f + (1+\rho)\ E_f \quad (5)$$

When the ratio of the present values, Z, is equal to one, our project yields foreign investors just a normal return and no adjustment to equation (1) is necessary.

If, however, Z is greater than one, then $E_f > 1$ and therefore $(1+\rho)\ E_f > 1$. This suggests that the project should receive a net benefit for paying out less to foreigners than the country would have if it had used the foreign financing for alternative investments. Since this case also implies that private investors earn less than a normal real rate of return of r_f, we must pause to consider some other factors before adding this net benefit to the economic externalities attributable to the project.

A critical factor in determining the rate of return that a foreign investor demands before making the investment is the economic cost of any explicit and implicit guarantees the project or the investor receives from the country (usually the government) (Vega, 1997). The guarantees that are designed to remove risk from the perspective of the foreign investor may cover a wide range of issues. Examples include completion guarantees, loan guarantees, and the contractual allocation of

[3] The stream of dividends, debt repayment, and interest received are all measured in constant dollars.

the foreign exchange rate risk to either the government or consumers.[4] These guarantees have associated with them real economic costs that usually are not explicitly accounted for in the cash flows of the project (Mason, Baldwin and Lessard, 1983). Hence, while it may appear that the foreign investor is willing to make funds available at an abnormally low required rate of return, it might simply be that the government is bearing a larger proportion of the financial risks than is normal for such investments.

Another factor that often is present in the foreign financing of investment projects is financing subsidies given by foreign governments to promote certain types of investments abroad. If these subsidies are included, it might appear that a host economy is receiving a substantial benefit because the project attracts this subsidized financing.

It is generally incorrect to include any foreign (or domestic) financing subsidies as a benefit (or a reduction in financing costs) to any single project. Usually such financing subsidies are provided to countries through a quota system, where it will not be able to get more than a given amount of such subsidies over a period of time. From the point of view of the promoter of any single investment in the host country, it might appear that these foreign financing subsidies are either bringing in incremental foreign financing, or are at least a reduction in the cost of foreign financing that would have been available to the host country. In both cases, it is incorrect to credit the financing subsidy provided to any single project within a country.

IV. CONCLUSION

The central issue in the evaluation of the benefits or costs to an economy from foreign financing of investments is the determination of the proportion of the inflow of foreign financing to project which is a substitute for other foreign capital inflows, and the proportion that represents an increase in the productive resources available to the host country. Because the economic cost of incremental and non-incremental foreign investment may be quite different, the relative size of this parameter can be a critical determinant of the economic net present value of a project.

---

[4] A good example of the allocation of foreign exchange rate risk to consumers can be found in the Concession Agreement between Metropolitan Waterworks and Sewerage System and the private contractor in the case of the privatization of the water systems in Manila. In this case any movement in the nominal exchange rate between the peso and the currency of the loans that was greater than 2 percent from the date of the agreement would be built into the adjustment for the price of water. It is not surprising that the concessionaires borrowed large amounts of funds in Yen, the currency that was likely to appreciate the most with respect to the peso.

A difficulty that plagues the empirical estimation of the proportions of the foreign investment that are incremental and non-incremental arises because the impact of today's foreign investment on the demand and supply of foreign saving need not be completed within a given period of time. In addition, the nature of the various types of financial obligations undertaken by a country will alter the impact of the inflow of foreign savings on the investment and saving decisions in the country over extended periods of time.

Because of the serious statistical problems that arise in the derivation of reliable estimates of the long-run effects of foreign investment on capital formation, and the plethora of unaccounted for implicit and explicit guarantees associated with many projects, caution is warranted before crediting a project either for inducing incremental foreign investment or for securing low cost foreign financing. In the vast majority of cases, a project that is being financed from foreign sources will be simply reallocating the total amount of foreign investment available to the country. This arises due to the constraints on a country's ability to repay its foreign financial obligations. In such a situation, the main concern of the project evaluator is to determine if this project is being structured in such a way (or is attracting the type of foreign investor) that will require a greater than normal rate of return to participate in this project. In this case, the economic analysis should reflect this higher cost and the particular financial design of the project appropriately penalized.

Factories that are being set up in an export-processing zone can illustrate a case where a project is likely to create incremental foreign investment. In such a case, the primary concern of the project analyst is to see that the domestic resources being used to accommodate this foreign investment are yielding a net return of at least equal to the economic opportunity cost of capital. The foreign investment coming in to finance the factory is a benefit to the country and the flow of interest, dividends and loan repayments are costs. The question here is, does the domestic labor and capital being employed earn a return greater than their economic opportunity cost?

Probably the most important reason for not giving a benefit to a project for non-incremental foreign investment that appears to have been made available at lower than normal costs, is the existence of complex guarantee provisions that are at the heart of all project financing arrangements. In such a situation the costs of financial risk may be reflected in other charges to the project separate from the rate of interest and expected dividends. Often the costs of risk management are being borne by the government, and are not allocated in any way to the project. It is the economic costs of these guarantees that need to be the focus of the analyst's attention.

Guarantees that are provided by the government to domestic investors may alter behavior and damage or help a project, but the triggering of the guarantee is essentially a transfer from the government to the domestic financial institutions within the country. This could have little or no economic cost. This is not the case with guarantees made to foreign investors. When such a guarantee is exercised, the

flow of funds is an outflow of economic resources. In this case, the expected economic cost to the economy is increased above what it would be if no guarantee were given.

REFERENCES

Asian Development Bank (ADB) webpage at http://internotes.asiandevbank.org/notes/phil/3f3a.htm visited Aug. 12, 1998.

International Institute for Advanced Studies (IIAS) (1998), *Buenos Aires-Colonia Bridge Project, Financial and Economic Appraisal*, July 30.

Jenkins, Glenn and Chun-yan Kuo (1998), "Estimation of the National Parameters for Economic Cost-Benefit Analysis for the Philippines," Harvard Institute for International Development Discussion Paper (Harvard: Harvard University), May.

Jenkins, Glenn P. and Henry B.F. Lim (1998), "An Integrated Analysis of a Power Purchase Agreement," Harvard Institute for International Development Discussion Paper (Harvard: Harvard University).

Mason, Scott, C. Baldwin, and D. Lessard (1983), "Budgetary Time Bombs: Controlling Government Loan Guarantees," *Canadian Journal of Public Policy* 9 (3).

Vega, Arturo Olvera (1997), "Risk Allocation in Infrastructure Financing," *The Journal of Project Finance* 3 (2), Summer.

Wells, Louis T. and Eric C. Gleason (1995), "Is Foreign Infrastructure Investment Still Risky?," *Harvard Business Review*, Sept.-Oct.

Environment, Culture and Services

Globalization and Environmental Quality

Nancy Olewiler

INTRODUCTION

Sustainability of our natural environment is crucial to economic growth and development. Our natural and environmental resources such as land for timber and agriculture, water, minerals, fish stocks and other wildlife, our atmosphere, and ecosystems generally, are essential to life. Degradation of our natural environment will affect both the quality of life and the ability of an economy to produce goods and services over time. What is the relationship between a world economy that is becoming increasingly integrated through international trade, factor and investment flows and global environmental quality? This paper looks at various empirical measures of environmental quality, and links these to globalization. After a short review of the literature, both theoretical and applied, I turn to estimation of the links between globalization and environmental quality throughout the world, focusing on the links between indicators of environmental quality and income and an economy's openness. I conclude with some conjectures on whether knowledge-based economic development will enhance environmental quality.

II. BACKGROUND

The literature on the relationship between globalization and environmental quality has evolved in a number of directions. One strand looks at the relationship between income levels and environmental quality indicators. There are competing theoretical notions of what this relationship should be. One might argue that income and environmental degradation must be positively correlated because rising incomes lead to more consumption and more consumption increases waste throughput; hence more pollution. Alternatively, environmental quality may be an income elastic good. Higher income levels lead people to desire higher levels of environmental quality B more parks, cleaner air, more environmentally friendly goods, more recycling, and so on. People will pressure their governments to increase the regulation of pollution-intensive activities. Higher incomes may also allow production processes to be "cleaner." Pollution per unit output may be reduced by investing in a more environmentally friendly or simply newer, more energy efficient production technology. High-income countries may be better able to afford those types of investments. Environmentally friendly technologies may also be mandated by government policy (in response to the public's demand for higher levels of environmental quality).

Grossman and Krueger (1995) summarized these possible relationships into three effects. The first is called the *scale effect*. This relationship says that higher levels of GDP lead to more consumption, which in turn, leads to lower levels of environmental quality. The *composition effect* captures the possible positive effects of higher GDP on environmental quality due to changes in consumers' demand toward more environmentally friendly goods and production. Finally, the *technique effect* looks at the relationship between GDP and how environmentally friendly are production technologies. The scale effect is unambiguously negative, while the composition and technique effects could be of either sign. It is thus possible if the composition and/or technique effects are positive (rising GDP leads to rising environmental quality) and large enough, they may offset the scale effect. The answer is thus an empirical issue.

The empirical relationship developed is called the "environmental Kuznets curve" (EKC). A reduced form equation is specified where an environmental quality indicator is the dependent variable and GDP in various forms (linear, squared, cubed, and averaged over some time period) and

sometimes other covariates are the independent variables.[1] Different specifications of GDP allow for estimating alternative functional forms. There are many examples of this basic relationship in the literature.[2] A structural model would be a preferable approach where one could isolate the effects of environmental regulation, technology, and industrial composition on GDP and then link this to pollution indicators. But this sort of structural model would be very data intensive and could easily build in a number of biases with each step. Another problem is what environmental quality indicator to use. There is no single index of environmental quality for a country. Various measures have been used including measures of air quality (sulphur dioxide, particulate matter), water quality (dissolved oxygen, fecal coliform, heavy metals), carbon dioxide levels, solid waste, and more. Due to the lack of time series data for environmental quality measures, most studies have looked at a cross section of countries with very different income levels. The environmental quality data also tends to be of poor quality. Because the data comes from many different countries, there is no guarantee that it is collected comparably and when there is a time series shown for a given country, there is no guarantee that the data are even comparable year-to-year.

Despite these difficulties, a number of studies have been done and the results show a number of different patterns between GDP and environmental quality. Figure 1 shows examples of the types of results found in the literature.[3] Estimated environmental Kuznets curves are illustrated for a number of different environmental indicators for two years (different years for each graph). Three different patterns are found. For lack of safe water, lack of urban sanitation, and dissolved oxygen in rivers, there is an inverse relationship between per capita GDP and pollution indicators. For per capita municipal solid waste and carbon emissions, the relationship is positive. For the other indicators (deforestation, particulates, sulphur dioxide, fecal coliform), there is an inverted U-shape that suggests that pollution rises with income up to some turning point at which it

---

[1] The covariates may include characteristics of the site where environmental quality is measured (e.g., dummies for the location of the monitoring site, nature of land use, population density of cities, etc). These covariates are unlikely to be correlated with GDP, so are included to help reduce residual variance in the relationship between GDP and environmental quality, and thus obtain more precise estimators. See Grossman and Krueger (1995) for details.

[2] Other early examples of this literature include Grossman and Krueger (1993), Seldon and Song (1994, 1995), Shafik (1994), and World Bank (1992). For a more recent look at the EKC hypothesis see Hettige, Mani, and Wheeler (1999).

[3] The source for these figures is World Bank (1992). GDP is per capita measured in constant US dollars. The pollution indicators are generally in per capita terms.

begins to fall again. The interpretation of the inverted U-shape is that as an economy grows, the scale effect initially predominates. But as outputs/incomes continue to grow, the composition and technique effects may become more important and offset the scale effect to lead to greater environmental quality as GDP rises.

The main conclusion from the EKC studies is that there is no consistent relationship between rising GDP and indicators of pollution. The evidence certainly does not suggest that pollution must rise with economic growth. Caution is in order, especially where the results yield the inverted U-shape. Few countries in the world have per capita incomes higher than $10,000 US. This can bias both the shape of the curve and the location of the turning point at which pollution starts to fall with increases in per capita GDP. Another factor that may be generating the U-shape is the influence of trade flows. As GDP in a country rises, there is a change in the production mix in response to people's demand for less pollution-intensive production. But the population may still wish to consume pollution-intensive goods, just not the pollution. The way to do this is to import pollution-intensive goods from countries with lower levels of per capita GDP. High-income countries will, for example, pass more restrictive pollution regulations, driving out the pollution-intensive industries to other countries/regions where regulation is weaker. This is called the *pollution haven* hypothesis (or environmental dumping). More formally, the "pollution haven" hypothesis states that if an economy is open to trade and factor flows, pollution-intensive industries will migrate to areas with weak environmental regulation. There is also a theoretical trade model literature that demonstrates how freer trade can reduce environmental quality.[4]

A corollary of the pollution haven hypothesis is the "race-to-the-bottom" effect. If free trade exists between countries with different degrees of environmental regulation, countries with more stringent regulation will be forced by domestic interest groups to "protect jobs and investment" by weakening their regulation of pollution-intensive industries. All countries will have to follow suit to stay competitive and over time, globalization with freer trade will lead to less environmental regulation in all trading countries. As these two hypotheses emanate from the same underlying premise - globalization and freer trade worsen environmental quality, I'll summarize the empirical evidence simultaneously.

Despite a healthy amount of empirical research, there is little conclusive evidence to support either the pollution haven or race-to-the-bottom (RTTB) hypotheses. The "early" literature of the late 1980s and early 1990s found no consistent evidence to support the hypothesis that rich countries are getting cleaner at the expense of poor countries, or that opening up to trade tends to weaken

---

[4] See Copeland and Taylor (1994, 1995) and Chichilnisky (1994) for examples of this literature.

environmental regulation and enforcement over time. More recent work (late 1990s) continues to find little or no support for pollution havens or RTTBs.

The following observations can be drawn from these papers:[5]

1. Between 1973 and 1982, comparative advantage in pollution intensive industries in the United States fell (Robison, 1988).

2. Developed countries' share of pollution-intensive exports is higher than that of developing countries. This contradicts the hypothesis that developing countries will become pollution havens. See Low and Yeats (1992).

3. In a study of 25 Latin American countries, Birdsall and Wheeler (1993) found that countries which were the most open to trade had the highest incomes and most rapid growth and the largest share of environmentally friendly production.

4. Lucas, Wheeler, and Hettige (1992) looked at the correlation between income levels, openness to trade and the toxic intensity of production for countries world wide. They found the countries characterized by the lowest incomes and most closed to trade, were the most pollution-intensive.

5. Suspended particulate matter (SPM) are air pollutants associated with adverse health effects in major urban areas. Wheeler (2000) finds an inverse correlation between SPM and foreign direct investment (FDI) in major metropolitan areas of China, Brazil, Mexico, and the United States. The evidence is inconsistent with the RTTB hypothesis. For example, over the period from the mid-1980s to mid to late-1990s, SPM declined by 40 percent in China's major metropolitan areas, while FDI increased by over 700 percent. In all five of the US's major metropolitan areas, SPM fell. The decline from 1988 to 1997 in Los Angeles was 32 percent.

There are many critiques of these studies. There might not have been enough time since the introduction of regulation to discern an effect. The data is too aggregate to pick up the effects. Because of the level of aggregation, there is no way to explicitly take into account differences among countries in the degree of environmental regulation and enforcement of regulation. Differences between

[5] Also see studies by Leonard (1988), Tobey (1990), Carson, Jeon, McCubbin (1997), List and Co (2000).

begins to fall again. The interpretation of the inverted U-shape is that as an economy grows, the scale effect initially predominates. But as outputs/incomes continue to grow, the composition and technique effects may become more important and offset the scale effect to lead to greater environmental quality as GDP rises.

The main conclusion from the EKC studies is that there is no consistent relationship between rising GDP and indicators of pollution. The evidence certainly does not suggest that pollution must rise with economic growth. Caution is in order, especially where the results yield the inverted U-shape. Few countries in the world have per capita incomes higher than $10,000 US. This can bias both the shape of the curve and the location of the turning point at which pollution starts to fall with increases in per capita GDP. Another factor that may be generating the U-shape is the influence of trade flows. As GDP in a country rises, there is a change in the production mix in response to people's demand for less pollution-intensive production. But the population may still wish to consume pollution-intensive goods, just not the pollution. The way to do this is to import pollution-intensive goods from countries with lower levels of per capita GDP. High-income countries will, for example, pass more restrictive pollution regulations, driving out the pollution-intensive industries to other countries/regions where regulation is weaker. This is called the *pollution haven* hypothesis (or environmental dumping). More formally, the "pollution haven" hypothesis states that if an economy is open to trade and factor flows, pollution-intensive industries will migrate to areas with weak environmental regulation. There is also a theoretical trade model literature that demonstrates how freer trade can reduce environmental quality.[4]

A corollary of the pollution haven hypothesis is the "race-to-the-bottom" effect. If free trade exists between countries with different degrees of environmental regulation, countries with more stringent regulation will be forced by domestic interest groups to "protect jobs and investment" by weakening their regulation of pollution-intensive industries. All countries will have to follow suit to stay competitive and over time, globalization with freer trade will lead to less environmental regulation in all trading countries. As these two hypotheses emanate from the same underlying premise - globalization and freer trade worsen environmental quality, I'll summarize the empirical evidence simultaneously.

Despite a healthy amount of empirical research, there is little conclusive evidence to support either the pollution haven or race-to-the-bottom (RTTB) hypotheses. The "early" literature of the late 1980s and early 1990s found no consistent evidence to support the hypothesis that rich countries are getting cleaner at the expense of poor countries, or that opening up to trade tends to weaken

[4] See Copeland and Taylor (1994, 1995) and Chichilnisky (1994) for examples of this literature.

environmental regulation and enforcement over time. More recent work (late 1990s) continues to find little or no support for pollution havens or RTTBs.

The following observations can be drawn from these papers:[5]

1. Between 1973 and 1982, comparative advantage in pollution intensive industries in the United States fell (Robison, 1988).

2. Developed countries' share of pollution-intensive exports is higher than that of developing countries. This contradicts the hypothesis that developing countries will become pollution havens. See Low and Yeats (1992).

3. In a study of 25 Latin American countries, Birdsall and Wheeler (1993) found that countries which were the most open to trade had the highest incomes and most rapid growth and the largest share of environmentally friendly production.

4. Lucas, Wheeler, and Hettige (1992) looked at the correlation between income levels, openness to trade and the toxic intensity of production for countries world wide. They found the countries characterized by the lowest incomes and most closed to trade, were the most pollution-intensive.

5. Suspended particulate matter (SPM) are air pollutants associated with adverse health effects in major urban areas. Wheeler (2000) finds an inverse correlation between SPM and foreign direct investment (FDI) in major metropolitan areas of China, Brazil, Mexico, and the United States. The evidence is inconsistent with the RTTB hypothesis. For example, over the period from the mid-1980s to mid to late-1990s, SPM declined by 40 percent in China's major metropolitan areas, while FDI increased by over 700 percent. In all five of the US's major metropolitan areas, SPM fell. The decline from 1988 to 1997 in Los Angeles was 32 percent.

There are many critiques of these studies. There might not have been enough time since the introduction of regulation to discern an effect. The data is too aggregate to pick up the effects. Because of the level of aggregation, there is no way to explicitly take into account differences among countries in the degree of environmental regulation and enforcement of regulation. Differences between

[5] Also see studies by Leonard (1988), Tobey (1990), Carson, Jeon, McCubbin (1997), List and Co (2000).

countries that are not connected to environmental factors such as factor endowments and prices are also not incorporated into these studies. The Lucas *et al.* paper (1992) also assumed that pollution intensity for an industry did not differ by country; they used the pollution intensity coefficients of US industries as the weighting factor. This is simply not the case. We would expect pollution intensity (toxics released per unit output or employment) to vary across countries in response to factor endowments, waste disposal opportunities, regulation, and so on. Unfortunately, there is generally insufficient data for countries to compute toxic intensity by industry. Estimates have also been done for Canada (see Olewiler and Dawson, 1998), who find that there are significant differences between Canada and the US in toxic intensity of a number of industries. Other reasons why there is so little evidence for pollution havens and a RTTB, may be due to offsetting policies introduced by governments to lower costs for their pollution-intensive industries. These might include favourable tax policies toward these industries (tax holidays, lower rates, tax expenditures, etc.), subsidized energy prices, infrastructure subsidies, and so on.

One of the key difficulties in doing any empirical work on the relationship between growth and environmental quality is the lack of a good empirical measure of the degree and nature of environmental regulation and enforcement. If regulation and enforcement is even included as an explanatory variable in a study, it is generally in the form of a time dummy B the year some regulation is enacted, or government expenditures on environmental protection, or other such proxy. An important area for research is to obtain better measures for the regulatory factor. Studies that do look at regulatory stringency do however tend to find that as expected, environmental quality is positively correlated with stringency, and that environmental regulation increases as a country's income rises.

While these critiques may suggest that it is premature to reject the pollution haven hypothesis, the general inability of studies to find consistent evidence of pollution havens and a RTTB and the EKC results suggest that environmental quality will eventually rise as globalization and economic growth continue. What are the possible reasons? I highlight a number of explanations.

1. The studies support the notion that environmental quality is income-elastic because regulation is income-elastic. Rising incomes are associated with rising levels of health, education, and technical knowledge (the causality could of course go the other way). When people understand the links between polluting activity and their health and degradation of their ecosystems, there is more social pressure for environmental regulation. Rising education also provides more local technical expertise to address environmental problems.

2. There may be a cascading effect in environmental regulation as a function of income that makes a pollution haven only a temporary condition. As a

country's income grows, it may begin to shed its most pollution-intensive industries to lower income countries (havens) that will have less environmental regulation. But as (and if) those countries grow, the cycle will continue and they too will shed their pollution-intensive industries.

3. Industries themselves don't move in response to environmental regulation; they simply adjust their production technologies to become less pollution-intensive over time. Aggregate studies will not be able to pick up these industry-level effects. Mani and Wheeler (1998), looking at more disaggregated data from 1960 to 1995 for Japan and comparing that to aggregate measures for other regions of the world by "eyeballing" a series of figures, do not find support for the pollution haven hypothesis. They argue that pollution havens are self limiting because economic growth leads to more environmental regulation and investment in cleaner production. These results are consistent with a U-shaped EKC.

4. Pollution control costs are simply too low a share of the total costs of a firm or industry to warrant significant change in its behaviour. While data on pollution control costs is scarce in many developing countries, there have been studies done examining industrial location as a function of environmental regulation in US states. The results are mixed; some find plant location of pollution-intensive industries does respond to differential regulation; others do not. See Levinson (1996), McConnell and Schwab (1990), and Jaffe *et al.* (1995).

5. Emissions from polluting industries may fall in developing countries as globalization leads to more FDI and less state-owned industry. State-owned enterprises have tended to be less economically efficient than their private-sector counterparts. Pollution can fall if the enterprise uses inputs, especially energy (whose by-products are major contributors to environmental degradation), more efficiently.

6. No doubt there are economies of scale in pollution control. Globalization can lead to larger plants that can take advantage of cost-savings due to greater scale of operations. An idea being promoted by some international lending agencies and researchers is to locate new and expanding industry in an industrial park where they can share pollution abatement infrastructure such as water and waste treatment.

7. Pollution abatement can be cheaper than violating the regulations and social customs that exist. All countries have some degree of environmental regulation with associated penalties for failure to comply. Social pressure is also a

deterrent B people can prevent "dirty" operations from locating in their backyard (NIMBY B "not in my backyard"). NIMBY is not confined solely to wealthy countries.

8. Multinational firms tend to adhere to OECD environmental standards regardless of where they locate their plants. Their behaviour is not governed solely by local regulation, but by the preferences of their shareholders. Studies have shown that shareholders do not like their companies to deliver unfavourable environmental news. See, for example, Lanoie and Laplante (1994) and Laplante *et al.* (1997). Companies who appear on environmental "black lists" see a decline in the share values following this sort of news. While the effects are not permanent, many companies do appear to care about their environmental record. Investors want a flow of secure profits and do not want to worry about future liability due to environmental problems created by the company. The effectiveness of industry "environmental report cards" such as Indonesia's labeling scheme for polluters is currently under study. These sorts of policies should induce more environmentally friendly investment.

9. With globalization comes better information about production and pollution control technology to developing countries. Developing countries may "leap-frog" the old dirty technologies that OECD countries used in the past and use the "best" technologies for efficient production that also produce less pollution per unit output. The availability of capital and availability of a skilled workforce can be key issues in what sort of technology pollution-intensive industries use.

No doubt there are other explanations for the empirical observations. As noted above, the generally optimistic results contain caveats. The inverted U-shape of the EKC suggests that some forms of pollution may get worse before it gets better in developing countries. While the internet has reduced discrepancies in world knowledge, many people (including those in richer countries), do not have a good grasp of the relationships between economic activity and environmental quality. Finally, while the studies show that there have been significant declines in some pollutants in developing countries as their incomes grow, the absolute level of pollution still remains high. For example, in Wheeler's data on particulate matter (Wheeler, 2000), while China had reduced its emissions by 40 percent, the level of emissions was still almost 10 times that of Los Angeles. There is still a long way to go to improve environmental quality.

This paper uses a modified EKC approach to look at the relationship between economic growth and environmental quality. The traditional EKCs typically only have GDP (and its exponents or means) as an explanatory variable. To better try to capture both income levels and the degree of integration of world

economies, I add another explanatory variable to an equation that tries to "explain" environmental quality. My work suffers from the same criticisms leveled above; in particular, it is aggregate, does not capture environmental regulation effects, and has to use a number of different measures of environmental quality, all of which are very poor quality data. The results provide some "good news"/"bad news" about the possible link between globalization and environmental quality and set the stage for further research.

III. LINKS BETWEEN ENVIRONMENTAL QUALITY AND GLOBALIZATION

Measuring environmental quality is a challenging problem. We have no universal indicator analogous to GDP. Moreover, environmental data is notoriously thin with very limited time series. What most researchers do is put together a series of indicators of environmental quality; examining air and water quality, ecosystem health and degradation, environmentally related health status emanating from sanitation and water quality, and others. Due to the limited amount of data, we must generally do cross sectional analyses. These can sometimes be done for two time periods to give a modest intertemporal perspective.

Recall the EKC curves from Figure 1. These showed indicators of environmental quality as a function of per capital GDP for 1986 and an earlier year in the 1970s or 1980. For all indicators except carbon emissions, annual deforestation, and fecal coliform in rivers, the EKC for 1986 lay below that of the earlier year. In the case of carbon, the two curves coincide. Environmental degradation is thus lower for all levels of income in these cases, regardless of the shape of the curve. I wanted to update all these relationships, but unfortunately could not obtain enough cross-sectional data to examine each of the indicators shown in Figure 1. The most recent data covering a large sample of countries are for years ranging from 1990 to 1997.[6] This allows for approximately a 10-year time interval between the indicators in Figure 1 and my data.

Environmental indicators are available for a number of countries with a wide range of income levels and "openness" to trade for: unsafe drinking water, sanitation availability, protected forests, sulphur dioxide in urban areas, net carbon dioxide emissions, and urban exposure to lead from motive fuels. These indicators are defined as follows.

- *Unsafe drinking water* is the percentage of the total population that does not have access to potable water in 1997. This is a variable very directly

[6] World Resources Institute (2000). The data compendium comes from a number of sources including the OECD and World Bank.

connected to human health. Safe drinking water is essential to economic growth and disease prevention.

- *Sanitation availability* is the percentage of the population that does not have some form of sewage treatment system for human waste in 1997. Again, this variable is directly related to health. Many virulent diseases are spread due to inadequate sanitation facilities.

- *Protected forests* are the percent of total tropical or temperate forests protected from exploitation as a share of total forested land in the 1990s. A few countries in the sample have acreage both in temperate and tropical forests. When this occurs, I use the forest type with the largest total acreage as the indicator. I interpret protected forests as an indicator of ecosystem health and attitude toward sustainable development; the greater the protected area as a share of total forest land, the greater the social interest in environmental protection. An estimate of *deforestation* comes from data showing the percent change in forest cover from 1990 to 1995. A negative change indicates net deforestation, which is defined as "the clearing of forest lands for all forms of agricultural uses (shifting cultivation, permanent agriculture, and ranching) and for other land uses such as settlements, other infrastructure, and mining" (World Resources Institute, 2000). A positive change indicates net afforestation.

- *Sulphur dioxide emissions in urban areas* is another indicator of human and ecosystem health. Sulphur dioxide is a by-product of combustion of sulphur-laden fuels. Emissions can be reduced by substituting lower-sulphur fuels for high-sulphur fuels or by investing in pollution abatement equipment either at the energy-generating source (e.g., a power plant), or by the end user (e.g., vehicle emission controls). High emissions of sulphur dioxide lead to morbidity and mortality from respiratory diseases. They also injure agricultural crops, forests, and contribute to the acidification of surface waters. The indicator is emissions from a major city in the country in years between 1993 and 1995. If more than one city is reported in the data, the city with the highest emissions is selected.[7]

- *Carbon dioxide emissions*. I have three measures of carbon emissions. Net carbon emissions refers to the amount of carbon from fossil fuel

[7] This is the case for all countries except China. Chongqing had the highest emissions at 340 micrograms per cubic metre. This is far above the average for other major Chinese cities, so I used the average in this case.

combustion, industrial processes, and land use changes (which can release or store carbon as a sink) measured during the period between 1990 and 1994.[8] To compare my estimates to those of the World Bank (Figure 1), I also examine carbon dioxide emissions per capita for the year 1996. These are emissions released by fossil fuel burning and cement manufacturing, the two largest sources of carbon dioxide from economic activity. Finally, because it is aggregate emissions that we care about from an environmental quality perspective, I also report on aggregate emissions by country for 1996. Carbon dioxide is a greenhouse gas that contributes to global climate change. It is also a good proxy for the energy intensity of a country's economic activities. In general, the more energy intensive the economy, the higher the emissions of a number of pollutants.

Using cross-sectional analysis, the relationship between each indicator and GDP per capita (the income measure) and an indicator of a country's openness to trade is estimated. The openness variable is the country's total exports plus imports as a share of GDP for 1997.[9] All figures are in US dollars. As warned above, the data is fraught with difficulty. The sample size changes with each indicator as many countries do not measure these indicators. Secondly, regressions linking each indicator to income and openness have very low explanatory power. While the coefficient estimates for each regression reported are often significant at the 95 percent level or better, the two independent variables do not explain the variation

[8] For most countries, the net emissions are positive. A few countries have negative emissions. I eliminated these from the sample because there is a lot of controversy over the measurement of carbon sequestration. In any event, they represented a very small portion of the total.

[9] The openness variable is independent of country size. It simply measures the scale of exports and imports relative to the country's GDP. Some countries, notably the United States, have a relatively low openness value, but the sheer scale of their economy has a large impact on world trade and globalization. Ignoring the size of a country's economy may thus introduce bias into the regressions. When a scale variable is added (GDP), the size of the coefficients change modestly, but their signs and adjusted R^2 generally do not. For most equations, gross economy size is not significant. This paper reports the results without the adjustment for country size. It would also be interesting to look at other measures of openness. Unfortunately, I do not have enough data to do this.

in the data very well.[10] This will become quite apparent by looking at the data. Despite the poor quality of the data, some interesting distinctions can be made with the earlier data, and provide a test of whether increasing trade flows with globalization are helping or hurting the environment.

Unsafe Drinking Water

Figures 2 and 3 illustrate different curves fitted to the unsafe drinking water data as a function of GDP per capita and openness respectively. The data points are shown along with two fitted curves that had the most explanatory power. In Figure 2, low-income countries clearly have the greatest percentage of their population exposed to unsafe drinking water. However, once income levels exceed $6,000 US per capita, the percentages fall to close to zero. Beyond $12,000 US, virtually none of the population has unsafe water.[11] Comparing these results to Figure 1, we see that the estimated curves in 1997 are much more L-shaped, with more countries showing higher water quality at lower incomes than in 1986. This suggests that economic growth may have important spillovers to all countries, that with globalization, countries may be able to access better technology to improve water infrastructure (or access it at lower cost). Figure 3 illustrates unsafe drinking water as a function of the openness of the country to trade.[12] Water quality does rise with openness, but the relationship is far from robust. Openness does, however, help explain the variation in the water quality data. The estimated linear equation does better than one dependent only on per capita GDP.

---

[10] GDP per capita and openness are also probably not really independent variables. A much more complex relationship, no doubt, exists than is modeled using simple regressions. However, data limitations are so severe that it makes no sense to specify and estimate a more complex model.

[11] Even this measure is not perfect. A water supply that is deemed 100 percent safe may still exhibit episodes of contamination. Canada, for example, reports 100 percent safe water, but has had cases in recent years of contaminated water that has killed and sickened people in various communities.

[12] While poor water quality is associated with low levels of openness, there are some countries less open to trade that have high water quality. One of these is the United States with an openness measure of 0.21 and none of its population exposed to unsafe water. Because of this variability, the equations do not fit the data very well. However, even when country size is added to the regression, coefficients change little, signs are the same, and overall fit declines. A more sophisticated empirical model might better deal with the interactive effects of openness and country size.

$$\begin{array}{lccc} \% \text{ unsafe drinking water} = & 33.57 & - .00099 \text{ GDP/pop} & - 8.629 \text{ openness} \\ & (8.68) & (-6.10) & (-1.67) \end{array}$$

The adjusted R^2 is .355, the number of observations is 78 and t-statistics are shown in parentheses below the coefficient estimates.

Inadequate Sanitation

Figures 4 and 5 show basically the same relationships for inadequate sanitation as for unsafe drinking water. Unsafe sanitation is clearly clustered in low-income countries, with most of the population receiving sanitation services once per capita income of a country exceeds $5,000 US. Compared to 1986 data, we again see a sharper L-shape and that sanitation is higher at lower income levels than in 1986. Figure 5 shows similar variability in the indicator at low levels of openness to that of unsafe water. The fitted quadratic is downward sloping. The linear regression for 78 observations is:

$$\begin{array}{lccc} \text{Inadequate sanitation} = & 44.11 & - .00129 \text{ GNP/pop} & - 12.821 \text{ open} \\ & (8.56) & (-5.92) & (-1.86) \end{array}$$

with an adjusted R^2 of .348.

Protected Forests and Deforestation

No significant relationship was found between the percentage of protected forest and per capita GDP and/or openness of the economy due to the variability of the data. In Figure 6, we see a cluster of low income countries with protected areas ranging from close to zero to almost 60 percent. But as per capita GDP rises, protected forests do not consistently rise or fall. Income is simply not a good predictor of the forest land set aside for protection.

The estimated relationship between per capita income and deforestation (percent change in forest cover) is shown in Figure 7. We see the same inverted U as was indicated in the deforestation calculation in Figure 1. As we are measuring different things on the vertical axis, the figures cannot be more directly compared. The data shows the major forest land losses over the period 1990-95 are clearly concentrated in the low-income countries. Once income levels exceed $10,000 per capita, the fitted curves predict increases in forest cover. The loss of forest cover is a major environmental concern because forests provide many products and non-marketed ecosystem benefits such as stabilizing soils, water retention, carbon sinks, species protection, and many more. These percent changes camouflage aggregate changes that are massive in the case of some countries.

Many of these countries have per capita income levels far from $10,000 and thus, if these trends continue, significant amounts of deforestation will occur.

The relationship between forest protection and forest cover and openness is not clear. In Figures 8 and 9, there is too much variability in the data to define a meaningful functional relationship. However, while there was no statistical fit between forest protection acreage and GDP per capita and openness, a weak relationship was found between deforestation and these variables. The adjusted R^2 was only .146 and while openness was negatively correlated with deforestation, it was insignificant. The estimated equation is:

Deforestation	=	- 0.77	+	.000039 GDP/pop	-	.116 open
		(-3.37)		(4.08)		(-.385)

Sulphur Dioxide Emissions

In Figure 1, ambient sulphur dioxide levels exhibited the inverted U-shape for the years 1972 and 1986. Figure 10 shows that by the period 1993 to 1995, the inverted U has changed to a normal U with a minimum at around $33,000 US per capita. The upswing in the curve is, however, very modest. Figure 10 indicates that sulphur dioxide emissions do fall with income and that the upward sloping section of the EKC appears to have disappeared since the mid-1980s. Again, this lends support to a hypothesis that income growth on net improves environmental quality. While ambient levels are not identical to emissions, the two are highly correlated because sulphur dioxide does not persist at monitoring stations unless emissions continue. I could not obtain ambient data. Openness also contributes to lower levels of sulphur dioxide emissions, although as with other environmental indicators, there is more variability in the data. Openness is negatively correlated with sulphur dioxide emissions as indicated in the regression:

Sulphur dioxide emissions	=	66.58	-	.0014 GDP/pop	-	13.32 open
		(7.28)		(-4.32)		(-1.32)

While the openness coefficient is not highly significant, the equation with openness performs better (adjusted R^2 of .364) than one where emissions are simply a function of per capita GDP.

Carbon Dioxide Emissions

In Figure 1, carbon dioxide emissions per capita appeared to be rising exponentially as a function of per capita income. But with data from 1996, we see a different relationship. In Figure 12, the estimated curves yield an inverted U-shape, with a peak at just over $20,000 per capita. However, the estimated linear

regression finds carbon dioxide emissions per capita positively correlated with per capita GDP and openness.

$$\begin{array}{lcccccc} \text{Per Capita CO2} & = & 1287.42 & + & 0.26\ \text{GDP/pop} & + & 2497.5\ \text{open} \\ & & (1.45) & & (6.89) & & (2.11) \end{array}$$

The coefficients of both explanatory variables are significant and the adjusted R^2 is .391. We thus cannot reject the hypothesis that carbon emissions are positively correlated with income and openness. Figure 13 illustrates the two best fitting curves between per capita CO2 emissions and openness, where the logarithmic curve is positively sloped, while the quadratic shows a very minor inverted U-shape. The relationship is thus questionable.

If one looks at net or aggregate carbon emissions, the picture is even less clear. Figures 14 and 15, net and aggregate carbon emissions versus per capita GDP respectively, show two data spikes; a cluster of low-income, high emitters (China, for example) and the United States with high income and high CO2 releases. Both net and aggregate carbon dioxide emissions are positively correlated with income. However, net and aggregate carbon emissions may be negatively correlated with openness as illustrated in Figures 16 and 17. Both fitted curves have negative slopes in Figure 16, while in Figure 17, the quadratic is U-shaped. Linear regressions for net and gross carbon show openness to be negatively correlated, with significant coefficients. The estimated equations are:

$$\begin{array}{lcccccc} \text{Net CO2} & = & 863.8 & + & 0.0077\ \text{GDP/pop} & - & 947.5\ \text{open} \\ & & (2.87) & & (.84) & & (2.24) \end{array}$$

$$\begin{array}{lcccccc} \text{Aggregate CO2} & = & 383.1 & + & .014\ \text{GDP/pop} & - & 438.3\ \text{open} \\ & & (2.64) & & (2.34) & & (-2.28) \end{array}$$

The adjusted R^2 estimates are .122 for the net equation and .079 for aggregate CO2.

These results suggest that economies that are more open to trade produce lower net carbon dioxide emissions. The result would be even stronger if the United States were not in the sample. Because it is a country with a low openness measure (remember openness is exports plus imports relative to GDP), and high carbon emissions, it is an outlier among the rich countries.

IV. KNOWLEDGE ECONOMIES AND ENVIRONMENTAL QUALITY

How does all this fit into the conference theme of the knowledge economy in a globalizing world? As noted above, effective environmental monitoring and regulation is dependent on the transfer of knowledge across economies. A second link is between industrial composition and environmental quality B the composition effect. We expect that knowledge-based economies will generate less pollution than economies based on "smokestack" industries because they use far fewer toxic material inputs, more human capital (some of whom can tele-commute), and produce many goods that can be shipped electronically. All these factors will, no doubt, lower the pollution intensity of a country's output and lead to rising levels of domestic environmental quality over time.

Knowledge-based economies do, however, use one input B electricity, fairly intensively. While I could not get a detailed breakdown by sector, computer-based activities, for example, are alleged to use a lot of electricity. Historically, most countries have depended on carbon-based electricity generation (coal, natural gas, and oil-fired generating plants). If we want to reduce carbon emissions, we are going to have to shift to substitute fuels (and work on demand management). We may be looking toward a future in which we have improved the health of environment locally by reducing local air emissions, cleaning up our wastes, and providing safe water, but risk potential catastrophes from global climate change. A knowledge-based economy may be less energy-intensive than one based on heavy use of materials, but it may still have a major impact on environmental quality.

V. CONCLUDING COMMENTS

Higher incomes and greater openness to trade can lead to higher levels of environmental quality. Comparing my estimates for the mid-1990s to those of the 1970s and 1980s, with the exception of carbon dioxide emissions and deforestation, we see more evidence of a negative correlation between environmental degradation and income than existed 10 years ago. The previous studies did not estimate a relationship between environmental quality and openness. Admittedly, my openness variable is extremely crude (it had to be a measure readily obtainable for a large enough sample of countries), but I find in all but the per capita CO2 estimates, openness is negatively correlated with environmental degradation (or insignificant). This suggests, however tentatively, that if globalization leads to higher trade flows as a percentage of GDP, environmental quality may improve. My results are thus consistent with the literature discussed earlier.

Many attributes of environmental quality also appear to be higher for all income levels compared to the 1980s.[13] Globalization does not appear to be destroying our natural environment B water quality and sanitation are improving while some urban air pollutants decline with globalization. However, this work highlights two major environmental concerns B deforestation and carbon dioxide. Other natural resources that I have not been able to examine may also be at risk. For example, capture fisheries are in distress worldwide. Let me also reiterate the many caveats to this empirical research B these numbers are very crude, highly aggregate, and certainly do not pick up cases within rapidly industrializing countries where serious environmental degradation has occurred. As noted, we don't have a good overall measure of environmental quality; these indicators do not capture all its components. Better data is an imperative for research.

What sort of policy conclusions can I draw? First, the greater a country's knowledge base, the more able it will be to address environmental problems. Globalization facilitates knowledge transfer. Governments should ensure that the public and their decision-makers receive environmental information. This information should include monitoring data on emissions, ambient environmental quality, pollution abatement costs, damages, technologies for mitigation, and information on the role economic instruments can play in environmental regulation. Participating in data collection and sharing is key to understanding and addressing local and global environmental problems. With this information, governments have the obligation to develop strong and cost effective domestic regulations and participate in international agreements for global pollutants. This is not to say that voluntary actions by polluters will not occur, but that environmental policy is the stimulus for many voluntary actions. Finally, my results and much of the literature suggest that open economies tend to have less pollution than closed ones. Trade sanctions based on pollution intensity of goods are not the right policy to address environmental problems. These sanctions slow income growth, and the EKC work shows that income growth will reduce a number of environmental problems, not exacerbate them.

[13] Figure 1 has per capita incomes in terms of 1986 dollars, while my estimates are in terms of mid-1990 dollars. This reinforces the argument that environmental quality as measured by these indicators is higher in the mid-1990s than mid-1980s.

REFERENCES

Birdsall, N. and D. Wheeler (1993), "Trade Policy and Industrial Pollution in Latin America: Where are the Pollution Havens?," *Journal of Environment and Development* 2, pp. 137-149.

Carson, R.T., Y. Jeon, and D.R. McCubbin (1997), "The Relationship between Air Pollution Emissions and Income: US Data," *Environment and Development Economics* 2, pp. 433-450.

Chichilnisky, G. (1994), "North-South Trade and the Global Environment," *American Economic Review* 84, pp. 851-874.

Copeland, B. and S. Taylor (1994), "North-South Trade and the Environment," *Quarterly Journal of Economics* 109, pp. 755-787.

_____ (1995), "Trade and Transboundary Pollution," *American Economic Review* 85, pp. 716-737.

Grossman, G. and A. Krueger (1993), "Environmental Impacts of a North American Free Trade Agreement," in P. Garber (ed.), *The US-Mexico Free Trade Agreement* (Cambridge, MA: MIT Press).

_____ (1995), "Economic Growth and the Environment," *Quarterly Journal of Economics* 110, pp. 353-377.

Hettige, H., M. Mani, and D. Wheeler (1999), "Industrial Pollution in Economic Development, Kuznets Revisited" in P.G. Fredriksson (ed.), *Trade, Global Policy, and the Environment* (Washington, DC: The World Bank, World Bank Discussion Paper No. 402).

Jaffe, A. *et al.* (1995), "Environmental Regulation and the Competitiveness of U.S. Manufacturing: What does the Evidence Tell Us?," *Journal of Economic Literature* 33, pp. 132-163.

Lanoie, P. and B. Laplante (1994), "The Market Response to Environmental Incidents in Canada: A Theoretical and Empirical Analysis," *Southern Economic Journal*, Vol. 60.

Laplante, B., P. Lanoie, and M. Roy (1997), "Can Capital Markets Create Incentives for Pollution Control?," *World Bank Policy Research Department Working Paper*, No. 1753, April.

Leonard, J. (1988), *Pollution and the Struggle for World Product* (Cambridge, UK: Cambridge University Press).

Levinson, A. (1996), "Environmental Regulations and Manufacturers' Location Decisions: Evidence from the Census of Manufacturers," *Journal of Public Economics* 62, pp. 5-29.

List, J.A. and C. Co (2000), "The Effects of Environmental Regulation on Foreign Direct Investment," *Journal of Environmental Economics and Management* 40, pp. 1-20.

Low, P. and A. Yeats (1992), "Do 'Dirty' Industries Migrate?," in P. Low (ed.), *International Trade and the Environment* (Washington, DC: The World Bank, World Bank Discussion Paper No. 159).

Lucas, R.E.B., D. Wheeler, and H. Hettige (1992), "Economic Development, Environmental Regulation, and the International Migration of Toxic Pollution," in P. Low (ed.), *International Trade and the Environment* (Washington, DC: The World Bank, World Bank Discussion Paper No. 159).

Mani, M. and D. Wheeler (1998), "In Search of Pollution Havens? Dirty Industry in the World Economy, 1960 to 1995," *Journal of Environment and Development* 7, pp. 215-247.

McConnell, V. and R. Schwab (1990), "The Impact of Environmental Regulation on Industry Location Decisions: The Motor Vehicle Industry," *Land Economics* 66, pp. 67-81.

Olewiler, N. and K. Dawson (1998), *Analysis of National Pollutant Release Inventory Data on Toxic Emissions by Industry*, Technical Committee on Business Taxation, Working Paper 97-16 (Ottawa: Ministry of Finance).

Robison, D.H. (1988), "Industrial Pollution Abatement: The Impact on the Balance of Trade," *Canadian Journal of Economics* 21, pp. 702-706.

Seldon, T. and D. Song (1994), "Environmental Quality and Development: Is There a Kuznets Curve for Air Pollution Emissions?," *Journal of Environmental Economics and Management* 27, pp. 147-162.

_____ (1995), "Neoclassical Growth, the J Curve for Abatement, and the Inverted U Curve for Pollution," *Journal of Environmental Economics and Management* 29, pp. 162-168.

Shafik, N. (1994), "Economic Development and Environmental Quality: An Econometric Analysis," *Oxford Economic Papers* 46, pp. 757-773.

Tobey, J.A. (1990), "The Effects of Domestic Environmental Policies on Patterns of World Trade: An Empirical Test," *Kyklos* 43, pp. 191-209.

Wheeler, D. (2000), "Racing to the Bottom? Foreign Investment and Air Quality in Developing Countries" available at: www.worldbank.org/nipr/work_paper/RaceWP1.pdf

World Bank (1992), *World Development Report 1992: Development and Environment* (New York: Oxford University Press).

World Resources Institute (2000), *World Resources Report, 2000-2001* (Washington, DC: World Resources Institute). Available at www.wri.org.

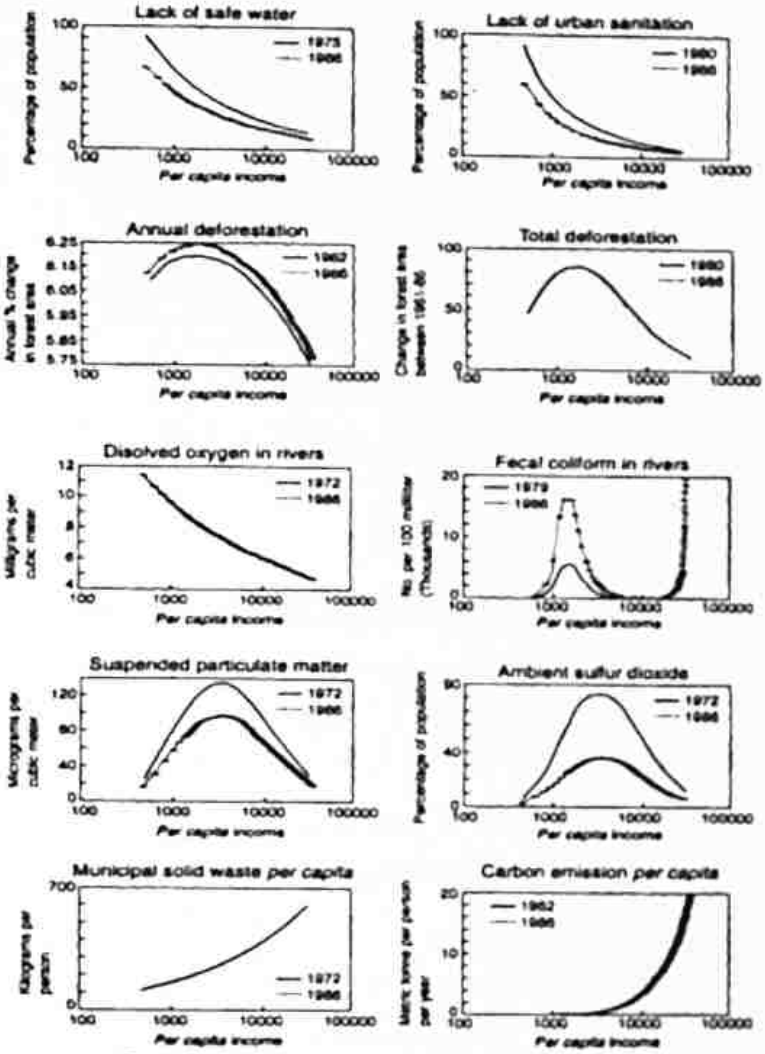


FIG. 1 Patterns of environmental change and *per capita* income

Source: *Oxford Economic Papers* 46, 1994.

Figure 2: % Unsafe Drinking Water

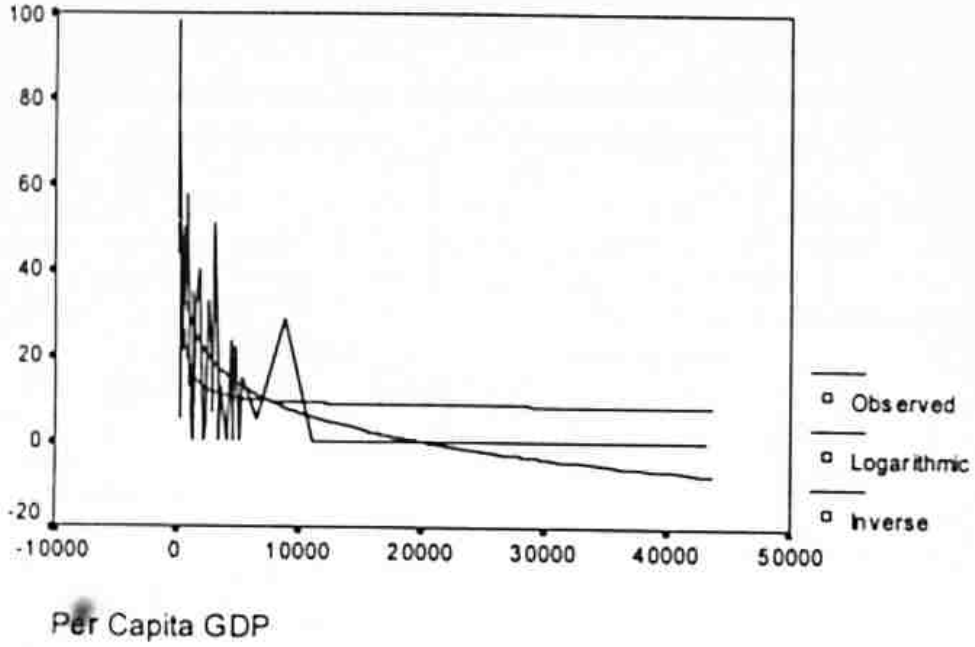


Figure 3: % Unsafe Drinking Water

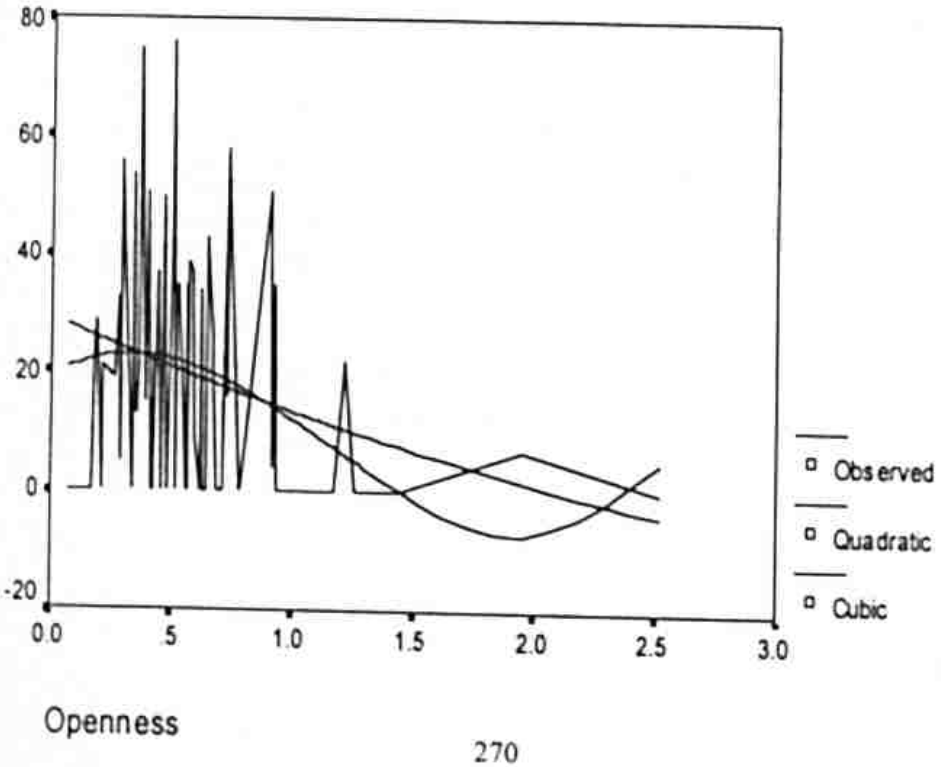


Figure 4: % Inadequate Sanitation

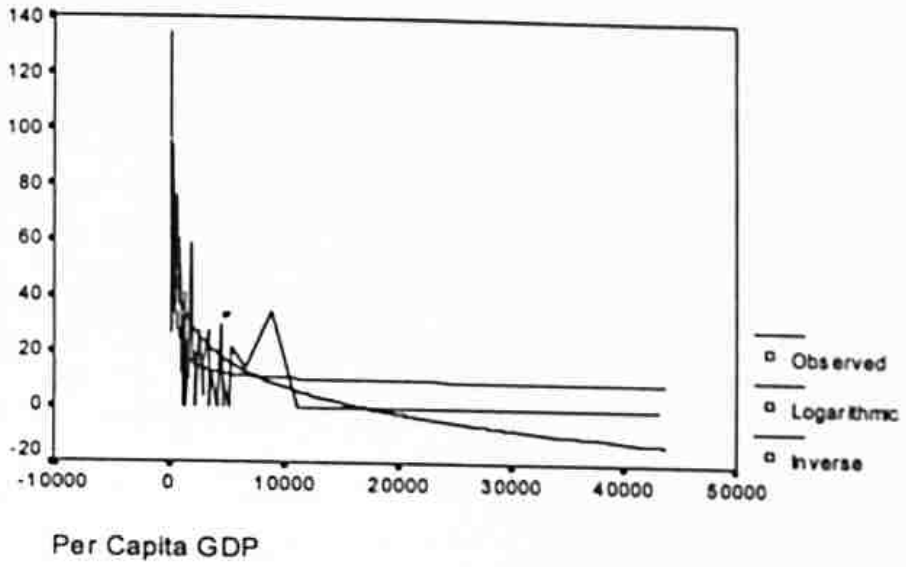


Figure 5: % Inadequate Sanitation

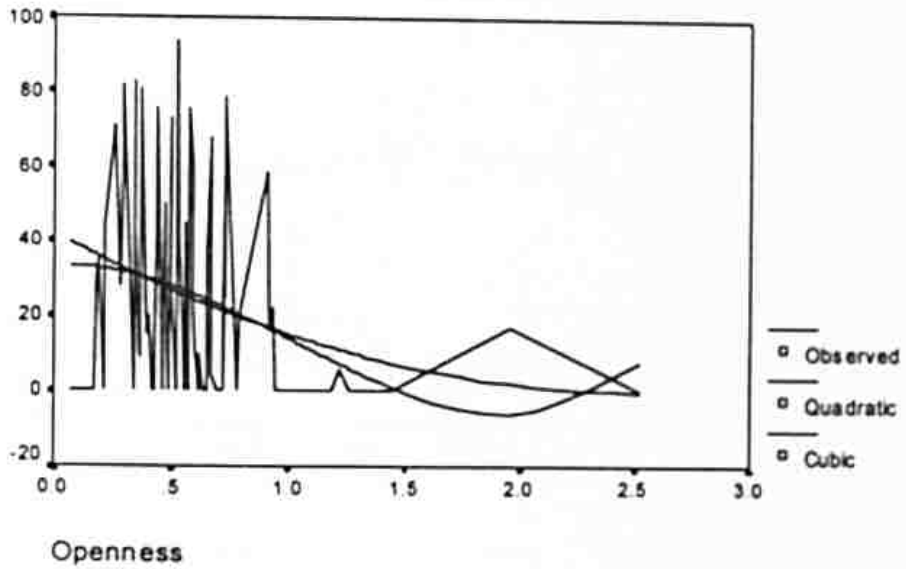


Figure 6: % Protected Forest

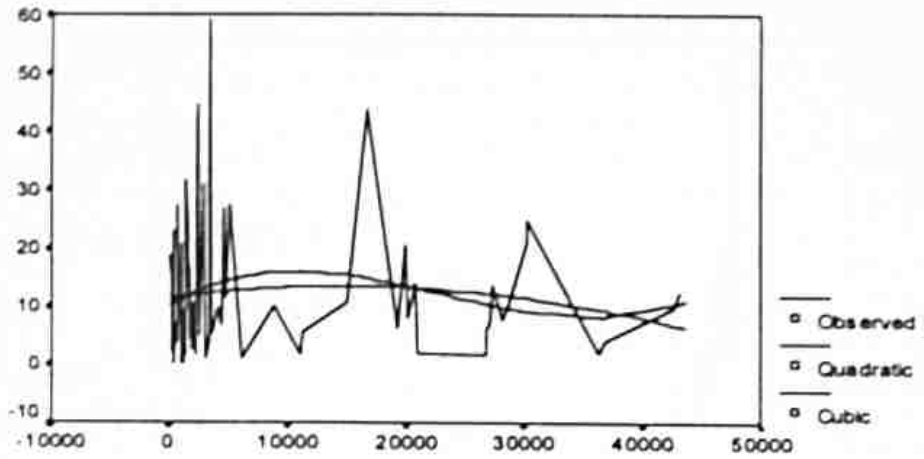


Figure 7: % Change in Forest Cover, 1990-95

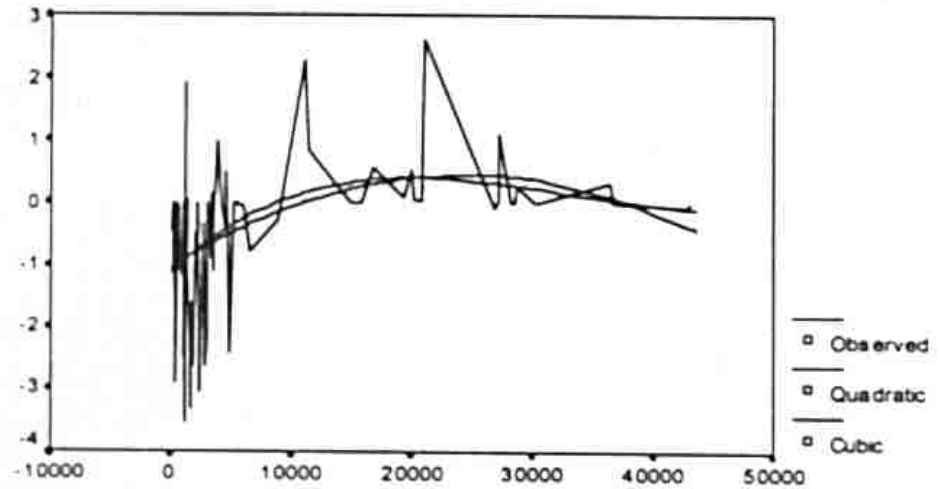


Figure 8: % Protected Forest

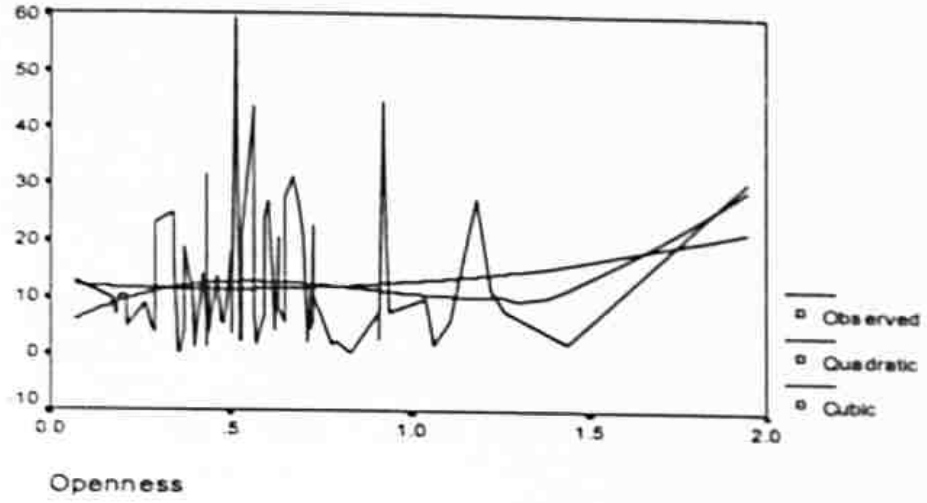


Figure 9: % Change in Forest Cover, 1990-95

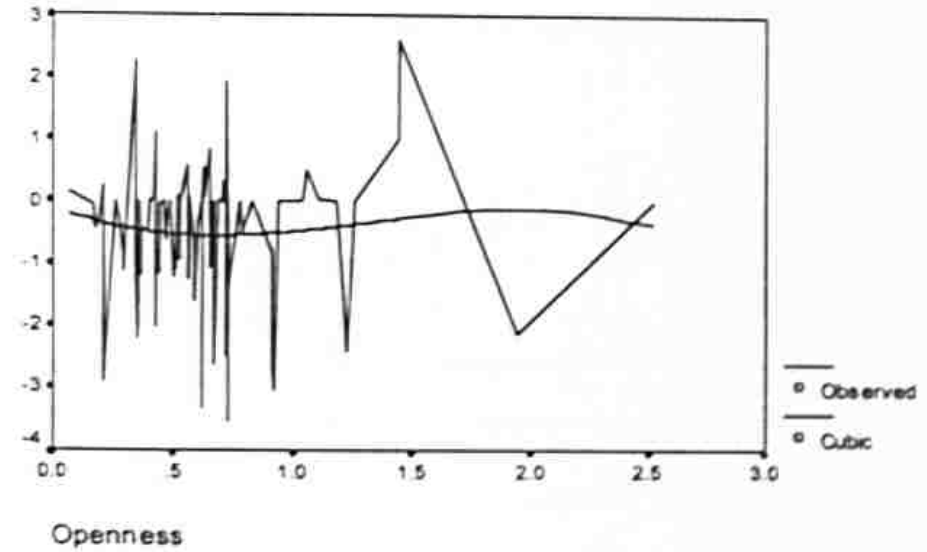


Figure 10: Sulphur Dioxide Emissions in Urban Areas, 1993-

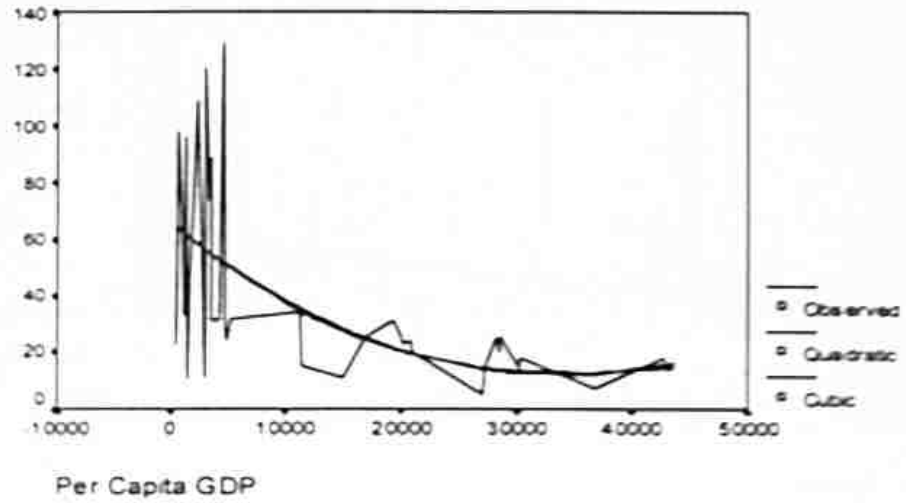


Figure 11: Sulphur Dioxide Emissions in Urban Areas, 1993-

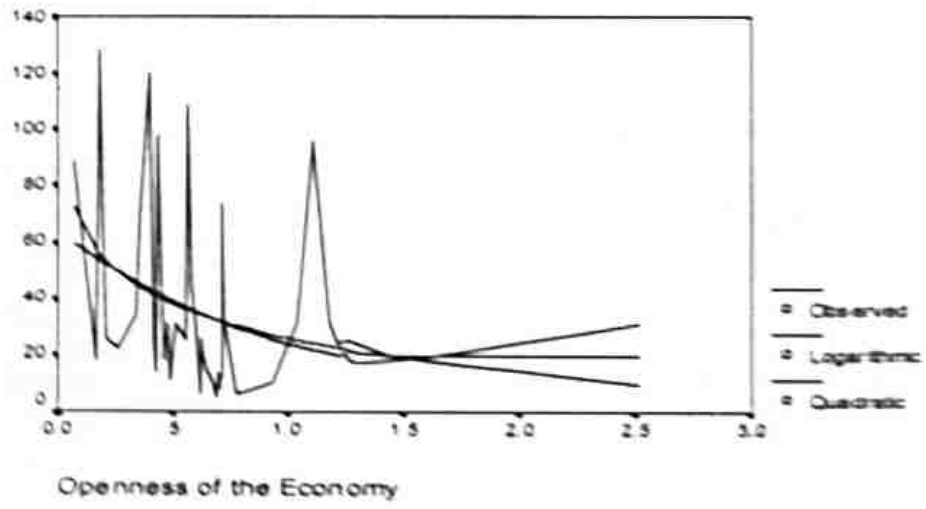


Figure 12: Per Capital CO2 Emissions, 1996

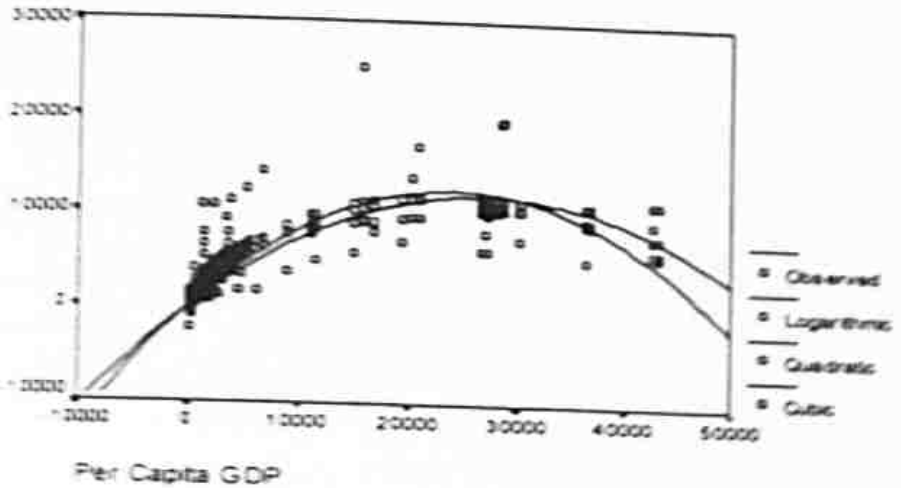


Figure 13: Per Capital CO2 Emissions , 1996

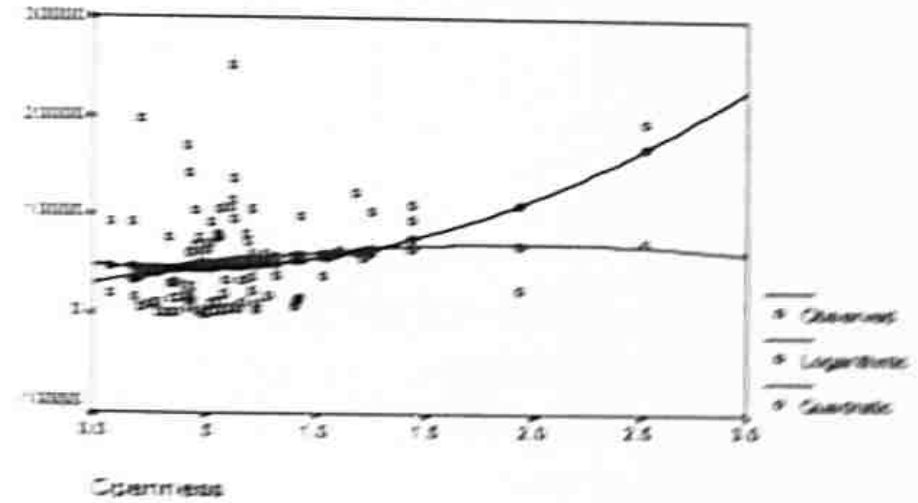


Figure 14: Net Carbon Dioxide Emissions

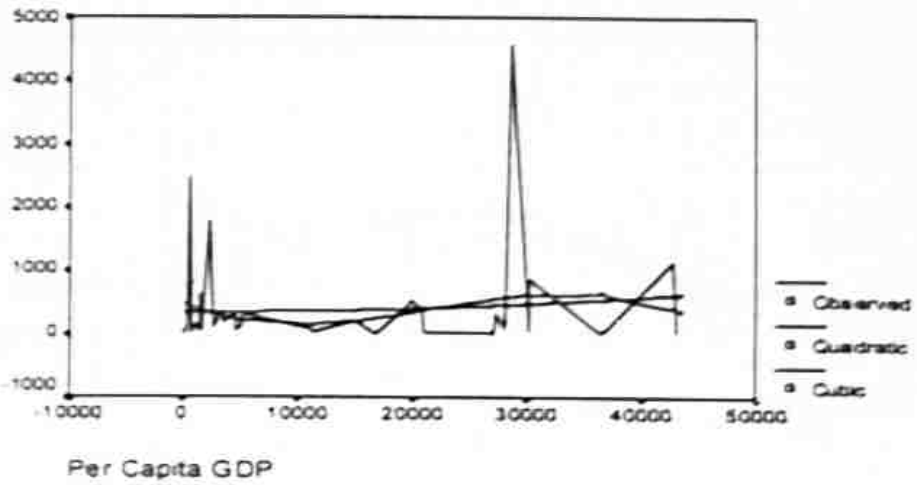


Figure 15: Aggregate CO2 Emissions, MMT, 1996

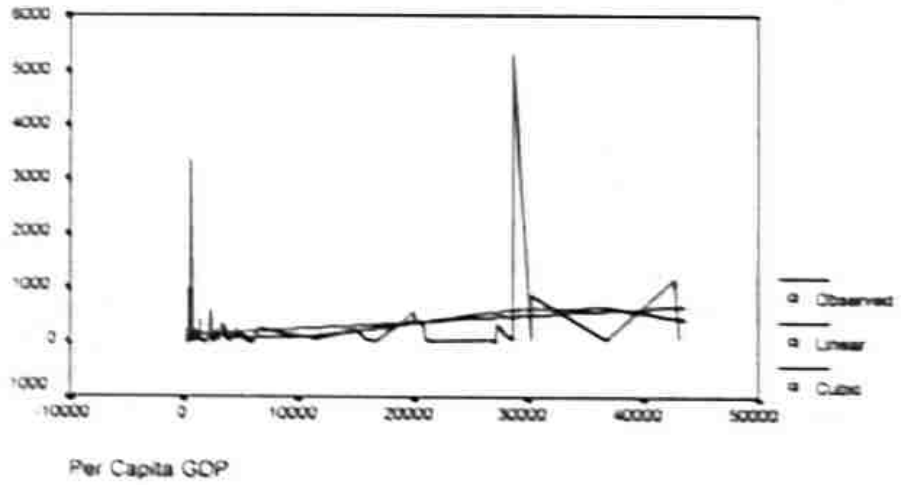


Figure 16: Net Carbon Dioxide Emissions

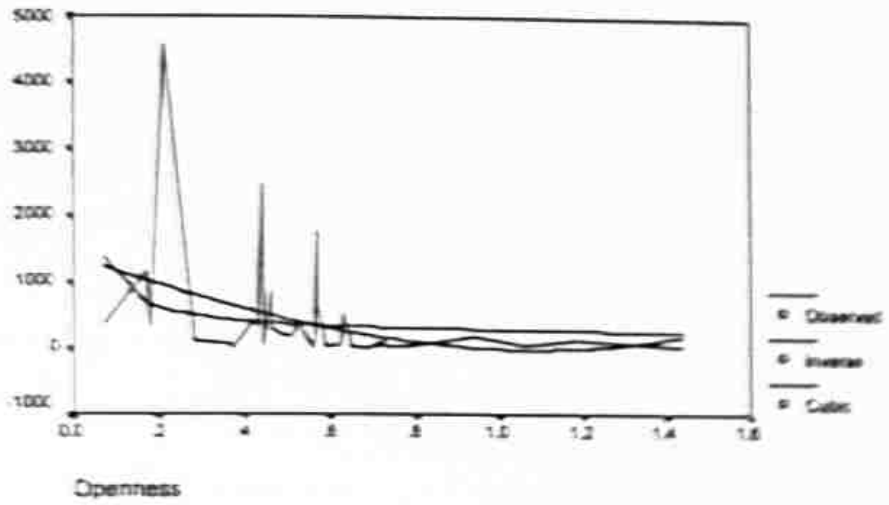
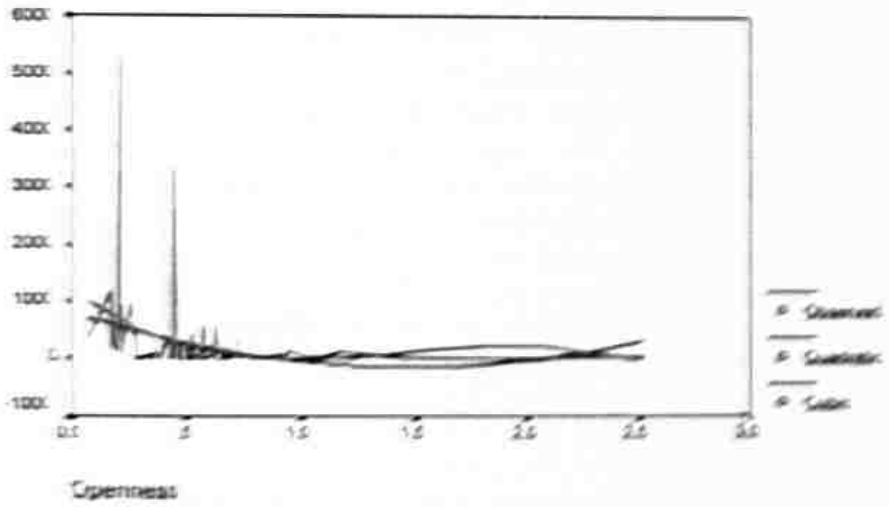


Figure 17: Aggregate CO2 Emissions, MMT, 1996



Globalization, Culture and the WTO

Christopher Maule

I. INTRODUCTION

The cultural industries are an important part of the knowledge economy. In trade agreements, the sector has traditionally embraced the print and audiovisual media including radio, television, films and music. With changing technology, the definition has expanded to include so-called new media, such as games, entertainment and education-training. Increasingly, transactions in these industries are undertaken electronically as well as through the exchange of tangible goods making it easier to undertake cross-border trade where World Trade Organization (WTO) disciplines apply. The purpose of this paper is to assess how these disciplines have been implemented and what changes can be anticipated in future negotiations on services. Despite the failure in November 1999 at Seattle to initiate a new round of negotiations, services and Trade Related Aspects of

The paper draws on published research co-authored with Keith Acheson and listed at www.carleton.ca/~cmaule/. My thanks are also due to Bill Dymond, Elizabet Filleul, Roy Hines and Aaditya Mattoo.
Contact author at: E-mail: c.maule@home.com

Intellectual Property Rights (TRIPS) are part of the built in agenda of the WTO agreed to by all member countries. Malaysia, along with other countries, will have to position itself for these negotiations.[1]

During the Uruguay Round, the United States lobbied countries to make commitments for the audiovisual industries but were unable to get agreement, especially from the European Union and Canada (Shao, 1995, pp. 113-114). Since 1994, pressure for commitments has continued in the context of a number of events and emerging trends. Some of these are connected to the concept of globalization and make this segment of the knowledge economy of interest from a trade policy perspective.[2]

The trends and events include: the growth of digitization which reduces the cost of content production and distribution; the expansion of channel capacity that makes government licencing to allocate scarce frequencies less needed; the increasing connectivity of people and companies to the Internet, which, aside from its popularity for e-mail, consulting pornographic sites and general commercial activities, is used for online newspapers and magazines and for broadcasting websites; widespread piracy of copyright material for music, print and video content; use of offshore location shooting of films and television programs in order to reduce production costs; corporate restructuring and mergers involving large firms such as AOL and Time Warner; and difficulties in measuring and monitoring trade, especially that undertaken electronically.

Institutionally, since 1994, the WTO has issued a ruling regarding measures affecting trade in periodicals (WTO, 1997a, 1997b), while a number of cultural trade disputes have been handled politically outside the framework of any international agreement. In developing trade disciplines for culture, these technological, market related and institutional developments will have to be taken into account. In the next part of the paper, a summary is made of the treatment of culture over time in the General Agreement on Tariffs and Trade (GATT) and successor WTO. While most of the examples deal with audiovisual trade, since this has been the main concern of Europe and the United States, reference is made to other cultural industries.

---

[1] Initiation of a new more comprehensive round of negotiations will be discussed at the 2001WTO Ministerial Meeting.

[2] A general description of globalization can be found in Flatters (2001, p. 1).

II. CULTURE AND THE GATT/WTO

Pre GATT

Prior to the second world war, most of the cultural trade irritants involved measures taken by European governments to prop up domestic film production and to restrict the importation of American films. Ian Jarvie (1992) has documented developments in this period where all the antecedents of current protectionist arguments can be found – insufficient shelf-space for domestic content, American cultural imperialism, dumping of foreign films, the use of quotas, tax incentives, and subsidies to offset these pressures. As well, it was recognized that films could be used not only to distribute political propaganda but also to promote trade. Trade follows the film.[3]

By 1945, two world wars had served to handicap the development of European film industries and to allow the American industry to flourish at home and abroad, often using scripts, performers and directors from Europe (Guback, 1969).

GATT 1947

The GATT 1947 contained two relevant provisions. In recognition of the economic circumstances of the European film industry, Article IV allowed for the imposition of theatrical screen quotas; Article XX permitted exceptions to be taken for the "protection of national treasures of artistic, historic and archaeological value." Agreement by the United States to screen quotas, which could have been for 100 percent domestic films, was in part due to their knowing that there would be pressure from European exhibitors and consumers to import and view foreign films (Shao, 1995, p. 111). In the 1950s, with the introduction of television, the United States attempted, without success, to amend the GATT to address restrictions placed by countries on television programming.

Any cultural product traded as a good has been subject to the GATT since 1947. The inclusion of Article IV implies either that film distribution involved trade in goods or that this aspect of service trade was subject to the GATT. In general, services were not subject to trade disciplines until 1994 when the General Agreement on Trade in Services (GATS) came into force. The goods-services distinction did not arise as an important GATT negotiating issue after 1947.[4] During

---

[3] In the heyday of the British Empire, foreign countries protested against British imperialism and British attempts to ensure that trade followed the flag.

[4] Reference to services did arise in two cases in 1974 and 1986 – see Acheson and Maule, (1999, pp. 59-60).

the early period, the principal trade issue concerned the valuation of films – whether value was associated with the physical material and/or the creative content. Another possible implication of Article IV is that an exemption has existed for this sector since 1947.

WTO 1994

With the introduction of the WTO embracing trade in both goods and services, all aspects of the cultural industries became subject to trade rules but with definite differences between the treatment of a good and a service. GATT continued to apply to traded goods while GATS operated differently regarding services. GATS obligations for market access and national treatment only apply if countries committed specified sectors, such as audiovisual services, to abide by the rules. Even if commitments are made, they can be listed as partial as opposed to complete so that there is considerable wiggle room in how countries can and have responded.

The ruling on a particular trade dispute illustrates a general problem. What happens if the traded cultural product combines a good and a service? Do GATT or GATS disciplines apply? In the case of a disputed Canadian policy measure that applied to advertising placed in periodicals, Canada argued that GATS provisions applied (trade in advertising services) while the US argued for GATT rules (trade in periodical publications). The panel ruled that where both a good and a service were involved, both agreements applied and that Canada's actions were contrary to GATT obligations, despite the fact that Canada had undertaken no obligations for traded cultural services in the relevant GATS sector (WTO, 1997a, 1997b).

A number of other cultural trade disputes erupted between Canada and the United States which were dealt with outside the WTO but are illustrative of the type of issues that will have to be addressed in any future negotiations. These cases are dealt with in detail elsewhere (Acheson and Maule, 1999). Although involving two industrialized countries that are geographic neighbours with most of the population using the same language, and might be considered a special case, they are indicative of many of the issues that will arise as satellites make each country a neighbour to every other, and dubbing and translation allows content to be sold in global markets.[5]

The disputes have involved magazine publication, cable and satellite television services, book and film distribution, payment for neighbouring rights, blank tape levies, and the portrayal of violence on television. A range of Canadian domestic policies with international implications has been at the centre of these disputes, including foreign ownership restrictions, public ownership, co-production treaties, content quotas, tax incentives and subsidies (Acheson and Maule, 1999).

---

[5] A theme that often unites the concerns of all countries is perceived American domination of these industries.

In most cases, the policies have evolved over time and become increasingly opaque as discretion is exercised in their administration and anomalies emerge. For example, as a result of special interpretations, the Canadian edition of *Reader's Digest* is the largest circulating 'Canadian' consumer magazine, and French-owned Vivendi has been allowed to acquire Canadian film distribution assets despite a policy guideline that states that this is not allowed.[6]

In negotiating trade agreements – WTO, Canada United States Free Trade Agreement (CUSFTA), the North American Free Trade Agreement (NAFTA) and others – successive Canadian governments have attempted to fulfill the rhetorical promise that culture is not on the bargaining table, and that the sector is excluded from the agreement thereby allowing governments to pursue a range of protectionist domestic policies. An exemption was inserted in the CUSFTA and carried over to the NAFTA with special wording,[7] and was thought to be achieved in the WTO by not undertaking commitments in the GATS related to cultural activities, especially regarding trade in audiovisual services. The realization that reality and rhetoric differed became apparent in the decision of the United States to resolve some cultural trade disputes outside the framework of either the WTO or regional agreements. It was reinforced when the United States successfully argued in the WTO, as noted above, that where trade in goods and services was combined in a product, provisions of the GATT and not the GATS would apply.

Canada's latest initiative is to propose that culture be treated in a special agreement that would allow countries to enact policies that promote cultural diversity. This proposal stems from the report of an advisory committee to the Minister of International Trade (Canada, February 1999) and has been endorsed by the government. We will return to this proposal below.

---

[6] Vivendi made a commitment of C$300 million over five years to support Canadian film, music and internet industries; a sum that appears to have bought a favourable ruling under the guideline (reported by Canadian Press, January 26, 2001).

[7] NAFTA articles 2106 and annex 2106. The cultural industries are listed in article 2107.

III. WHITHER CULTURE? COUNTRY POSITIONS

To reiterate, the present state of play for culture in the WTO is that trade in cultural goods is subject to GATT 1994 and trade in cultural services to GATS 1994. A dispute panel ruling states that where a good and a service are combined in a product, GATT disciplines will apply. The ruling also states that "the ability of any WTO member to take measures to protect its cultural identity was not an issue in the [present] case." Some ambiguity exists as to how these disputes will be handled in the future.

Despite the failure at Seattle to kick start a new round of multilateral negotiations, member countries are committed as a result of a previous agreement to continue negotiations on trade in services. The modalities, scope and framework of future GATS negotiations will be discussed at a March 2001 meeting of the GATS Council in Geneva. Countries are in the process of submitting their initial positions for these negotiations.

The following sections discuss the attitudes of select countries to future negotiations. At this time, not all countries have stated their position in a format that allows for close comparability, so that one has to read the tea leaves from statements and actions. The United States, the largest exporter of audiovisual material, through the United States Trade Representative (USTR) tabled a discussion paper on audiovisual services on December 14th, 2000 (see USTR website).

United States

The USTR paper includes the following points:

- A recognition of the need to ensure "...an open and predictable environment that recognizes public concern for the preservation and promotion of cultural values and identity."

- A redefinition of the audiovisual sector to account for commercial possibilities made possible by new technologies, particularly digital compression and increased broadband capacity. (An annex to the paper provides examples of the activities that should be included in the new definition and examples of firms involved in different locations including, Brazil, Finland, Hong Kong, India, Malta, Mexico and Spain, and as well as the usual suspects.)

- A recognition that existing WTO agreements already refer to culture, especially GATT Article IV for theatrical quotas and the GATS for audiovisual services. The latter provides flexibility for countries to make full or partial commitments.

- A proposal for a code to be developed that would address trade distorting subsidies. Precedents developed elsewhere in the WTO could be adapted to the circumstances of the cultural industries.

The message, at this shadow boxing stage of negotiations, is that the United States wants action on audiovisual services but not in the confrontational manner of the past. Countries will be asked to make further commitments on culture in the GATS and to agree that the WTO is the venue where future negotiations should take place. The USTR refers to the GATS sectoral agreements on financial and telecommunication services as models that might be applied to culture. The proposals on audiovisual services should be examined in relationship to other USTR discussion papers issued at the same time, especially those on telecommunications, accelerating development of a globally networked economy, and distribution services, all available on the USTR website.

It is not known whether these positions advocated by the Clinton administration will continue to be supported by President Bush. Hollywood has been a strong supporter of the Democratic Party and provided input on audiovisual trade policy. Whether it will have the same influence in and support of the Republican administration is unclear.

Europe

The European Union (EU) position is important but difficult to summarize. At present, culture is a responsibility shared between Brussels and individual countries. Official statements stress both the diversity of member countries' cultures and the desirability of promoting a European cultural interest. There is considerable difference of views within the EU on developing an agreement among member countries, which would almost certainly treat non-EU countries less favourably. Some countries, such as France, support less liberalization and an exemption for culture in wider multilateral agreements. The UK, with greater success for its products in international markets, favours more liberalization internally and externally.[8]

[8] The UK Department of Culture, Media and Sport stresses the export success and potential of UK firms and individuals – see www.culture.gov.uk. During the negotiations on a Multilateral Agreement on Investment (MAI), the French position was supported by Italy, Portugal, Greece and sometimes Spain, while the UK position was supported by Germany and the Scandinavian countries.

At the Nice European Council (December, 2000), a draft treaty was put forward including a section on Common Commercial Policy (sub-titled Article 133 TEC) that includes the following wording:

> ... agreements relating to trade in cultural and audiovisual services, educational services, and social and human health services, shall continue to fall within the shared competence of the Community and its Member States. Consequently, in addition to a Community decision taken in accordance with the relevant provisions of Article 300, the negotiation of such agreements shall require the common accord of the Member States. Agreements thus negotiated shall be concluded jointly by the Community and the Member Sates.

Any member state can exercise a veto by denying its consent for a "common accord."

During the 1997 OECD negotiations of a Multilateral Agreement on Investment (MAI), France supported an exemption for culture from trade and investment agreements. This appears to remain the position according to Minister Lalumière's recent speech at a UNESCO meeting (December, 2000).[9]

The position of the French government exists within a context of growing doubts within France about the desirability of its protectionist policies. Professor Messerlin, an advocate of greater liberalization, writes (Messerlin and Cocq, 1999),

> The main message of this paper is that ongoing economic and social changes are increasingly separating the industrial and cultural segment of audiovisuals. This increasing separation offers the opportunity to combine a better policy for industrial audiovisuals (based on progressive liberalization) with better regulation of cultural audiovisuals (better institutions and instruments for supporting culture).

After noting that France has adopted particularly protective policies in the audiovisual sector, Messerlin comments,

> Since the summer of 1999, the French press has been pinpointing flaws, in an unusually aggressive tone, in French film policy. In doing so, the press have identified the

[9] The Minister also suggests the possibility of global destabilization if people feel threatened by loss of cultural identity.

underlying 'privilèges' (rents) drawn from this policy by a few vested interests – 'privilèges' felt undue because the policy shows obvious signs of failure.

Examples of media commentary (Messerlin and Cocq, 1999) are shown in Exhibit 1. The recent takeover of Universal by Vivendi is also likely to cause dissent from French orthodoxy, as the company's interests equate more with open markets.

Exhibit 1

Public commentary on French cultural policies

- French and other European subsidy programs have become enormously complex and expensive and are not achieving desired results. Filmmakers are using the subsidies to make clones of American films not French films. When successful they reward the filmmakers. When they flop, the treasury pays.

- Because there are insufficient domestic films made to fill the quotas, broadcasters show old French films, many made with less subsidy than the newer films, not new ones. The replay rate of old films have increased.

- The subsidies/quotas have worked to shut out other EU films so that American films have retained their share of the non-EU quotas. European films have not penetrated other European markets.

- Anomalies have been noted: *Fifth Element* is branded a French film – funded by French and US firms, made in London in English with non-French actors; a film based on Goethe's work was directed by two Italians, shot in Tuscany and declared 100 percent French because 78 percent of the dialogue was French.

Previously, doubts have been expressed about subsidy programs for films and television programs in Europe (Dale, 1997). David Puttnam, a successful British film producer (*Chariots of Fire, The Killing Fields, Midnight Express*, and *The Mission*) with experience managing Universal Studios in Hollywood, has recently been critical of European film policies in contrasting American and European approaches to this sector (Puttnam, 1998).

Asia

The countries of Asia represent an even more heterogeneous grouping than those of Europe. In the last WTO round, Hong Kong, India, Japan, Malaysia, Singapore and Thailand made GATS commitments for the distribution of motion pictures; Thailand for radio and television production; Japan and Singapore for sound

recordings; and Malaysia for broadcasting (with a content quota on cross-border delivery). India and Singapore were among those listing MFN exemptions from GATS commitments.

Home to a large film industry, India may be interested in stronger measures to protect intellectual property rights.[10] Piracy is identified by the Motion Picture Association of America (2000) as the principal trade problem in the region, together with inadequate measures to deal with electronic commerce and use of the Internet. Other measures listed by the association as restricting trade in film and television by country include:

- Film and/or broadcast quotas for local content – Australia, Brunei, China, India, Indonesia, Korea, Malaysia, Sri Lanka, Vietnam;
- Foreign investment restriction – China, India, Japan, Korea, Malaysia, Philippines, Vietnam;
- Government monopolies – China, India, Myanmar, Sri Lanka;
- Restrictions on revenue transfer – China, India;
- Import taxes and duties – Indonesia, Thailand;
- Restrictions on television advertising – Thailand.

Japan has submitted to the WTO its proposals for services negotiations. Included is the following reference to audiovisual services:[11]

> *Significance of Audio-visual Services*
> The liberalization of audio-visual services is important for respecting the right of the citizens of each Member for free access to a variety of cultures and information. Audio-visual services have become remarkably important with the recent progress of information technology.
>
> *Expectations from the negotiations*
> In the audio-visual services, we expect the following issues to be improved through the current negotiations for the liberalization of trade in services.

[10] I am grateful to Aaditya Mattoo for assistance with these details.

[11] See WTO, Council for Trade in Services, Communication from Japan, S/CSS/W/42, December 22, 2000.

- Exemptions of Most-Favoured-Nation Treatment in providing services
- Quantitative limitations
- Deviations from the principle of national treatment.

The foregoing is indicative of the concerns of certain countries in the region. It does not claim to provide comprehensive coverage. What does appear to be a widespread concern of Asian countries, including Malaysia, is the content of imported films that conflict with local values. Sex and violence are often mentioned in this regard. These are often the concern of countries elsewhere in the world and may be an issue on which it will be possible to get some level of international agreement.

Canada

The Canadian government is approaching cultural trade negotiations on two tracks. It is participating in WTO services negotiations and seeking to preserve its domestic cultural policies by making no services commitments that would upset these policies. Exemption through non-commitment characterizes this approach and attempts to preserve the position taken in the NAFTA negotiations and the Uruguay Round that culture is off the negotiating table.

The second track is the proposal for a special agreement on cultural diversity that would serve to mediate between domestic policies and international trade agreements. As noted, the New International Instrument on Cultural Diversity (NIICD) emerged as a recommendation of an advisory committee to the Canadian Minister of International Trade (Canada, February 1999). Following the WTO decision on periodicals which had been won by the United States on all counts, and the resolution of a dispute over the delisting of an American cable service provider in Canada, which resulted in the Canadian policy being withdrawn, it was realized that the cultural industries were not exempt from trade agreements. This exemption had been the promise of successive governments and part of the rhetoric supporting negotiations on multilateral and regional trade liberalization. A summary of changing Canadian attitudes is shown in Exhibit 2.

Exhibit 2

Changing attitudes in Canada on the effectiveness of a cultural exemption

Successive Canadian governments of different political stripes have pledged to exempt culture from the obligations of first the CUSFTA, then NAFTA and finally the WTO. Prior to the NIICD proposal, during hearings before a Canadian parliamentary committee on the proposed Multilateral Agreement on Investment (MAI) in December 1997, representatives of the different cultural industries argued

unanimously for an "ironclad exception from the obligations of a MAI" (Canada, 1997, p. 32).

Less than two years later in June 1999, after the NIICD proposal had been released, in hearings before the same standing committee on the forthcoming WTO agenda prior to Seattle, the same industry groups appeared to have changed their tune if not their mind (Canada, June 1999, 7-6 to 7-8). Through their umbrella organization, the Canadian Conference of the Arts (CCA), they argued that the traditional exemption route did not work and was unable to insulate culture from the disciplines of international trade agreements. It favoured the NIICD approach in the hope that this would provide an exemption mechanism.

The unreliable nature of the exemption approach is noted by a former senior official of the Department of Canadian Heritage and by the CCA. Speaking in November 2000, the official, now Chair of the Board of Directors, Canadian Television Fund, in discussing the new instrument stated,

"Instead of leaving the evolution of cultural policy to the anarchy of the exemption, the instrument would establish rules for determining how government may or may not behave. In so doing, it would establish which actions would be subject to countervails and other disciplines and which would not" (R. Stursberg, Trade and Culture, Keynote address to the Canadian Institute of International Affairs, Montreal, November 25, 2000, p. 5).

The CCA's position is noted in its report on a recent meeting in Santorini, Greece (see www.incd.net under News and Events Vol. 1-7, p. 4). Another industry grouping representing some of the same interests as the CCA has argued that "...the Canadian position of keeping culture off the table in trade negotiations is now and will continue to be the right one." and urges "...the Canadian government to maintain the position held at the close of the Uruguay Round, i.e., not to submit cultural sectors and policies to coverage under the GATS (Coalition for Cultural Diversity, 2000, 4,9)." This seems to imply a desire to perpetuate the policy of a cultural exemption despite the recognition in some quarters that it has not worked. At this time, the views of industry related interests are unclear. It depends which voice is listened to.

The advisory committee considered four alternatives: negotiate a broad cultural exemption; make no commitment on culture; create a new international instrument on cultural diversity (NIICD); or develop agreements covering specific industry sectors, measures or practices. It chose the third one which was later endorsed by the government in its response to the committee's recommendation. "As described by the SAGIT, the purpose of the agreement would be to set out clear ground rules to enable Canada and other countries to maintain policies that

promote their culture while respecting the rules of the international trading system and ensuring markets for cultural exports."[12]

The reference to exports recognizes the growing importance of foreign markets for Canadian cultural producers such as for music, audiovisual productions and print material (not magazines) and the extent of Canadian investment abroad in these industries. Absent from the recommendation were details of where the instrument might reside and what might be included. These details have subsequently been discussed in various fora. My view is set out in Acheson and Maule (1999, pp. 346-348) and is expanded in the last section of this paper.[13]

The Canadian government has promoted the NIICD through two initiatives; one involving governments and one industry related groups. The International Network on Cultural Policy (INCP) is a network of over 40 government ministers of certain countries; the International Network on Cultural Diversity (INCD) is a parallel network of artists, creators, cultural workers, producers and those who bring the artistic creation to local and global audiences. The purpose of the INCP is to build increased awareness and support for cultural diversity in an era of globalization and technological change. Both networks seek to ease the frictions between domestic cultural policies and international agreements involving trade and investment obligations. Cultural diversity has now become the buzzword for the new approach.[14] To some, cultural diversity sounds a benign and worthy objective. Countries with ethnic tensions may disagree.

The INCP and INCD last met in September 2000 in Santorini, Greece. The Founding Statement of the INCD (December, 2000) states that,

> Cultural trade agreements do affect the arts and cultural expression and "exempting" culture from their terms appears to be insufficient to permit states and citizens to retain the broad scope of policy making necessary in an age of globalization.
>
> We Believe:
> Governments must not enter into any agreement that constrains local cultures and the policies to support them.

---

[12] The statement can be found at www.dfait-maeci.gc.ca under Trade > WTO > Canada and the Future of the WTO.

[13] I was a member of the advisory committee that produced the report. Other committee members have elaborated their views concerning details of the instrument.

[14] Details of INCP activity can be found on www.pch.gc.ca/network-reseau/eng.htm, and of the INCD on www.incd.net.

The implementation of a new international agreement will give a permanent legal foundation for cultural diversity.

Absent from this statement is a reference to an agreement respecting the rules governing the international trading system and ensuring markets for cultural exports. Nor is the proposed location of the instrument specified.

IV. ALTERNATIVE APPROACHES

In the coming weeks, other countries will present their positions. Three of the most likely to be debated are:

1. Inclusion of culture in the WTO under existing GATT, GATS and TRIPS provisions.
2. Development of a special stand-alone agreement on culture separate from the WTO.
3. Inclusion of culture in the WTO under existing GATT and TRIPS provisions and the introduction of a GATS sectoral agreement similar to that for telecommunications and financial services.

There is widespread if not unanimous agreement that the cultural exemption route of NAFTA does not work as anticipated, and that WTO rulings are now likely to apply to culture if goods trade is involved. Services trade will be affected if countries make the necessary commitments under the GATS and there will be pressure from the United States for countries to increase these commitments. Failure to get increased GATS commitments will leave culture in a similar situation to that which it now enjoys with the so-called exemption. When disputes arise, countries will be bound by no rules. Each will have considerable leeway to act as it pleases and others can retaliate. The strong will tend to benefit at the expense of the weak. The GATS with few commitments is a repeat of a NAFTA-type exemption that is like King Canute commanding the incoming tide.

A proposal for a stand-alone agreement on culture is under discussion by a group of countries, but some of the major players are not involved, and the proposal is not integrated at this stage with the WTO agenda. The failure at Seattle to launch a comprehensive round of negotiations has given increased importance to the WTO built-in agenda, thereby speeding up the discussion of culture within the

WTO, and limiting the attention that may be given to any proposal for a stand-alone agreement for culture.[15]

One way of combining alternatives one and two is to examine a third option, a sectoral agreement on culture within the WTO. The case for a sectoral approach is based on the combined advantages of this approach and the disadvantages of a stand-alone agreement. Previously, industry sectors have been seen to have special features that make the general provisions of the WTO difficult to apply without some modifications. Ways have been found to tailor an agreement to the special prudential requirements of financial services and the ownership restrictions and network externalities of telecommunications. In agriculture, protectionist policies have been converted to tariff equivalents so as to provide a common currency for negotiations. Tariffs are not a big item in the cultural industries, but tax incentives, subsidies and content/quota restrictions are. It might be possible to establish a subsidy equivalent approach for the range of cultural policies so as to create a common currency for these negotiations.

A sectoral approach would automatically include the major trading countries whose absence from an agreement would undermine its effectiveness. If either of the US or some members of the EU are not part of the negotiations, as might occur in a stand-alone agreement, it would have little of the desired impact assuming that it came into existence. The US has stated that it favours negotiations within the WTO framework. The EU member countries are divided on how to approach the topic. Managing these differing positions and creating a new stand-alone approach would be even harder to achieve than working with these countries through the WTO where a common framework exists.

Culture is presently in the WTO, although somewhat tenuously when it comes to services. A stand-alone agreement would require dealing with a range of issues already covered by existing agreements. Removing these issues would be necessary in order to prevent duplication. It would mean negotiating on two tracks simultaneously, the WTO and the stand-alone agreement, a difficult task for negotiators. Countries such as the UK as well as the US are unlikely to agree to this, or the quid pro quo would be expensive in some other area where trade concessions are being negotiated.

Some suggest locating a separate agreement in an organization like UNESCO that already has a cultural mandate. UNESCO is not highly regarded by a number of countries, has no experience with trade policy issues and has not been involved with a formal dispute resolution process. The issues on which agreement would have to be reached in a stand-alone agreement in order to "respect the rules of the international trading system" (the Canadian government's wording) would be

---

[15] The environment, human rights and labour are other issues that will be prominent in future negotiations. Culture may get sideswiped by these issues.

those of non-discrimination regarding market access (content quotas and limits on foreign investors), and most-favoured-nation provisions, subsidies, anti-dumping and countervailing duties, safeguards, rules of origin and the treatment of public enterprises such as public broadcasters as well as dispute resolution.

The GATS – see Exhibit 3 – lists the types of supply mechanisms and protectionist measures that would have to be considered since these are the ones that cause trade frictions. Countries would also want to ensure that their obligations under a stand-alone agreement would not restrict the activities of their firms in foreign markets. The place where these issues are discussed at present on a multilateral basis is the WTO.

Exhibit 3

Modes of Supply and Examples of Protectionist Policies

The GATS sets out four modes of cross-border supply, two where the service supplier is not present in the territory of the member country where the service is received, and two where it is present:

Cross-border supply – e.g., television programs distributed by satellite, distribution via the Internet.
Consumption abroad – e.g., viewer travels abroad to watch film or television program.
Commercial presence – e.g., foreign ownership of cinemas showing foreign films.
Natural persons – e.g., persons travel with a film or television program to show it abroad.

The types of limitations on market access noted are:

Limitations on the number of suppliers.
Limitations on the total number of service transactions or assets.
Limitations on the total number of service operations or on the total quantity of service output.
Limitations on the total number of natural persons that may be employed.
Measures which restrict or require specific types of legal entity or joint venture.
Limitations on the participation of foreign capital.

Details of the way in which commitments and MFN exemptions in the GATS operate can be found in Siwek (1999).

Subsidies are an important cultural policy instrument. A subsidies code has been introduced into the GATT. In a sectoral agreement this could be adapted to the case of culture where a demarcation could be made between those subsidies that serve recognized and agreed upon national purposes and those that create major

trade distortions. Where national treatment prevails, there would be little questioning about a country's freedom to act. A red, amber and green light classification of cultural subsidies could be developed similar to that already in use.

It would be difficult to agree on the scope of culture and the cultural industries in a stand-alone agreement. Some countries emphasize the audiovisual, print, music and film industries. Some include heritage, education, sports and advertising. Some see a rural life style as being part of culture and include farming, while others state that Asian, Islamic and other religious values form part of what should be considered as culture. The WTO has been dealing with a set of industries which has generally been considered to make up the cultural sector. In negotiating a sectoral agreement, these could be expanded to take into account technological developments that are modifying the traditional boundaries and include "new media."

A related question of scope concerns electronic commerce and its probable inclusion as a topic in future WTO negotiations. Electronic commerce will likely be dealt with as a horizontal issue as it affects a wide range of industries trading goods and services. Because cultural products can be and are delivered by electronic means, any agreement on electronic commerce will affect cultural trade and make it more difficult to extract culture from the WTO.

Electronic commerce raises two other trade related issues, piracy and censorship. Protection of intellectual property rights is a continuing and growing problem for the cultural industries; and the treatment by countries of what is perceived to be anti-social material on the Internet is occurring more frequently in legal decisions with cross-border implications.[16] Differing standards for censorship will almost certainly cause trade frictions and require agreement similar to phyto-sanitary standards which address quality concerns in other areas of trade.

Arguments in support of a stand-alone agreement tend to be based on the view that culture is different because of its effects on individuals and

[16] *Economist*, January 13th, 2001, pp. 21-25.

nations.[17] Trade lawyers and economists are not the people who should be deciding these issues. They should be left in the hands of those with expertise in cultural matters typically found in government departments of communications, culture and heritage. These officials deal with policy towards the print media, broadcasting, cablecasting, film, music, the fine arts and heritage. A related argument often used is that traditional economic theory does not apply in this sector; this position can be refuted, but is too extensive a topic to be dealt with in this paper.

The foregoing is similar to arguments made for the uniqueness of other sectors. What was necessary in the case of the sectoral agreements on financial and telecommunications services was to bring together the industry and the trade specialists so as to shape an agreement that dealt with both sets of concerns. The cultural trade frictions that presently exist are not going to evaporate in the event of a stand-alone agreement. They would still have to be addressed.

V. CONCLUSION

Failure at Seattle makes the GATS negotiations the most likely forum in which culture will be negotiated. If countries do not make further commitments for audiovisual services, the situation becomes similar to an exemption. Few or no rules will apply and there will be a continuation of disputes settled in the political arena where small countries are at a disadvantage. The most promising route to explore is a sectoral agreement within the WTO where over 130 countries are present, there are agreed-upon negotiating procedures and the trade issues are understood. The WTO has been adapted to special industry circumstances before. A sectoral agreement on culture would follow this format.

---

[17] France is an articulate spokesperson for this view. In 1993, Prime Minister Balladur stated that "[the French] cannot accept everything related to the fundamental values of our tradition, our culture, our civilization [as] being treated like ordinary goods," and President Mitterand contended that "[w]hat is at stake, and therefore in peril, in the current negotiations is the right of each country to forge its imagination and to transmit to future generations the representation of its own identity" (quoted in Shao, 1995, pp. 137-138). Statements expressing similar sentiments have been made on numerous occasions by Canadian politicians, officials and industry representatives. A recent Canadian statement expressing these views can be found in Coalition for Cultural Diversity (2000). One difference between France and Canada is that France is concerned about declining use of the French language while Canada is concerned about competition from the United States in the same language, at least as far as English is concerned. Seldom is it acknowledged that proximity to a large market is an advantage for Canadian English language productions, although this is precisely what Canadian firms are now targeting with their productions.

Malaysia will have to establish its position on GATS negotiations in general, the commitments it wants from others and what it is prepared to offer in all areas including audiovisual services. It will have to put forward a position regarding the enforcement of intellectual property rights, especially in light of its interest in attracting investment in a multimedia super corridor as part of a knowledge economy. And it will have to address its concerns, along with other countries, on how to monitor and control the distribution of anti-social content.

In developing a sectoral agreement, a first step would be to draft a reference paper setting out the definitions and principles of the sector's peculiarities bringing together trade and cultural policy officials to address each other's concerns. This would need to show, for instance, how the four modes of service delivery in the GATS apply in the case of culture, and how particular cultural policies may impinge on market access and national treatment. Legitimate cultural concerns can be inserted into the trade framework.

In the process of developing a Reference paper, there will be a need to assess the objectives and effectiveness of existing domestic policies that are the cause of the trade frictions. Economists are no better equipped than any other taxpayer to say where government funds should be spent and support provided. They are trained to evaluate whether the chosen policies have achieved and are likely to achieve their objectives. On this count, many policies, in my judgment, are deficient, although they are ardently supported by their beneficiaries. Initial progress to defusing disputes may be to amend or eliminate certain dysfunctional policies. As an overall objective for cultural policy, an emphasis on promoting creativity has merit and would likely attract broad support. This was the emphasis of an earlier government report (Canada, 1982) and recently articulated by a senior cultural official.[18]

A sectoral agreement would not be easy to negotiate. Some of the issues involve relatively uncharted trade territory, such as electronic commerce, censorship, and competition policy as it relates to cross-border mergers and transactions that involve restrictive practices. The alternative is bleak. Failure to

---

[18] Creativity is the approach emphasized by Michael Wernick, the Assistant Deputy Minister in the Department of Canadian Heritage in an address to a conference at New York University, March 3rd, 2000 – "There is an increased emphasis on the creative process and creators, and how you take the inherent creativity of society and allow it to flourish and explode in the world scene. So, the incentives have to be increasingly targeted towards original content, risk taking, and taking chances with how you use that million dollars, the controversy about how the tax payer's dollar is used. It's very much about building capacity. We try to use the opportunities of the digital age that you're already immersed in, and will connect communities and individuals to each other and to the rest of the world" (remarks taken from unedited record of proceedings).

make progress on an agreement and clinging to an exemption will provide, as one trade official remarked, protection equivalent to the Maginot Line.

REFERENCES

Acheson, K., and C.J. Maule (1999), *Much Ado about Culture, North American Trade Disputes* (Ann Arbor: University of Michigan Press).

Canada, Federal Cultural Policy Review Committee (1982), *Report of the Federal Cultural Policy Review Committee* (Ottawa: Department of Communications, Government of Canada).

Canada (1997), "*Canada and the Multilateral Agreement on Investment*," Third Report of the Standing Committee on Foreign Affairs and International Trade, House of Commons, December.

Canada (1999), *Canadian Culture in a Global World, New Strategies for Culture and Trade*, Report of the Cultural Industries Sectoral Advisory Group on International Trade, Ottawa, February.

Canada (1999), "*Canada and the Future of the World Trade Organization: Advancing a Millennium Agenda in the Public Interest*," Report of the Standing Committee on Foreign Affairs and International Trade, House of Commons, June.

Coalition for Cultural Diversity (2000), *Submission to the Department of Foreign Affairs and International Trade (DFAIT) concerning Consultations on Trade in Services Negotiations*, October 15.

Dale, Martin (1997), *The Movie Game, The Film Business in Britain, Europe and America* (London: Cassell).

Flatters, Frank (2001), "Modern Trade Policies for the Global Economy," paper prepared for CIDA-funded MIER/Queen's University conference on *Globalization and the Knowledge Economy* (Kuala Lumpur, Malaysia) January 30-31.

Guback, T.H. (1969), *The International Film Industry: Western Europe and America since 1945* (Bloomington, IN: Indiana University Press).

Jarvie, I. (1992), *Hollywood's Overseas Campaign: The North Atlantic Movie Trade, 1920–50* (Cambridge: Cambridge University Press).

Messerlin, P. and E. Cocq (1999), "Preparing Negotiations in Services: EC Audiovisuals in the Millennium Round," paper prepared for the World Services Congress 1999 (Atlanta, USA) Nov. 1-3.

Motion Picture Association of America (2000), *Trade Barriers to Export of U.S. Filmed Entertainment, 2000 Report to the United States Trade Representative* (Washington, DC).

Puttnam, David (1998), *Movies and Money* (New York: Knopf).

Shao, W. Ming (1995), "Is There No Business Like Show Business? Free Trade and Cultural Protectionism," *Yale Journal of International Law*, 20 (105), pp. 105-150.

Siwek, S.E. (1999), "Changing Course: Meaningful Trade Liberalization for Entertainment Products and the GATS," paper prepared for the World Services Congress 1999 (Atlanta, USA) Nov. 1-3.

World Trade Organization (1997a), *Canada – Certain Measures concerning Periodicals: Report of the Panel*, WT/D531/R (Geneva: World Trade Organization).

_____ (1997b), *Canada – Certain Measures concerning Periodicals: Report of the Appellate Body*, WT/D531/AB/R (Geneva: World Trade Organization).

The Services Sector: Malaysia's Next Engine of Growth?

Syarisa Yanti Abubakar

I. INTRODUCTION

With the growing popularity of the "K-economy" as the basis of a new model for Malaysia's economic development, it could be argued that there has emerged in Malaysia a discernible paradigmatic shift with respect to the emphasis given to particular sources of economic growth. While the emphasis of the P-economy (that characterized economic development up till now) had been on industrialization and manufacturing, the thrust of the K-economy, arguably, is on activities that some have called "post-industrial," especially given the accent on knowledge, technology and innovation that underpins much of the K-economy logic. The focus on the K-economy, at least in terms of policy, has been perceived to be an indicator that Malaysia is preparing to move into the next stage of economic development – a primarily services-based economy – in the near future. By implication, this would mean that the manufacturing sector is to give way to the services sector as the country's main engine of growth in the future.

The association with the K-economy notwithstanding, the notion of the services sector as Malaysia's next engine of growth is certainly not new. The idea, in its rudimentary form at least, has been bounced around the discussion circles of policy-makers, policy scholars and various other intellectuals involved in influencing national policy for at least two decades. Indeed, the importance of the

services sector to further Malaysia's economic growth has been increasingly highlighted in the country's 5-year development plans. Included in these development plans are outlines of the various strategies that are to be adopted by the country to promote the services sector. Despite this keen interest however, the services sector, while contributing the largest share (compared to the agriculture, and manufacturing sectors) of the country's GDP, has yet to realize its full potential in pushing the country to a higher stage of development. This can be seen in the large gap that exists between the size of the services sector in industrialized countries as a whole and that of Malaysia. Indeed, given the fact that in industrialized countries, the contribution of the services sector to GDP averages around 61 percent, the relatively stagnant share of the services sector to GDP in Malaysia which has averaged 43 percent from 1960-1995, is certainly an indication that there may be scope for improvement in terms of policy conception, design, and/or implementation.

As a country that is seeking to make the transition from developing to fully developed economy in the short span of thirty years,[1] the importance of targeting specific sectors and industries to provide a catalyst and dynamic force to promote rapid sustainable economic growth cannot be underestimated. For example, in making the transition away from an agriculture-based economy in the 1970s, the manufacturing sector was targeted to be the country's primary engine of growth. On the whole, the strategies and policies that were adopted to structurally transform the economy have been remarkably successful in enhancing Malaysia's economic growth and pushing the economy further along the development trajectory. Indeed, with the exception of a few years in the mid-1980s when Malaysia experienced an economic recession, Malaysia's economic growth has been impressive with an average growth rate of 8.5 percent between the years 1987-1996. Having just emerged out of the recent economic crisis that began in mid-1997, a time when the manufacturing sector was especially hard-hit, it is perhaps timely to shift our attention to the services sector to understand how the services sector can contribute to the further development of the Malaysian economy and the strategies that can be implemented toward this end.

The aim of this paper is thus to gauge the potential of the services sector to be Malaysia's engine of economic growth into the 21st century. In doing so, the paper adopts the following organization. After a brief theoretical survey of popular perspectives on the contribution of the services sector to a country's economic growth, the discussion in the paper turns toward exploring the situation in a Malaysian-specific context. This section begins by profiling the services sector in Malaysia, and goes on to review the past performance of the sector including the effect of the recent economic crisis. Based on this, and in consideration of the

[1] This is essentially the thrust of Malaysia's Vision 2020 development plan.

domestic and global economic environment enveloping the country, a tentative projection of the direction of the services sector to Malaysia's economic growth in the future is then suggested. In the final section, the various structural challenges that the economy faces in making this transition are discussed.

Definitions and Theories

Before embarking any further with the discussion, it would be useful to outline what is meant by the term "services sector." A service is that which is intangible (invisible) and for which a consumer, firm or government is willing to exchange something of value. The phrase "services sector" thus denotes an array of similar or different industries tied together by their individual and collective action of providing services whether to the individual, firm, or organization.[2] From an analytical perspective, the industries and businesses involved in the services sector can be conceived of as falling into two main typologies – final and intermediate services. Industries such as hotels and restaurants, as well as wholesale and retail trade businesses that are involved in the provision of services for consumption are considered as final services. In contrast, industries and businesses providing business and professional services, transport and communications, finance, insurance, and information technology and computer services are considered intermediate services because they contribute to the production of final goods and services.

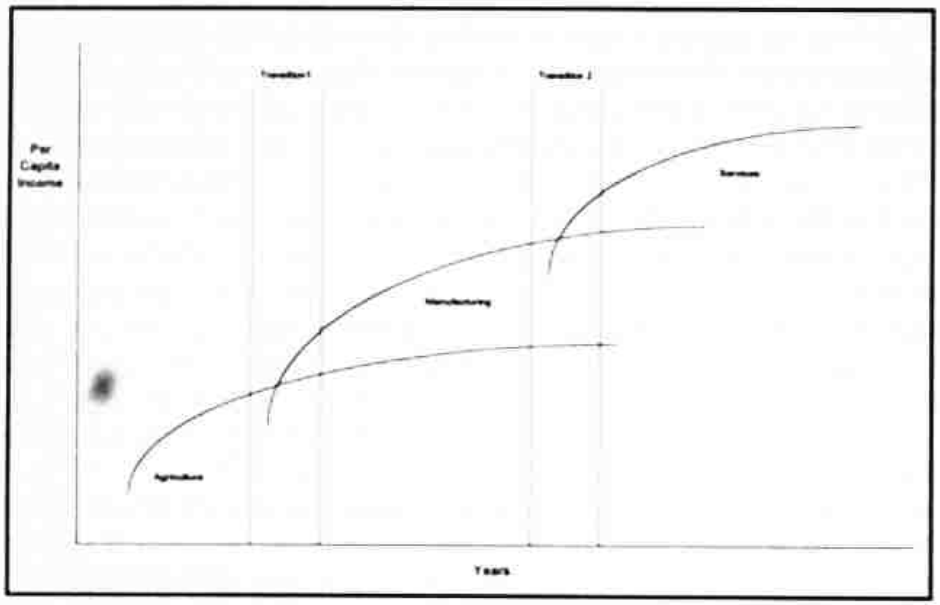
In understanding the relationship between the services sector and its contribution to economic growth, many theories have been suggested. These vary in terms of the particular approach adopted, including microeconomics, developmental economics, and even political economy. Ultimately however, these different approaches are united in the sense that regardless of which approach is employed, it is widely agreed that on the whole, most countries follow a general pattern of economic development, although the particular rates and time-spans taken to reach similar levels of development may differ from country to country (see Figure 1). In this model, a decline in the agricultural sector (in terms of output and employment) at the initial stage of industrialization is accompanied by a concomitant expansion of the manufacturing sector (transition1), and subsequently, in the move toward a post-industrial society, the services sector becomes more prominent while the manufacturing sector declines in relative importance (transition 2). This transformation is also accompanied by other structural changes too, notably, migration, urbanization and shifts in comparative advantage. Given the higher positive income elasticity of services relative to that for goods, the demand for services is expected to rise faster than for goods as income increases. This pattern – a rising share of the services sector as per capita income rises – can be

[2] Other terms used to denote "services" include "tertiary" and "invisibles" and are often used interchangeably.

observed in the economic development of most countries. From this perspective, the growth of the services sector has often been perceived as a function of rising income levels and as a by-product of development.

FIGURE 1

GENERALIZED MODEL OF COUNTRIES' DEVELOPMENT TRAJECTORY



Currently, the services sector is increasingly being regarded as having an important active role in and of itself to promote economic development. The changing perception of the services sector is brought about by several developments such as technological progress, increasing globalization of the world economy, and the deregulation and deepening of the financial market. Generally, the services sector, particularly the transportation industry, telecommunications network, banking system and public administration, has been recognized as an essential part of a country's development in the sense that it forms an infrastructure and contributes to economic growth in much the same way as physical infrastructure. On another level, the services sector has one very salient feature. Since the beginning of the industrial revolution, people have worried that resource scarcity will bring economic growth to a halt. As studies for industrialized economies have shown, the development of the services sector not only has the effect of expanding the economic and technological capacity of the economy (which in turn has the effect of enhancing productivity levels), but it also leads to the creation of new services products such as sophisticated financial instruments and services, as well as new industries such as that which has been spurred by the electronic commerce

phenomena. Indeed, the potential for what Paul Romer calls "perpetual growth" is one of the advantages that the services sector has, particularly in conjunction with the technology element, over the agricultural or manufacturing sector (Romer, 2000).

But how exactly does the services sector contribute to the process of economic development? Firstly, like physical infrastructure, the infrastructure provided by the services sector is essential for economic development because efficient and well-managed banking and transportation systems, telecommunications networks and public administration are likely to reduce production costs and improve the overall international competitiveness of a country. Similarly, advances in technology have also enabled service providers to enhance the effectiveness of existing physical infrastructure (for example, by offering more effective and efficient transport logistics systems) and generating what has been described as advanced infrastructure, a feature that characterizes the East Asian newly-industrializing countries (NIEs). Secondly, the growing inter-linkages between the services sector and other sectors in the economy – the manufacturing sector in particular – is also an important factor contributing to economic growth. For instance, the demand for intermediate services arises primarily from companies wishing to improve or diversify their products and meet new competitive challenges in their traditional or new markets. This would imply that increasingly, intermediate services influence the cost and competitiveness of products, ultimately determining the competitiveness of countries. Thirdly, the services sector provides employment opportunities. The growth of new dynamic services activities that are intensive users of communication and information technology have also created both more and higher quality job opportunities. Additionally, a study by UNCTAD in 1988 showed that the increasing share of employment in the services sector in industrialized countries had been accompanied by a number of changes in the workforce, including the increasing participation of women, the shift to white-collar jobs, and an increase in the level of skills and wages (BNM, 1995). This is unsurprising as the intermediate services industries are thought to be gender-neutral as well as knowledge and skill-intensive. In short, as economies move further and higher along the development trajectory, the services sector will grow in size and importance generating a higher rate of labour force participation in addition to creating higher skilled and better paid jobs.

From an international perspective, technological advances and the rapid globalization of the world economy have undoubtedly increased the "tradability" of services and created new opportunities for countries to develop via the export of these services. According to World Bank estimates in 1995, the services sector accounts for about a quarter of world trade, compared with a 19 percent share a decade before. Technological innovation has created new opportunities for long distance exports of services through the unbundling of the production and consumption of information-intensive service activities (such as research and development, computing, inventory management, quality control, advertising,

distribution, and legal services), thus enabling their geographic dispersal. Moreover, countries whose services sectors are at an advanced stage can, through the export of these services, have the opportunity to generate income and foreign exchange while countries with fledgling services sectors can still have access to services via the importation of services.

While it has been the intention in this section to provide an overview of the potential contribution of the services sector to the growth and development of countries, the following section will address the performance and prospects of the services sector in a Malaysian-specific context.

II. THE SERVICES SECTOR IN MALAYSIA

In Malaysia, the notion of the services sector as the country's next engine of growth is based on the expectation of Malaysia conforming to the general development model outlined previously. However, in analyzing the actual potential of the country's services sector to become the next engine of economic growth, it is not sufficient to merely base analyses on general theories without taking into consideration the unique characteristics, circumstances and development pattern of the particular sector and economy in question. Indeed, it can be argued that besides global trends and imperatives, the development of the services sector in Malaysia is influenced by the latter factors. As a result, the unique characteristics that define the Malaysian economy differentiates to an extent the services sectors' growth pattern from neighbouring countries like Singapore and Taiwan on one end, and Thailand and Philippines on the other. In order to explore this concept further, the following paragraphs takes a more detailed look at the services sector in Malaysia.

Services Sector Profile

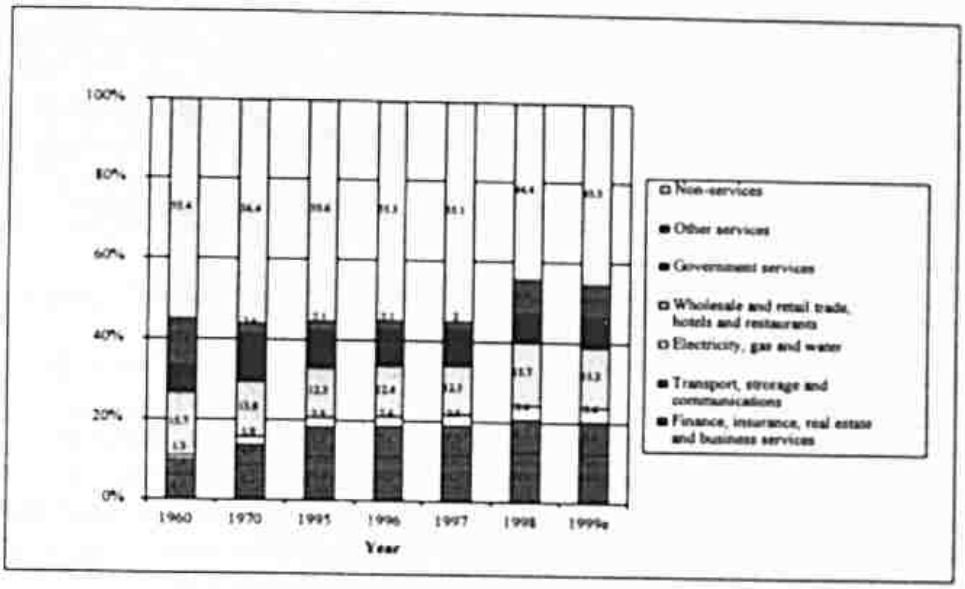
The overall share of the Malaysian services sector relative to GDP has remained steady at about 40-45 percent for some time now,[3] although there has been a shift in the relative importance of the various sub-sectors over time. During the 1960s and 1970s, the services sector was focussed on basic infrastructure facilities such as utilities, transportation and government services. Nevertheless, it came to be recognized that as the economy develops, an inadequate services infrastructure would hinder production in other sectors of the economy. Consequently, since the late 1980s, there has been a shift in emphasis to other services activities such as financial services, wholesale and retail trade, tourism, and telecommunications. As a result, the importance of final services, in terms of GDP share, has been

[3] This contribution is comparable to that of Indonesia, Philippines and Thailand (ranging from 40-50 percent), although it is still significantly lower than Singapore (1994: 65 percent).

superseded by intermediate services. Whereas the contribution of final services to GDP has declined from 29.9 percent in 1970 to 19 percent of GDP in 1997, intermediate services have increased from 13.7 percent of GDP to 19 percent of GDP over the same period (Ministry of Finance). Indeed, the rise in the importance of intermediate services is unsurprising as it is symptomatic of the increase in the pace of the industrialization process experienced by the country and concomitantly, rising levels of general demand.

FIGURE 2

SHARE OF SERVICES SUB-SECTORS TO GDP IN MALAYSIA

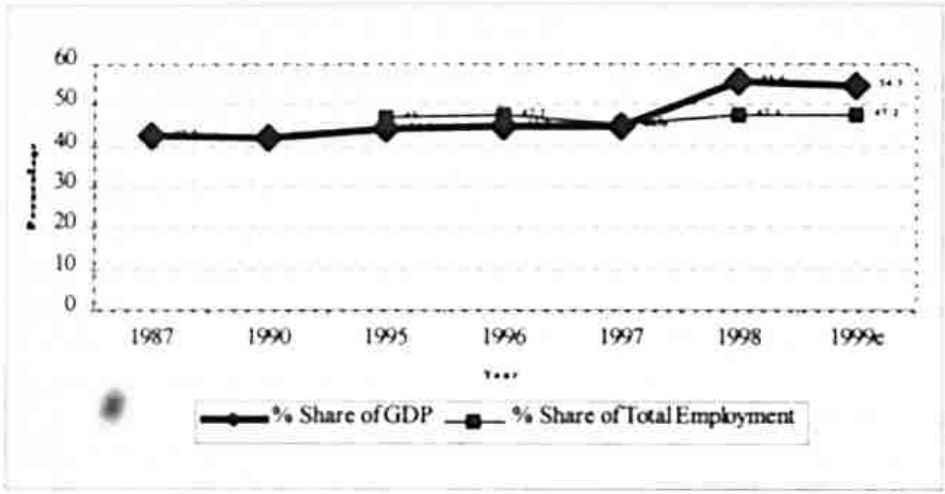


In terms of employment opportunities provided by the services sector, a substantial shift in the overall trend can also be gleaned. Prior to the 1980s, the agriculture sector provided the bulk of employment for the population although the sector's preponderance as providers of employment eventually gave way to the manufacturing and services sector. From the 1980s onwards, industries and businesses in the services sector have become the largest providers of employment in the country, overtaking the manufacturing sector. At this time, according to official figures, nearly one-half of the labour force was engaged in the services sector, whereas only around 26 percent were engaged in the manufacturing sector. Of the total employed in the services sector, about one-fifth are involved in intermediate services, while the balance are involved in final services. Thus, it could be concluded that while the intermediate services sector is beginning to grow in importance, particularly with respect to its contribution to GDP growth and

employment, there still remains much potential for the growth of this area of the services sector.

FIGURE 3

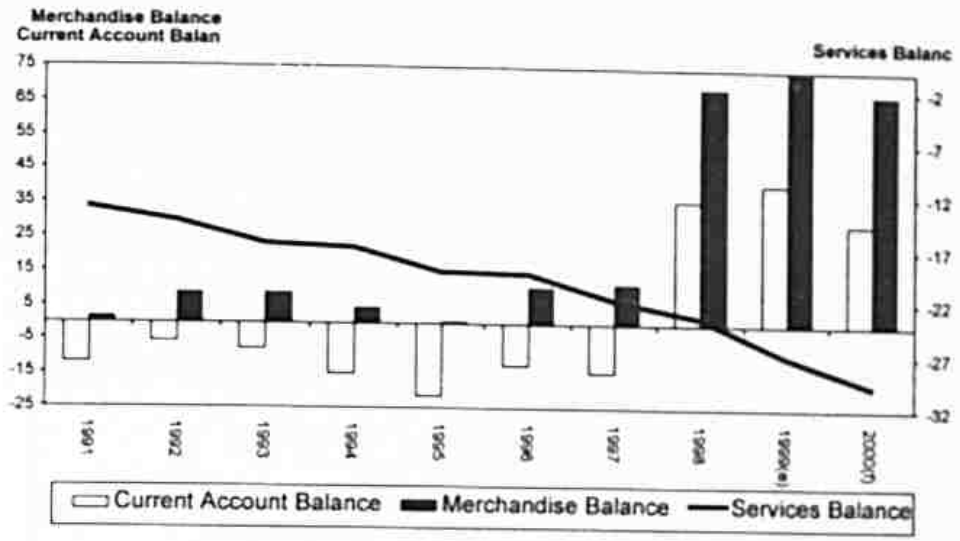
CONTRIBUTION OF THE SERVICES SECTOR TO ECONOMIC GROWTH



On the external front, the services sector in Malaysia has, on the whole, displayed a deficit in the national balance of payments account over the years. In that sense, the contribution of the services sector in terms of foreign exchange earnings is being offset entirely by the outflow of funds for foreign non-factor services. For example, while the country exports "freight and insurance," "other transportation," "travel," "government transactions," and "other" services (mainly contract, professional charges; rent and royalties; and agency fees) internationally, the returns are not enough to offset the outflow of funds for foreign non-factor services, particularly freight and insurance. On another level, this situation could be said to be the result of Malaysia's as yet limited ability to export its own services owing to the relative immaturity of the services sector in the country. Indeed, both factors are mutually reinforcing. As the services sector in Malaysia has not expanded fast enough, as evidenced by infrastructure constraints; consequently, the excess demand has to be met from abroad.

FIGURE 4

SERVICES BALANCE IN THE CURRENT ACCOUNT



Policies and Strategies

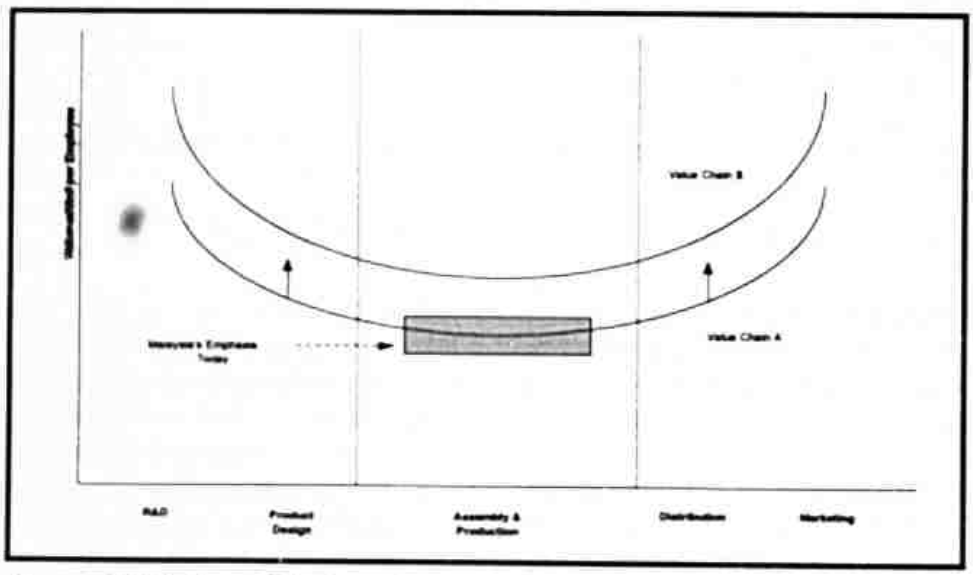
As Malaysia is what political economists would call a "developmental state," the government has always played an active role in shaping the direction of the country's economic development. In that sense, developments in the services sector, including but not restricted to, the shift in importance from final to intermediate services, while largely the spontaneous result of socio-economic developments in the country, is also being pushed to an extent by the government's long-term development plans and strategies. Malaysia's aspiration for development, as embodied in the country's Vision 2020, is to be a fully developed nation by the year 2020. It is envisaged that by this time the Malaysian economy would have grown (as measured in terms of GDP) by eight times based on a projected growth of 7 percent per annum. Given that Malaysia's GDP in 1990 was $115 billion, the country's GDP in 2020 is projected to be about $920 billion (1990 prices) in real terms (Mahathir, 1991). A major source of this growth is to be provided by the manufacturing sector. Nevertheless, the services sector is also expected to play an increasingly important role in economic growth with the growing proliferation of higher value-added, technology and knowledge-based industries in the near future.

In order to ameliorate the current structural imbalance, as well as to leapfrog into the next so-called stage of development, several initiatives have been undertaken by the government. While Vision 2020 provides the general direction of Malaysia's development aspirations, the specific strategies involved are contained in the various Industrial Master plans, the most recent being the Second Industrial Master Plan (1996-2005). The latter promulgates a two-pronged development

strategy – the Manufacturing Plus Plus strategy and the cluster-based development strategy. In broad terms, the cluster-based approach aims to promote specific industries in an integrated and synergized manner to spur the development of higher value-added activities, while the Manufacturing Plus Plus strategy calls for the participation of domestic producers and service suppliers in the whole value chain of a product from the initial stage of product design and prototyping to the production stage of processing and assembly and finally, distribution and marketing. Figure 5 provides a simplified model of this development strategy.

FIGURE 5

MODEL OF MANUFACTURING PLUS PLUS STRATEGY



Source: MITI, *Second Industrial Master Plan 1996-2005*

The black arrows represent the role of the services sector in this. In the above model, these arrows denote both the direction and thrust of the services sector in "pushing" the economy *forward* along the value-chain, as well as *upward* to a higher level in the value chain by adding to the productivity of the labour force and the economy as a whole. The government has identified particular intermediate services to augment the Manufacturing Plus Plus strategy. The latter include:

- Conventional business services of finance and accounting, legal, public relations, advertising, and marketing.

- Technical business services of quality control, testing, environmental management services, management consulting, and production consulting.

- Information technology involving data processing, management information systems, electronic data interchange, and network systems.

- R&D in software development, industrial design, and product development.

- Packaging involving the printing and publishing services.

In the above conception, the services sector plays a primarily supporting role. Nevertheless, the potential of the services sector to be its own spur to the country's economic growth is well appreciated. In terms of policy, this can be gleaned from the way the government has targeted specific services industries that the country has a comparative advantage in, such as shipping and tourism, to act as a catalyst for the growth of other sectors of the economy. Indeed, in recognizing the services sector as the next leading sector of the economy, the government has also recently launched the Multimedia Super Corridor (MSC) to catalyze the development of information technology industries in the country. This move is seen to be necessary to provide the country with an important intermediate service industry, and more importantly, to provide the necessary infrastructure for Malaysia to make a quantum leap into the Information Age and Digital Economy Era. It is envisaged that the design and construction of Putrajaya, the MSC, and the Kuala Lumpur International Airport at Sepang will provide ample opportunities for innovation, creativity, and inventiveness, especially by the private sector. This is indicative of the emphasis on the development of high-level industrial and services-related activities, concentrating on new technology-oriented processes and systems that will provide high-quality products and spin-offs for Malaysia.

In short, the focus of policy, with respect to economic development and the services sector, has transformed over the years from one that emphasized the supportive role of the services sector to manufacturing-led growth to one that places the services sector as a leading generator of economic growth in and of itself. Additionally, while the government has taken an active role in promoting and steering the growth and direction of the services sector, it has been the government's intention to eventually pass the baton over to the private sector to spearhead the development of the services sector. Nevertheless, as will be made increasingly clear, reality has been slow to take up on the lead provided by policy.

Historical Development and Performance

As a prelude to analyzing the development potential of the services sector in Malaysia, it would be a particularly useful exercise to review the historical development of the sector with a view to understanding the enabling and impeding factors, as well as the particular situations and contexts, which may play a part in influencing the performance of the services sector. In order to simplify the task, the

historical development of the services sector is divided conceptually into two periods: (1) prior to the economic crisis (up to 1997), and (2) during the economic crisis (1998-1999).

FIGURE 6
GROWTH TREND OF THE SERVICES SECTOR IN MALAYSIA

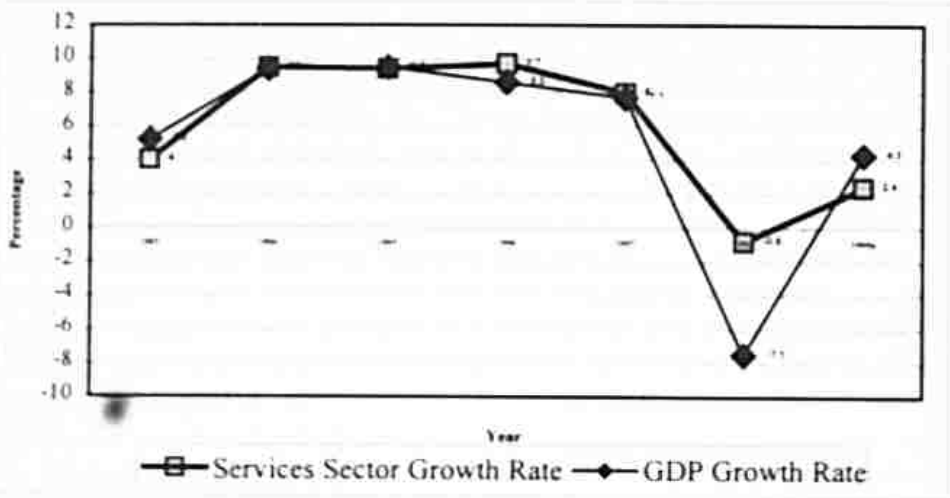


Figure 6 shows the overall growth trend of the services sector in Malaysia from 1987 to 1999. As is apparent from the chart, the trend of the services sector closely follows the country's overall growth trend (as measured in terms of GDP). Prior to the recent economic crisis, a sustained high rate of growth characterized both the overall Malaysian economy and the services sector in particular. After emerging out of the mid-1980s recession, the country adopted a high-growth strategy that saw its GDP rate rise sharply from 5.2 percent in 1987 to 9.5 percent in 1990. The spill-over effect of the economic growth was likewise to raise the growth rate of the services sector from 4 percent to 9.4 percent over the same period. During the period between 1990 and 1996, the growth of the services sector matched that of the overall economy, and just prior to the crisis, the growth rate of the services sector was showing some signs of surpassing that of the overall economy. As to the individual importance of the various services sub-sectors to economic growth during this period, some shifts in the importance of the various sub-sectors over time can be discerned. From Figure 2, one can see that the importance of the finance, insurance, real estate, and business services has grown tremendously, almost doubling between the years 1960 to 1997. Likewise, though less dramatic, has been the growth of the transport, storage and communications sub-sector, government services sub-sector, although the contribution of these latter sub-sectors to GDP has remained stagnant, particularly between 1995 and 1997.

Beginning in mid-1997, however, the Malaysian economy suffered a massive decline as a result of becoming embroiled in a region-wide economic crisis. From a robust GDP rate of 10 percent in 1996, the economy fell to 7.8 percent in 1997, before eventually plunging to -7.4 percent in 1998 when the full brunt of the crisis began to be felt in the economy. Inevitably, the services sector was also hard-hit. In 1997, the growth rate of the services sector fell to 8 percent from 9.7 percent the year before. Reflecting the recession in 1998, the services sector also experienced a decline in growth by 0.8 percent that year, although its performance is very much better compared to that of the manufacturing sector which declined by 13.7 percent that year. According to a National Economic Action Council (NEAC) report released in August 1998, the performance of the services sector slackened primarily due to such factors as the moderation in domestic demand for services by the real sector of the economy, the fall of share prices, and the drop in disposable income. Less directly, the slower growth in international and domestic trade, the overall economic slowdown, and general uncertainties of the period also had a negative effect on the intermediate services industries, that is by acting as a drag on the supply of services as well. The moderation of the growth rate in the services sector was felt especially in the wholesale and retail trade, hotels and restaurants sub-sector (final services), and the finance, insurance, real estate and business sub-sector (intermediate services) which plunged dramatically by 3.1 percent and 4.3 percent respectively in 1998. While the performance of the government services sub-sector was pulled down by the pursuance of certain tight fiscal policies and the abandonment of certain "mega-projects" in the early stages of the crisis, its performance in 1997 was buoyed by an injection of special funds for the education and health sectors so that overall, this sub-sector performed quite well growing from 4.2 percent in 1996 to 6.1 percent in 1997, although it did moderate to 1.8 percent in 1998.

Most worrying, has been the continuous deficit in the services account of the country's balance of payments. While the effect of the crisis has been to transform the overall deficit in the current account of the country's balance of payments into a condition of surplus (1997: -5.4 percent of GNP; 1998: 13.7 percent of GNP; 1999: 15 percent of GNP), the services sector continues to register a growing deficit. From a deficit of 7.6 percent of GNP in 1996, the figure grew to 8.5 percent and 8.3 percent in 1997 and 1998, respectively. On the flip side, the crisis did engender some positive effects for the services sector. After having stagnated at around 40-45 percent for some years, the share of the services sector to GDP rose to 55.6 percent and 54.5 percent in 1998 and 1999 respectively. While it is acknowledged that the rise is, in part, a reflection of the declining share of the manufacturing sector which fell to 27.9 percent in 1998 and 29.2 percent in 1999 (1997: 35.7 percent), nevertheless the rise could also be interpreted as a sign of the growing maturity and increasing productivity of the services sector in Malaysia.

Outlook For The Future

In order to arrest the further slide of the economy and to revive the flagging health of the various affected sectors including the services sectors, the government formulated several strategies. These strategies could be said to be divided into those that sought to raise the general economic performance of the country, and on another level, those that specifically targeted certain industries within the services sector for revitalization and improvement. The latter included the property, transport, freight forwarding, tourism, as well as banking and insurance industries.[4] As a result of the various strategies implemented by the government and the slight rebound experienced in the Malaysian economy recently, the prospects of the services sector has begun to look promising. Given the slight recovery of aggregate demand for services, the services sector has experienced a modest turn around as evidenced by an annual growth rate of an estimated 2.4 percent experienced in 1999 (1998: -0.8 percent), although the share of the services sector in GDP has moderated slightly from 55.6 percent in 1998 to 54.5 percent in 1999 (Ministry of Finance, 1999). The recovery in the services sector is mainly being propelled by a 4.2 percent growth in the utilities sub-sector as well as the improved performance of the government services sub-sector (including general public services, education, health, defence and others) which has grown by an estimated 3.5 percent in 1999. On the external front, owing to the better performance of the economy in 1999, a rise in outflows of net payments on investment income as a result of higher levels of profits and dividends following higher earnings by foreign companies is expected. This is anticipated to raise the deficit in the services account of the balance of payments even further.

The impact of the economic crisis on the development of the services sector can be seen in two ways. A pessimistic view would be one that sees the growth potential of the services sector as being jeopardized by the plunge in the overall economy. This view is based on the projections of the Second Industrial Master Plan which highlighted the fact that the services industries (such as utilities, transport and communication, distributive trade, financial services, other business and government services) should grow at an average rate of between 8 to 9 percent per year in order to meet the goal of increasing its contribution to GDP from 44.4 percent in 1995 to 56 percent in 2020. As the annual growth rate of the services sector was -0.8 percent and 2.4 percent in 1998 and 1999 respectively, it is

[4] For specific policies, please refer to Chapter 7 of the National Economic Recovery Plan (NEAC, 1998).

somewhat natural to foresee difficulties in reaching this goal.[5] Additionally, the general perception that the period of rapid high economic growth has ended and that a more subdued, though more sustainable growth has begun, makes the likelihood of higher services sector growth rates in the future to offset the recent decline decidedly slim. Nevertheless, a more optimistic view of the situation, however, would be one that sees the crisis as having given the opportunity for the economic, institutional, and governance foundations of the economy, in general, and the services sector, particularly the finance and real estate industries, to be further strengthened. Essentially, this view could be read as one that values the quality of development over quantity. In strengthening the foundations of the services sector, particular attention needs to be paid to the issues of policy development, human resource development, and technology developments. The following section will outline in greater detail some of the issues and challenges that face the services sector.

Issues and Challenges

Comprehensive Services Sector Policy Framework

In architectural terms, the successful construction of a building depends, in large part, on the quality of the blueprint. Likewise, in creating a new service-oriented economy, there is a crucial need to develop a "services master plan" to guide its development. Up till now, the various planning documents have presented the various services as separate sub-sectors whose roles were regarded as social or facilitative in nature. In the traditional framework, the services sector was seen as a collection of almost unrelated heterogeneous activities. As a result, development of services in the past lacked coherence and more often than not proceeded in an *ad hoc* manner. Increasingly, there is a need to discard the notion of services as being "disaggregated appendages," and assume that services are fundamental economic activities in their own right, capable of supporting, and even leading other economic sectors, whose role of holding the economy together cannot be underestimated. A framework for the coherent development of the services sector that takes these into consideration is thus very much overdue.

In formulating such a framework, Sieh (1991) proposed a three-pronged approach that comprises three sets of detailed policies. Almost a decade on, this approach still has some salience for policy formulation. The first "branch" of the approach focuses on the promotion of services production and consumption in order

---

[5] However, as we have already seen, during the crisis the share of the services sector to GDP in fact rose to 55.6 percent and 54.5 percent of GDP in 1998 and 1999 respective-ly (although the rise in the services sector's share of GDP was met with a fall in the manufacturing sector's share).

to encourage economic growth in directions that will result in an optimal mix of services activities. Traditionally, shipping, tourism, and education were the primary industries that were actively promoted. While these sectors continue to be the star performers of the services sector in Malaysia, some new industries are also being promoted, particularly knowledge-based industries that specialize in information communication technology (ICT) based services, professional and technical services, banking and insurance, and modern health care. Nevertheless, as Malaysia has been widely acknowledged to be facing an acute shortage of skilled labour, this particular strategy entails the need to develop a critical mass of highly-skilled knowledge-workers in the country, as well as the need to foster other supporting institutions. Of course, the promotion of technology-based industries does not diminish the possibility of other sectors from being promoted in the future. Industries such as shipping, tourism and education, in which Malaysia still enjoys relative advantage compared to other countries in the region, would also benefit from the increased usage of ICTs to augment efficiency and productivity, and thereby add to the competitiveness of these industries. Moreover, given the deficit in the services account of the balance of payments, priority needs to be given to the promotion of the more "tradable" services that can be exported. Even though technological advancements and innovations have increased the potential for the export of services, nevertheless Malaysia would still need to improve its efficiency to be able to compete effectively in the world market.

The second branch of the approach should meanwhile concentrate on developing a coherent set of policies on investment in the services sector. In particular, the role of direct public sector investment, especially for communications infrastructure and to establish research and design (R&D) facilities must be balanced out with that of private sector investment in the sector. Additionally, the desired composition of foreign and local participation in the services sector should also be indicated in terms of equity ratios, management and in various technical and management agreements. Policies on trade-related investment in services should be clearly articulated along with guidelines for transnational corporations in the supply of services. Explicit conditions must be set for foreign access into the Malaysian market, including their commitment to human resource development, transfer of technology, and other conditions that contribute to the development of domestic services industries and their capabilities. The third branch of the approach should focus on policies on "trade in services" to cover exportable services and those that are importable. Export support measures for services can take various forms, including tax concessions, export financing or guarantee schemes, lower tariffs or duty free import of equipment necessary to produce those services, provision of information on potential export markets and with overseas buyers, facilities for output testing and quality assurance. Given the fact that the country and the rest of the world engaging in trading of services are about to face new rules of conducting invisible trade under the General Agreement

on Trade in Services (GATS), such policies should be consistent with the need to foster the development of indigenous services industries.

Internationalization of Services

The internationalization of services is one of the main challenges facing the services industries, including those of Malaysia, in the 21st century. Services are the fastest-growing component in both trade and foreign direct investment (FDI). The World Bank reported that services now account for close to one-quarter of world trade and one-fifth of FDI flows. Studies have also shown that the share of trade in commercial services in world exports expanded at a faster pace than merchandise trade during the 1980s. As a group, the developed countries are the larger importers and exporters of commercial services. Developing countries, especially the dynamic East Asian nations, also have a niche in certain specialized services, and are expected to follow in the expansion of trade in services. With the opportunities, comes the challenge of improving efficiency in the provision of services. Efficiency improvements are necessary not only to capture new export opportunities, but also because access to efficient services will be an increasingly important determinant of competitiveness throughout the economy.

Malaysia's adoption of a liberal trade and investment regime will be essential to maximize benefits from the internationalization of services. An important step in this direction is the adoption of the General Agreement on Trade in Services (GATS) in the Uruguay Round. Essentially, GATS extends multilateral rules and discipline to services in order to ensure fair trading practices in this sector. Under GATS, trade in services is conducted on the basis of non-discrimination, that is with equal treatment for all participating member countries of the agreement, in order to realize greater liberalization of market access in member countries. From a business perspective, such a development provides the conditions necessary for freer trade, namely clear and predictable rules. The relaxation will mean that Malaysia will gradually have to relax some of its current rules pertaining to the services sector. The main implication of this, is that the domestic services sector can no longer be protected by policies. The sector needs to build up efficiency, productivity, and thus competitiveness, through essentially market means, as it will be increasingly open to foreign participation and global best practice standards, including transparency of rules and regulations. In other words, in order to enjoy greater business opportunities arising from the global liberalization of services, Malaysian services industries will have to adapt to a more open market environment. This development brings to the fore, new challenges for the Malaysian economy, thus strengthening the need for comprehensive strategies to be formulated to address them.

Human Resource Development

To reiterate, a policy framework and strategies for the development of the services sector are vital for Malaysia's economy to continue to grow and develop. Crucial for the success of these policies and strategies, is a supportive physical and human infrastructure. More so than the agriculture or manufacturing sectors, the services sector is highly dependent on the abilities, and know-how of people. Therefore, human resource development must be an integral part of any services sector development plan. As knowledge-based industries and businesses represent the next wave of economic growth in Malaysia, knowledge-workers are especially important in the development of telecommunications and information technology networks. Skills upgrading is also sorely needed to take advantage of export possibilities in the fast-growing IT intensive services.

III. CONCLUSION

This paper has been written with the full recognition of Malaysia's current position standing at a crucial juncture of its developmental trajectory, namely, at the point of transition between a manufacturing-based and services-based economy. Theoretically, traditional patterns of state development and global imperatives make the transition to services-based economy inevitable and when completed in as short a time as possible, even desirable. While the thrust of Malaysia's overall long-term developmental policies and strategies that position the services sector as the next engine of growth is commendable, yet, short-term considerations cannot and should not be ignored. It is clear that currently, Malaysia lacks the critical mass of knowledge workers needed to push the services sectors to the fore as an engine of growth. Unsurprisingly, the reality of the current situation in Malaysia is that the manufacturing sector is still the primary driver of the economy and will continue to be for a short while at least. Latest statistics, for instance, show that manufacturing sales rose 34.8 percent in August from a year earlier and were up 5.6 percent from July, while manufacturing output rose 25.1 percent over the same period, demonstrating that the sector continues to drive the country's economic recovery.

This in no way reflects negatively on the growth potential of the services sector. On the contrary, at this early stage of the transition, the growth of the services sector is still largely dependent on a robust manufacturing sector. In the medium-term, however, it is projected that the services sector will begin to supersede the importance of the manufacturing sector (particularly when the country begins to lose its comparative advantage in terms of labour costs to the emerging economies such as China and Indo-China) as long as the correct steps are taken now. In the short-run, and given the current conditions, the simultaneous development of both the manufacturing and services sectors may be in order for

Malaysia. In this respect, Singapore's strategy of placing equal emphasis on both manufacturing and services as the twin engines of growth while it was in a similar position may be particularly instructive for Malaysia. Undeniably, the simultaneous development of both the manufacturing and services sector in the short to medium term requires intricate planning. In this respect, a Services Master Plan, along the lines of the Industrial Master Plans would not be amiss, especially in light of the fact that the services sector is targeted to be the next engine of growth. The much-anticipated K-economy Master Plan is expected not to detract from the creation of a services-oriented economy, but to strengthen it instead by outlining the particular ways by which knowledge and technology can enhance the efficiency and productivity of the sector.

The recent economic crisis has clearly demonstrated that over-reliance on one sector of the economy, particularly export-oriented manufacturing, is unsustainable in the long-run as it creates conditions of economic vulnerability in an increasingly globalized world economy. Likewise, Malaysia's experience with the development of particular services industries, such as finance and real estate, also show that a lack of strong institutions and governance generally, and within these sectors particularly, can be equally detrimental to a country's economic health. The crucial lesson to be learnt here is that meticulous planning across a whole gamut of related issues ranging from economic, political, social and legal is important to ensure a solid base for the growth of the services sector. The ways in which these plans are implemented are also vital to ensuring the success of the sector.

In evaluating the potential of Malaysia's services sector as the next engine of growth, there are various contending factors that play a part in influencing this outcome. On the plus side, the Malaysian government has always pushed for development and economic growth, and thus is very supportive in principle of policies that could provide the much needed push to boost the services sector in the country. Moreover, policies to promote specific services industries, such as shipping, education, tourism and more recently ICT, already exist. All that is needed, albeit crucially, is to tie these various industry-specific policies together in a coherent and synergistic manner so as to guarantee their efficacy, thereby providing a powerful boost to the country's economic growth and development. On the minus-side, are the current gaps in terms of what is needed to develop the services sector in Malaysia, such as highly-skilled human resources, a highly supportive legal and institutional environment, and investment in the various services industries? While currently high investments in the education sector should ameliorate the human resource problem in the medium- and long-term, the increasing mobility of people and the tradability of services will ensure that Malaysia can take advantage of resources that are available on the global market as well to help ease the process of transition to a service-oriented economy.

Clearly, while there are various constraints that may hinder the potential of the services sector as the next engine of growth, there are also enabling factors

that can counter these constraints. On a closer analysis, the constraints are only short-term ones that can be overcome in the medium- to long-term if there is a strong commitment in policy and practice from the public and private sector. While it is acknowledged that the various structural adjustments that Malaysia will have to make to realize its goal of creating a service-oriented economy will undoubtedly be a painful process, it is ultimately, a necessary one. Malaysia's main advantage to this end is the fact that if track record is anything to go by, then it is clear that a pragmatic stance prevails among policy-makers in Malaysia, especially at crucial junctures when timely and decisive action on structural changes need to be made. This is indeed such a time, and decisions taken now will be instrumental in shaping the future economic fortunes of the country. Ultimately, the development of the services sector is beneficial not only because it provides a range of new services as incomes increase, but more importantly, as essential to expanding economic and technological capacity, productivity of the economy, besides enhancing the international competitiveness of Malaysian products in an increasingly globalized world. An appreciation of this is important, particularly if Malaysia is to begin strategically positioning itself in the New Economy.

REFERENCES

Bank Negara Malaysia (1995), *Annual Report* (Kuala Lumpur: Government Printers).

Mahathir Bin Mohamad (1991), "*Malaysia: The Way Forward,*" Working paper presented at the Inaugural Meeting Of The Malaysian Business Council, Kuala Lumpur, 28th February. Available at: http://www.epu.jpm.my/epu-mservis-v2020.html

Ministry of Finance, Malaysia (1999), *Economic Report* (Kuala Lumpur: Government Printers).

Ministry of International Trade and Industry, Malaysia (MITI) (1996), *Second Industrial Master Plan 1996-2005* (Kuala Lumpur: Zainon Kassim).

National Economic Action Council (NEAC) (1998), *National Economic Recovery Plan: Agenda for Action* (Kuala Lumpur, Malaysia: Economic Planning Unit, Prime Minister's Department).

Raja Zaharaton bte. Raja Zainal Abidin (1996), "*Services Industries as Source of Economic Growth,*" paper presented at the 1996 National Outlook Conference organized by the Malaysian Institute of Economic Research (MIER) at the Shangri-La Hotel, Kuala Lumpur, 3-4 December 1996.

Romer, Paul (2000), "Perpetual Growth," speech presented at the World Knowledge Forum 2000, Seoul Korea, October 17.

Sieh, Lee Mei Ling (1991), *"Services in Malaysia: On the Threshold of a New Era,"* paper presented at the National Outlook Conference organized by the Malaysian Institute of Economic Research (MIER) at the Shangri-la Hotel, Kuala Lumpur, 3-4 December.

Profiles of Contributors

Dr. Richard Harris is the Telus Professor of Economics at Simon Fraser University, and a Fellow of the Economic Growth Program of the Canadian Institute for Advanced Research. He was an undergraduate at Queen's University and received his PhD from the University of British Columbia. Prior to 1990 he spent most of his professional career in the Economics Department at Queen's University with visiting appointments at Berkeley, M.I.T, and the University of New South Wales. He is the former director of the John Deutsch Institute for the Study of Economic Policy at Queen's University. His major area of specialization is international economics, and in particular the economics of integration. During the 1980's he worked extensively on economic modeling of the impact of the Canada-US Free Trade Agreement and subsequently on NAFTA. He has served as consultant to a number of Canadian government departments, international organizations, including the World Bank and O.E.C.D., and corporations in the area of international economics. In addition to a number of technical articles, he has published policy-oriented books and articles on Canada-US free trade, international macroeconomics, economic growth, the Asia-Pacific region, and Canadian public policy. He is currently involved in research on the determinants of productivity growth, the Canadian "brain drain," North American monetary integration, and the New Economy. He is Fellow of the Royal Society of Canada and a former President of the Canadian Economics Association. He resides in Deep Cove, British Columbia but tries to spend as much time as possible at his summer cottage on Simcoe Island in eastern Lake Ontario.

Dr. Mohamed Ariff, a specialist in International Economics is currently the Executive Director of the Malaysian Institute of Economic Research (MIER). Previously he held the Chair of Analytical Economics at the University of Malaya where he had also served as the Dean of the Faculty of Economics and Administration. Dr. Ariff is also a Board Member in Inland Revenue Board (IRB), National Productivity Centre (NPC), Social Security Organisation (SOCSO) and Ministry of Domestic Trade and Consumer Affairs.

Dr. Ariff obtained his BA First Class Honours and MEc from the Universiti of Malaya. He completed his PhD program at the University of Lancaster, England, in 1970, on Commonwealth Scholarship. He had a brief stint in the private sector as the Chief Economist at the United Asian Bank in 1976.

He has authored, co-authored and edited many books and monographs, in addition to publishing numerous articles in academic journals and mass media. His book *The Malaysian Economy: Pacific Connections* - published by Oxford University Press - won the prestigious Tun Razak Award in 1993.

Most of his works deal with international trade, foreign direct investments and regional economic integration. In addition, he has also made some pioneering contributions to the theoretical and empirical literature in the field of Islamic Economics.

He has participated in numerous international conferences around the globe. He has served as Consultant to many international organizations, including the World Bank (Washington, DC), UNIDO (Vienna), OECD Development Centre (Paris), Commonwealth Secretariat (London), UNCTAD (Geneva), UNCRD (Nagoya), ESCAP (Bangkok) and Islamic Development Bank (Jeddah).

Dr. Ariff was attached to the Institute of Developing Economies in Tokyo (April-November 1974), the Australian National University in Canberra (November 1983-July 1984) and the East-West Center in Honolulu (October 1989-July 1990) as Visiting Research Fellow.

He is also professionally affiliated to several institutions including the Institute of Southeast Asian Studies (ISEAS) in Singapore. He is a member of the Malaysian National Council for Pacific Economic Cooperation (MANCPEC) and a Council Member of the East Asian Economic Association. He is also a member of the International Steering Committee of the Pacific Trade and Development (PAFTAD) Conference. Other hats he wears include such editorial positions as Corresponden[illegible] Editor of *Asia-Pacific Economic Literature* (Canberra), and as Advisor to *Asia Pacific Business Review* (Singapore) and *Journal of International Business and Entrepreneurship* (Kuala Lumpur).

Dr. Masahiro Kawai is the Chief Economist of the World Bank's East Asia and Pacific Regional Office, now based in Tokyo.

He joined the Bank from the University of Tokyo, where he was Professor of Economics at the Institute of Social Science. Mr. Kawai has also served as a Special Research Advisor for the Institute of Fiscal and Monetary Policy in Japan's Ministry of Finance as well as a Coordinator of the Japan Financial Markets Development Committee for the Pacific Economic Cooperation Council. In addition to his academic work at the University of Tokyo, which he joined in 1986, Mr. Kawai has also taught at Johns Hopkins University (1978-1986, 1988) and at the University of British Columbia (1991-92). The articles, essays, and reviews written by Mr. Kawai have been published extensively in professional journals and books and cover the fields of international finance, open-economy macroeconomics, international money and finance in East Asia, economics of commodity and futures markets, and housing demand. His recent book is "The World Fiscal Order: Implications for Industrialized Nations" (co-edited with C. Eugene Steuerle), Washington, D.C., Urban Institute, 1996. Mr. Kawai received his BA and MA in Economics from the University of Tokyo, his MS in Statistics and his PhD in Economics from Stanford University.

Dr. Frank Flatters is Professor of Economics and Director of John Deutsch International Executive Programs at Queen's University, Kingston, Canada. For the past fifteen years he has been Director of the CIDA-funded collaboration and assistance program between Queen's and MIER.

Dr. Flatters obtained his PhD in Economics from Johns Hopkins University and has taught at Queen's University since 1971. He was a Visiting Professor of International Economics at University of Chicago and has held visiting teaching and/or research positions at Johns Hopkins University, University of Essex, University College London, the London School of Economics and Harvard University. He is author of many books and articles in the fields of public economics, international trade, governance and policy analysis. In recent years he has done research and published a number of articles on causes, impacts and lessons from the Asian financial crisis, as well as on corruption, policy reform and other governance issues.

From 1983 to 1986 he was Resident Director and Policy Advisor to the Government of Indonesia under the Harvard Institute for International Development project on economic management. During this time the project concentrated primarily on assistance in the design and implementation of tax, trade and industrial policy reforms. Since then, he has served as policy advisor in trade and fiscal policy in many countries in Asia and Africa. His most recent work has concentrated on the transitional economies of Southeast Asia and on regional integration and cooperation in southern Africa.

Dr. Robin Boadway is Sir Edward Peacock Professor of Economic Theory at Queen's University, Kingston, Canada. He has taught there for 25 years, though with year-long interruptions to take up a post-doctoral fellowship at the University of Chicago (1976-77) and to be visiting scholar at the University of Oxford (1980-81) and CORE, Universiti Catholique de Louvain (1986-87). He was Head of the Department of Economics at Queen's University from 1981-86, and is currently Associate Director of the John Deutsch Institute for the Study of Economic Policy. He received his first degree in engineering at the Royal Military College of Canada, and went on from there to study economics, first at the University of Oxford and then at Queen's University where he completed his PhD. He was elected Fellow of the Royal Society of Canada in 1986.

He served as Editor of the Royal Canadian Journal of Economics from 1987-93 and President of the Canadian Economics Association in 1996-97. He is currently co-editor of the Journal of Public Economics and the German Economic Review. He is a member of the Executive of the International Institute of Public Finance.

His research interests have been in the areas of public sector economics and welfare economics, with special emphasis on tax-transfer policy, fiscal federalism and cost-benefit analysis. His works include books entitled Public Sector Economics, Welfare Economics, Canadian Tax Policy, and Economics and the

Canadian Economy; monographs entitled "Taxes and Savings in Canada," "The Constitutional Division of Powers: An Economic Perspective," "Equalization in a Federal State: An Economic Analysis," and "Intergovernmental Fiscal Relations in Canada;" as well as several articles in academic journals. His current research focuses on two main areas: redistribution and fiscal federalism.

He is former President of the Canadian Economics Association, and a Fellow of the Royal Society of Canada. He is a world-renowned scholar and researcher and is especially well-known in the field of public economics. He is author of numerous articles and several widely used textbooks in this and other fields. He has been editor and has served on the editorial boards of a number of major economics journals.

Dr. Glenn P. Jenkins is currently a Professor, Department of Economics, Queen's University, Canada, an Institute Fellow Emeritus, Harvard University, and President of Cambridge Resources International. In 1985 he founded the Program on Investment Appraisal and Management at the HIID, Harvard University, and was its Director from 1985 to 2000. Dr. Jenkins specializes in the fields of public finance, investment appraisal, and economic development. He has published a number of books, and articles, in these subject fields. From 1981-84 he was the former Assistant Deputy Minister of Tax Policy and Legislation in the Department of Finance for the Government of Canada, and he has served as a research or economic consultant for many governments and institutions, including the governments of Malaysia, United States, Argentina, Chile, Canada, Bolivia, Nepal, Indonesia, and Sri Lanka, as well as for international agencies such as the World Bank, the Asian Development Bank, InterAmerican Development Bank, International Finance Corporation, the Ford Foundation, and the North-South Institute. His educational background includes a BComm in Economics from Carleton University in Canada, an MA in Economics from the University of Western Ontario, and both an MA and a PhD in Economics from the University of Chicago.

Dr. Nancy Olewiler is a Professor of Economics at Simon Fraser University and was Chair of the Department of Economics from 1995 to 2000. She received her BA from Columbia University (1970), her MA from Simon Fraser University (1973), and her PhD from the University of British Columbia (1975). Prior to coming to SFU in 1990, she was at Queen's University for 14 years. Nancy teaches undergraduate and graduate courses in environmental economics. Her research has focused in recent years on environmental policy and the impact of environmental regulation on the economy. She has published in academic journals and edited books, and has written reports for government. She has written two widely used textbooks: *Environmental Economics* (second edition to be published in 2001) and *The Economics of Natural Resource Use* with John Hartwick, now in its second edition. Recent work is on pollution taxes and the pollution intensity of Canadian industry. From 1996 to 1998 Nancy served as a member of the Technical

Committee on Business Taxation. This Committee was established by federal Finance Minister Paul Martin to create a blueprint for reform of business taxation in Canada. The Report of the Technical Committee was released in 1998. From 1990 to 1995 she was Managing Editor of *Canadian Public Policy*, Canada's leading public policy journal.

Dr. Christopher Maule is Distinguished Professor of Economics and International Affairs at Carleton University, Ottawa, Canada. He received his degrees in economics from the University of British Columbia (BA, 1961), Queen's University at Kingston, Canada (MA, 1964) and London School of Economics (PhD, 1966). For the past twelve years, his research co-authored with Keith Acheson, has focused on the economic organization and policy aspects of cultural industries. In 1999, they published "Much Ado about Culture, North America Trade Disputes" (University of Michigan Press) which examines a series of trade disputes between Canada and the United States in the context of current international and regional trade agreements. In addition, he is working on the policy issues associated with electronic commerce in transition economies. Previous published work in books and articles since the 1960s have dealt with industrial organization, competition policy, foreign investment and government policy towards business. These publications are listed on the website www.carleton.ca/-cmaule/.

He has worked with MIER on three previous occasions since 1997 on projects concerned with competition policy and corporate governance.

Ms. Syarisa Yanti Abubakar is a Senior Research Officer attached to the Policy Studies Division of the Malaysian Institute of Economic Research (MIER). She joined MIER in 1998 as a Research Officer and was promoted to her current position a year later. Ms. Syarisa holds a BA (with high distinction) in Economics and Political Science from the University of Michigan, Ann Arbor, as well as an MA (with distinction) in International Political Economy from the University of Warwick, UK. Her main research interests include the political economy of development, technology and globalization.