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GOVERNMENT POLICY, EDUCATION, AND EARNINGS IN MALAYSIA

By

Hong Peng Ong

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ABSTRACT

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By

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This dissertation attempts to study the effect of government policy and education on earnings in Malaysia. It is based on the first and second waves of the Malaysian Family Life Survey (MFLS). The first chapter concerns the effect of New Economic Policy (NEP) on earnings differentials and returns to education of Malays relative to Chinese and Indians. The estimated results show that the earnings differentials of Malays relative to Chinese and Indians declined from pre-NEP to post-NEP periods. The decline in relative earnings of Chinese and Indian compared to Malays during the post-NEP period can be attributed to the faster rate of increase in the level of education and improvements in the returns to education of Malays, especially at the post-secondary level. The other reason is the larger shift from the agricultural occupations to the more urban, higher paying occupations such as professional, clerical, service, and production related occupation of Malays relative to Chinese. The Malays experience a bigger shift from agricultural occupations into managerial, clerical, service occupations which offer relatively better earnings when compared to Indians. Using a linear spline specification on earnings, the key finding is that the returns to post secondary education of Malays relative to Chinese and Indians showed the most significant improvements from the pre-NEP to the late post NEP period. These results are compatible with the strategies employed by the NEP to reduce the racial earnings gap and to improve the returns to

education of Malays through occupational restructuring and improved access to higher education for Malays.

The second chapter examines the distribution of schooling and earnings inequality in Malaysia. The decomposition of earnings inequality indicate that schooling and occupation are important factors in explaining earnings inequality. However the unobserved factor remains the biggest factor in explaining the earnings inequality. The unusually high residual variance in log earnings of Malays during the pre-NEP period is observed even when occupation variables are accounted for. This phenomenon is not due to the differences in the rate of forgetting between Malays and non-Malays based on tests of significance. But from the view of point estimates, there is substantial difference in the rate of forgetting between Malays and non-Malay. Even so, the explanation of the effect of NEP that substantially reduces the residual variance of Malays during the post-NEP period is plausible. The comparison of generalized Lorenz curves of real earnings of Malays and non-Malays suggest that the NEP has played a role in improving the position of Malays relative to non-Malays but the Malays still lag behind in terms of social welfare ranking of real earnings distribution. These results point to the need to maintain the policies intended to uplift the economic position of the disadvantaged group.

It is noted that the link between parents' schooling and children's schooling weakened significantly for cohorts born after 1960. This suggests that the education policies and NEP have played a role in providing better educational opportunities for offspring of parents with lower education. This augurs well for the future as the weaker intergenerational transmission of schooling tends to bring about greater equality in human capital that is associated with greater earnings equality.

This dissertation is dedicated to my mother and the memory of my father.

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INTRODUCTION

Malaysia is a multi-ethic society and national unity is the over-riding concern of the Malaysian government. The government has implemented a number of policies to that strives to achieve a balance between the goals of economic development and the need to achieve as peace and stability. It is viewed that economic growth with equity is crucial for national unity which is the pre-requisite for growth and development. The major policies that are relevant to this study are the educational policy and the New Economic Policy (NEP). One of the key features of the education policies is the use of Malay language as the medium of instruction at the secondary and tertiary level of education to achieve national unity. The other key feature is the emphasis of education as means for development through the policy of education expansion. The NEP is considered as a socio-economic engineering program that is intended to redistribute wealth and to achieve greater equality in schooling and employment opportunities to reflect the racial composition of Malaysia. This dissertation attempts to analyze the effect of government intervention on schooling attainment and earnings in Malaysia.

Chapter 1 examines the effect of NEP on returns to education and earnings in Malaysia. To achieve this purpose, the data from the first and second waves of the Malaysian Family Life Survey (MFLS) were used. By dividing the data into pre-NEP, early post-NEP and late post-NEP periods, the analysis of outcomes before and after the NEP can be obtained. The first research objective is to look at the earnings of Chinese and Indians relative to Malays before and after the NEP. The estimated results indicate

that the earnings differential of Malays relative to Chinese and Indians have narrowed over the three periods of analyses. The second research objective was to examine the returns to education of Malays, Chinese and Indians before and after NEP. The main result is that the returns to post secondary education of Malays relative to Chinese and Indians have showed the most significant improvements from the pre-NEP to the late post-NEP period. These results are in line with the objectives of the NEP that are aimed at improving the relative position Malays who are disadvantaged group.

Chapter 2 examines the distribution of schooling and earnings inequality in Malaysia. The evolution of schooling distribution have been examined by using schooling data by birth cohorts. The trend analysis indicate that the levels of schooling are increasing from the older to younger cohorts for both males and females irrespective of ethnic group, while schooling inequality has been declining from the older to younger cohorts. As for earnings inequality, a trend of falling earnings inequality can be observed for both Malays and non-Malays. A technique of decomposition of earnings inequality has been applied to examine the extent of the contribution of certain key determinants of earnings inequality. The simulation results indicate that schooling and occupation are important factors in explaining earnings inequality. Generalized Lorenz curves are drawn to provide an idea of the social welfare ranking of real monthly earnings distribution of Malays and non-Malays. The results show that the social welfare gap of Malays relative to non-Malays have narrowed after the NEP but the Malays are still lagging behind. These results suggest that there is still a need to maintain the policies intended to uplift the economic position of the disadvantaged group.

The Hansen test of parameter stability on the timing of the effect of government policy on mean schooling and schooling inequality did not reveal a clear pattern of the timing of government intervention. As such, this study uses birth cohort measures of schooling to determine whether the timing of changes in schooling decisions by families in the different ethnic groups coincides with the major changes in government policy. It is noted that the link between parents' schooling and children's schooling weakened significantly for cohorts born after 1960. This suggests that the education policies and NEP have played a role in providing better educational opportunities for the offspring of parents with lower education. This augurs well for the future as the weaker intergenerational transmission of schooling tends to bring about greater equality in human capital which is associated with greater earnings equality.

To sum up, the Malaysian government has been quite successful in using the policy tools to reduce the earnings differentials of Malays relative to Chinese and Indians, to increase the relative returns to education of Malays, to raise overall levels of education, to lower schooling inequality, and to achieve a more equitable distribution of earnings.

CHAPTER 1

THE EFFECT OF NEW ECONOMIC POLICY ON RETURNS TO EDUCATION AND EARNINGS IN MALAYSIA

1. Introduction

One of the most important policy questions in Malaysia is the degree of success of the New Economic Policy in correcting the economic imbalance among the major ethnic groups in Malaysia. The great deal of attention and interest in the relative earnings among the races can be traced to the economic, social, cultural and political conditions in Malaysia. Prior to the NEP, the occupational scenario in Malaysia was such that Malays were more likely to work as fishermen or farmers and Chinese were more likely to engage in business and urban labor market activities while the Indians were predominantly in the rubber plantations. As a result, the income disparities among the races were getting wider. This resulted in a lot of racial tensions and culminated in racial riots in 1969, which was known as the May 13 tragedy. Consequently, the government realized that intervention was required and launched the New Economic Policy (NEP) in 1970. The NEP was incorporated into the four five-year development plans implemented from 1971-1990[1] (Second to Fifth Malaysia Plan). It was an exercise in social engineering designed to reduce the socioeconomic imbalances among ethnic groups, to eradicate poverty, and to restructure the employment patterns of the country.[2] It is against

[1] Subsequently, the National Development Policy (NDP) was introduced in 1991, which has similar goals as the NEP.

[2] The objectives of the New Economic Policy were to achieve national integration and unity. The two-pronged strategy are: (i) to reduce and eventually eradicate poverty by raising income levels and increasing

this background that the topic of earnings and ethnicity is of real concern in Malaysia, and that provides the motivation for this paper.

In addition, this paper is intended to estimate the returns to education in Malaysia. This is motivated by the findings of Smith (1991) who used the first Malaysian Family Life Survey (MFLS1) data. He finds that education is the single most important variable in explaining income growth in Malaysia. Hence in the study of relative earnings among the various races, it is important to examine their respective returns to education. In addition, it is noted that within the framework of NEP, education is used as a means to correct the economic disparities among the various races. One strategy is to impose quotas that reflect the racial composition of the country for admission to tertiary education. It is also intended for employment restructuring by increasing the supply of qualified Malays for managerial and professional jobs, which offer relatively higher earnings.

Furthermore, the development literature has provided ample evidence that education is an effective form of human capital investment. This is shown in Psacharopolos (1985) who used data from 61 countries to make cross-country comparisons on returns to education. The findings conclude that there are significantly positive returns to education and that returns are highest for primary education, general curricula, education of women and countries with the lowest per capita income. Heckman and Hotz (1986) showed that the return to schooling in Panama was 7.5% after controlling for age and age squared, training, intensity of employment and regional dummies. As for family background variables, mother's education was statistically

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employment opportunities for all Malaysians, irrespective of race; and (ii) accelerate the process of

significant and had a larger positive effect than father's education. These results are consistent with Smith's results for Malaysia.

Another study that is similar to this paper is by Gallup (1997) who used the second wave of Malaysia Family Life Survey (MFLS2). He finds that male Malay earnings steadily fell behind male Chinese earnings over the period 1960 to 1988. This result is not consistent with the findings of the income cross-section data. He attributed the inconsistency to the recall bias in the reported work histories. While there is some overlap in terms of the area of study, this paper intends to examine the issue of the effect of ethnicity and education on earnings from a different analytical approach. For instance, Gallup generates annual earnings data for each individual based on the starting and ending earnings of each job by using interpolation.[3] This may not be desirable because these earnings that are interpolated are unlikely to reflect the actual earnings of the individual respondents.

One major difference is that this paper is based on the new sample, panel and children sample of MFLS2 and Panel Sample of MFLS1 while Gallup's paper is confined to the New sample of MFLS2. In view of the recall error confronted by Gallup with MFLS2 data, this paper utilizes data from the last five years of survey from 1984 through 1988 only. The additional contribution of this paper is the focus on the effect of the NEP on relative earnings and returns to education among the ethnic groups.

A recent paper by Schafgans (1998) used the parametric Heckman as well as semiparametric approach to examine ethnic wage differences by gender. The key results

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restructuring Malaysian society to correct economic imbalances so as to reduce and eventually eliminate the identification of race with economic function.

[3] The individual earnings interpolation were constrained to have the same second derivative of -.5150. The estimated wage regression is as follows:

are that there are increasing returns to higher education among all ethnic groups for men and women, and there is no significant evidence of ethnic discrimination against Malays among men and women. Schafgans study is based on the cross-section data set of MFLS2. The data is pooled from the new, panel and senior sample. The difference between this study and Schafgans paper is in the estimation method and data set coverage. This paper attempts to examine the non-linearity on returns to education and relative earnings among the ethnic groups before and after the NEP.

To sum up, the key research questions in this paper are as follows:

(a) What are the earnings of Chinese and Indians relative to Malays before and after the NEP; and

(b) What are the returns to education before and after NEP among the Malays, Chinese and Indians.

Section 2 of this chapter contains a description of the data set. The descriptive statistics by sample and race over time are presented in Section 3. Empirical results on the earnings differentials and earnings growth are in Section 4. Section 5 discusses results on the returns to education. Section 6 compares the cross-sectional and panel data results as well as results based on earnings derived from main job and all jobs. The conclusions of the study are in Section 7.

2. Data

The data for this paper is based on the first and second wave of MFLS. The first wave was fielded in 1977 while the second was carried out during the period August

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wage = -384 + 49.6 age - .5150 age^2

1988 through January 1989. RAND and the National Population and Family Development Board of Malaysia conducted this survey. The overall purpose of the MFLS was to enable the study of household behavior in diverse settings during a period of rapid demographic and socioeconomic change.

The focus of this paper is on male earnings. This allows comparisons consistent with the studies by Smith and Gallup, and avoids problems of sample selection, which are more serious for the female sample. The panel sample from the first wave consists of 1262 private households with at least one ever-married woman less than 50 years old at the time of the initial visit. These households were located in 52 randomly selected geographic areas to be representative of Peninsula Malaysia. 1047 husbands of the female primary respondents were interviewed on the work history questionnaire. After dropping respondents with missing values in work history data the number of male respondents for MFLS1 panel sample is 937. Job history data is collected retrospectively starting from age 15 or at the time of entry into labor force for those who started working after age 15. The job information is collected based on every job change or at every 3-year interval.

The samples in the MFLS2 used for analysis in this study are the panel, children and new sample. The husbands of Panel respondents that were interviewed in the second wave are 717 respondents. The children sample that was interviewed for the male life history data are selected sons and sons-in-laws of Panel women and comprise 833 respondents. The new sample consists of 1513 men who are husbands of new sample women. After deleting respondents with missing data and inconsistent job history

information, the pooled panel and children sample comprises 1272 respondents and the new sample consists of 1409 respondents.[4]

Work history data were collected retrospectively in both the first and second wave of the survey. But the critical difference is that information was collected only when there were job changes in the second wave. In the first wave, job history information was recorded at regular 3-year intervals. The other problem is the manner which earnings data were collected. In the first wave only total earnings from all jobs were recorded, but for second wave, earnings from main and secondary jobs were recorded separately. The problem arises because only starting and ending earnings of every job change were recorded in the second wave. As there are numerous cases with different starting and ending dates of main and secondary jobs, we cannot simply aggregate the earnings to obtain total earnings.[5] In order to derive total earnings we need to interpolate the earnings of both main and secondary jobs. Since the approach of interpolation of earnings is subjective and inaccurate, the computation of total earnings through interpolation will aggravate the measurement error problem. As such, this study uses earnings data from all jobs for the first wave. But for the second wave, earnings are from the main job only. The sensitivity of using earnings from main job and all jobs is tested in Section 6. Another difference is that earnings in kind were not imputed for the work history data in the second wave. Therefore, for the sake of comparability, earnings for the first and second wave used in this study refer to monetary earnings (excluding earnings in kind).

[4] The children sample used for analysis is 692 and panel sample is 580. The number of respondents for new sample used by Gallup is 1412 respondents.

[5] For example if the main job starts in 1984 and end in 1987, the secondary job starts in 1985 until 1988. Then we need to interpolate the earnings of main job in 1985, 1986 as well as earnings of secondary job in 1986 and 1987 to derive the total earnings for 1985, 1986 and 1987.

The analyses from the first wave comprise only the panel sample. It is divided into two periods, that is, the pre-NEP period (1965-69), and early post-NEP period (1971-76). The analyses from the second wave are for the late post-NEP period (1984-88)[6] based on the stratification into children and panel sample, new sample, and the total pooled children, panel and new sample.

3. Descriptive Statistics

The descriptive statistics of the Malays, Chinese and Indians over different time periods are presented in Tables 1-3 respectively. It is interesting to note that the mean real earnings are increasing over the three time periods, that is the pre-NEP, early post-NEP and late post-NEP periods.[7] The only exception is for the Chinese in the panel and children sample in 1984-88, which recorded slightly lower mean real earnings. This is partly due to the higher attrition rate of wealthier and more educated Chinese in the panel sample and also earnings in 1984-88 covers only main job earnings.

It is also worthwhile to note that the years of education are increasing over time for all races, but, that Malays recorded the fastest increase in the amount of schooling after the NEP. The years of education of parents also recorded an upward trend over time for all races.

In terms of age, the average age of the total panel sample in 1965-69 is 30.8 years and 36.56 in 1971-76. In 1984-88, the mean age of the total pooled panel, children and new sample is 34.52 years. It is noted that the panel sample has the highest mean age

[6] For the second wave, only data for the last five years (1984-88) was used to avoid the problems of memory recall in retrospective data which was encountered in Gallup's study.
[7] This is despite the fact that the real earnings for 1984-88 consist of main job earnings only.

(48.3 years), followed by the new sample (33.7 years) and the youngest are the children sample (26.9 years).

There is an interesting development regarding the rate of urbanization over time among the various races over time. It is observed that the percentage of Malays residing in urban areas increased over time from 30.6% (pre-NEP period) to 43.7% in late post-NEP period (total pooled sample). However, the percentage of Indians residing in urban areas remained stable over time at around 50%. As for the Chinese, the percentage residing in urban areas increased from 55.6% (pre-NEP period) to 81% (late-NEP period).

One of the major strategies employed by the NEP policy is employment restructuring. As such, the question of whether the occupational distribution among the various races changes over time is a pertinent question. In order to answer this question, a linear probability model is used to estimate the relative probability of the various races to be engaged in certain occupations. Table 4 shows the results of the probability of being employed in certain occupation groups of Chinese and Indians relative to Malays in 1976 and 1988 and the differences between the two periods. It is observed that Malays relative to Chinese experienced a bigger shift out of the rural agricultural occupations to the more urban and better paying occupations such as professional, clerical, service and production related occupations.[8] Similarly, there is larger movement out of agricultural occupations into managerial, clerical, and service occupations by Malays relative to Indians. These

[8] Agricultural occupations includes farmers operating on their own land, agricultural workers and fishermen. Production related workers includes miners, food and beverage processors, tailors, carpenters, bricklayers, painters, blacksmith, plumbers, rubber and plastic product makers, chemical processors. Service workers includes cooks, waiters, housekeeping and related service workers, cleaners, hairdressers, protective service workers.

results provide some evidence that occupational restructuring between the races have occurred during the post-NEP period.

4. Earnings Differential and Earnings Growth

4.1 Regression Analysis

Ordinary Least Squares regressions are estimated separately for the relevant samples based on the pre-NEP (1965-69), early post-NEP (1971-76) and late post-NEP (1984-88). The basic estimating model is of the form:

$$Y_{it} = \alpha + \gamma \text{ Chinese} + \phi \text{ Indian} + \lambda \text{ education} + \beta \mathbf{X}_{it} + \varepsilon_{it}$$

where subscript i and t represents individual and year respectively, Y is the dependent variable which is real monthly earnings in natural logarithm terms, Chinese is the dummy variable for Chinese and Indian is a dummy variable for Indians, education is years of education based on the linear spline specification, **X** is a vector of control variables such as year dummies, potential experience and its square, family background characteristics, region dummies, and ε is the error term.[9]

[9] This regression model is applied to the samples in the first and second wave of the survey.

4.2 Relative Earnings between Races

The simple specification of earnings regression with ethnic and year dummies, experience and its square for the pre and post NEP periods are presented in Table 5. It is estimated that on average, Chinese earn 99.0 %[10] more than Malays during the pre-NEP period (1965-69) and declined to 91.4% more than Malays during the early post-NEP (1971-76). In the late post-NEP period (1984-88), the earnings differential between Chinese and Malays are further reduced. On average Chinese earn more than Malays by 57.9% (panel and children sample) and 86.6% (New sample) and 68.5% (Total pooled sample). The Indians on average earn 39.4 % more than Malays for pre-NEP period and 25.86% in the early post-NEP period. During the late post-NEP period, the average earnings of Indian are higher than Malays by 17.7% (Panel and children sample) and 7.0% (New sample) and 13.1% (Total pooled sample). The above results show that there is a clear trend of a reduction of earnings gap between Chinese and Indians versus the Malays during the post-NEP period.

One of the reasons for the narrowing of earnings differentials among the races is the faster rate of increase in the levels of education and better returns to education of Malays after the NEP compared to Indians and Chinese. The other reason is the larger shift in occupations from agricultural sector to the higher paying labor market activities in the service, sales, production, transportation sectors compared to the Chinese. While the Malays have faster rate of growth in the professional and technical, administrative and managerial occupations compared to Indians in the same occupation category. Another possible reason is that the Malays enjoy a fastest rate of earnings growth

[10] $(e^{.688} - 1)*100\% = 99.0\%$.

followed by Chinese and Indians during the post-NEP period. The discussion on the analysis of annual earnings growth is presented in section 4.3 below.

This simple specification is further augmented by adding controls such as years of education, region dummies, parent's education, number of jobs, starting and ending job dummies. The reason for adding number of jobs as a control for 1965-69 and 1971-76 periods is because it covers data from the first wave which collected only the aggregate earnings for all jobs for respondents who have more than one job at the same time. Starting and ending earning dummies are added for the period 1984-88 period of analysis because only starting and ending earnings of jobs were collected retrospectively in the second wave.[11] The regression results are shown in Table 6. It is observed that even with education, parent's education, region of residence accounted for, Chinese still earn more than Malays by 68.5% (pre-NEP), 59.0% (early post-NEP) and 54.5% (late post-NEP – Total pooled sample). Indians on average still earn more than Malays by 14.1% (pre-NEP), 8.8% (early post-NEP) and 17.2% (late post-NEP – total pooled sample).

For purposes of comparison of relative earnings among the races over time, the simple specification[12] is preferred as it allows the coefficients of the ethnic dummies to reflect changes in the level of education, individual and family background characteristics and region across groups and time. This is because the NEP is aimed at correcting ethnic economic imbalances by raising the level of education, employment restructuring to more urban labor market activities which involves the shift from rural to

[11] There are concerns that there may be problems of selectivity as those who change jobs may have systematic differences with those who do not change jobs. Using starting and ending jobs is a crude way to control for the type of data collected in the second wave. It is noted that introducing starting and ending job dummies do not affect the estimated earnings differential or the returns to education.

urban areas. Therefore, it would not be appropriate to have education and regional controls when comparing the relative earnings among races. Although this analysis is not a direct test of the causal effect of NEP on the ethnic relative earnings, it does provide some feedback on the outcomes of the relative earnings before and after NEP. The results from the simple specification in Table 5 do indicate that there is some degree of success in the implementation of the NEP as the earnings differential between races have narrowed considerably during the post-NEP period.

4.3 Attrition of Panel Sample

There are concerns that the narrowing of differentials between the races in the panel and children sample in 1984-88 may be due to attrition of wealthier Chinese. In view of this another set of earnings regression analysis is computed based on the common panel sample for the pre-NEP and post-NEP periods. The earnings regression results are shown in Table 7. A similar trend can be observed whereby the earnings differentials between the Malays and Chinese narrowed from 86.8% (pre-NEP) to 84.4% (early post-NEP) and 78.4% (late post-NEP). As for the earnings gap between the Malays and Indians it also narrowed from 63.7% (pre-NEP) to 39.8% (early post-NEP) and 38.5% (late post-NEP).

[12] Adding number of jobs and starting and ending job dummies do not change the relative earnings differential. The results also do not change when year dummies are replaced with a time trend variable in the simple specification.

4.4 Earnings Growth

Since the data used are longitudinal, the earnings growth may also be attributed to the changing sample compositions. As such, we cannot separate out the effects of earnings growth due to productivity factors or due to changing sample composition. This study attempts to get a cleaner estimate of earnings growth in the post-NEP period by comparing the current earnings from all jobs for the first wave (1976) and the second wave (1988) of the same individual.[13] The dependent variable is the log differences in real earnings[14], which represents an average annual percentage growth in real earnings. A simple regression is estimated with log differences in real earnings on Chinese and Indian dummy variables. This has the effect of controlling for individual fixed effects because the earnings growth is computed for each individual. The estimated results are as follows:

Annual real earnings growth	=	.268	- .006 Chinese	- .013 Indian	
		(.004)	(.005)	(.008)	

n = 499 R-squared = .006 p-values are in parentheses.

Although the results are not significant at the 10% level, the estimated coefficients above show that Chinese and Indians respectively have a slower annual earnings growth of 0.6% and 1.3% than Malays over the period 1976 through 1988.[15] However, the slower

[13] This is possible by using the panel sample of the first and second wave of the survey. There are 580 cases of panel sample that were available in 1988. Out of these, there were 44 cases were unemployed in 1976 and thus no earnings were reported, 7 cases for other races, and 30 cases did not have adequate information were dropped from the sample. The final sample size is 499.

[14] Annual real earnings growth = (natural log earnings in 1988 – natural log earnings in 1976)/12

[15] It is observed that based on earnings growth, the earnings gap (Table 9) between Indians and Malays should have narrowed by a greater margin than the earnings gap between Chinese and Malays during the early to late post-NEP periods. This discrepancy is because the earnings growth is based on current

earnings growth of Chinese and Indians relative to Malays presents part of the explanation for the narrowing of earnings differentials among the races.

5. Returns to Education

5.1 Overall Sample

The returns to education with experience, its square, ethnic dummies, year dummies, parents education, region dummies, number of jobs, and starting and ending job dummies as controls are indicated in Table 6. A linear spline specification is used to show the non-linearity in returns to education. It is interesting to note that the returns to education are highly significant and convex for the pre-NEP and post-NEP periods. The other striking trend is that the returns to primary, secondary and post-secondary education are declining over time. In fact, there is a compression of returns to education from the pre-NEP to post-NEP periods. This could be due to the rapid increase in supply relative to the demand of educated workers with post-secondary education during the post-NEP period. The next pertinent issue is the relative returns to education among the main ethnic groups in Malaysia.

With monthly real earnings as the dependent variable, a linear spline specification of year of education interacted with race is used to estimate the returns to education. The estimated results are reported in Table 8[16]. It is observed that the coefficient of returns to primary education for Chinese relative to the Malays is negative but insignificant at the

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'earnings while the earnings differential is based on retrospective earnings for 1984-87 period which captures earnings of those who change jobs only. It is observed that those who change jobs in the Indian sample have relatively higher earnings which accounts for the smaller rate of decrease in earnings gap between Indians and Malays.

10% level during the pre-NEP period. It is also insignificant during the early post-NEP period. In the late post-NEP period, it is negative and insignificant for the pooled panel and children sample, but, it is significantly lower than Malays by 7.2% for the new sample. The estimated returns to education to primary education for Indians are significantly lower than Malays for all time periods. However, there is a trend towards a smaller difference in returns to primary education of Indians relative to Malays over time.

At the secondary level of education, the Chinese have significantly lower returns to secondary education compared to Malays for all time periods. The estimated returns to secondary education of Chinese relative to Malays narrowed slightly by about 2% during the early post-NEP and by about 4-7% depending on sample for the late post-NEP period. The return to secondary education of Indians relative to Malays is negative but insignificant for the pre-NEP, early post-NEP and late post-NEP (new sample). However, it is significantly lower than Malays for the total pooled sample during the late post-NEP period.

The estimated returns to post-secondary education produce the most interesting result. During the pre-NEP period, both Chinese and Indians respectively have significantly higher returns to post-secondary education of 20.1% and 17.8% compared to the Malays. Although the Chinese and Indians still have higher returns to post-secondary education during the early and late post-NEP, but, the magnitude of the difference in the relative returns to education were substantially reduced. In fact, during the early post-NEP period, the Chinese only have significantly higher returns of 7.3% and Indians 3.1% significantly higher than Malays. In the late post-NEP period, the

[16] Replacing year dummies with a time trend variable produce similar estimates.

returns to post-secondary education of Chinese and Indians are not significantly different from Malays based on the total sample. These findings show that Malays gained substantial ground over the Chinese and Indians in terms of returns to post-secondary education and may be due to the NEP's quotas for Malays in positions requiring post-secondary education.[17]

5.2 Labor Force Entry Before or After NEP

The next question of interest is to examine the difference in the returns to education among the races for those who first join the labor force before or after the NEP. The issue of interest here is whether Malays have relatively better returns to education than Chinese and Indians after the implementation of NEP. The second issue is whether Malays who join the labor force would be able to benefit more than Malays who enter the labor force after the NEP. The reason is that Malays who are already working before NEP would have relatively less labor mobility to benefit from the preferential employment policies.

Table 9 provides the results of the regression estimates for those respondents who initially join the labor force before the NEP.[18] Overall, the returns to primary education between Chinese and Malays are not significantly different during the pre-NEP, early post-NEP and late post-NEP (pooled sample). As for the returns to secondary education, Malays have significantly higher returns than Chinese but the magnitude declined over time. Regarding the returns to post-secondary education, Chinese have relatively higher

[17] Racial quotas are effectively enforced in the public sector and government-owned companies. But for the private sector, fiscal incentives are utilized to encourage private companies to comply with the employment quotas by race.

return (20.1%) to post-secondary education than Malays during pre-NEP period. But the mangitude of the returns to post-secondary education were reduced to 14.4% during the early post-NEP period. During the late post-NEP period, the returns to post-secondary education of Chinese were not significantly different from the Malays.

Comparing the relative returns to education of Malays and Indians at the primary schooling level, it was found the Malays have significantly higher return than Indians during the pre-NEP and early post-NEP period. But it was not significantly different during the late post-NEP period. At the secondary education level, the returns to education were not significantly different for the three time periods. However, the return to post-secondary education for Indians were relatively higher (17.8%) than Malays with post-secondary education during the pre-NEP period. During the early post-NEP period, the return to post-secondary education was still higher than Malays with similar education level but it declined to 10.9%. But for the late post-NEP period, there is no significant difference in the returns to post-secondary education between the Malays and Indians. To sum up, it appears among those who joined the labor force before NEP, the relative returns to post-secondary education of Malays showed the biggest improvement after the implementation of NEP.

Table 10 shows the regression results during the late post-NEP period for those who start work after the NEP. Based on the total pooled sample, the returns to primary and secondary education of Chinese and Indians are significantly lower than Malays who join the labor force after NEP during the late post-NEP period. The returns to secondary education of Chinese and Indians who join the labor force after NEP are also

[18] It is noted that there is no change in the estimates in the pre-NEP period in Table 9 and 10 because all

significantly lower than Malays who join the labor force after NEP. While the returns to post-secondary education of Chinese and Indians are significantly higher than Malays who join the labor force after NEP (panel and children sample). But there is no significant difference for the new sample and total pooled sample. These results imply that during the late post-NEP period, Malays that join the labor force after NEP have the advantage in returns to primary and secondary education. In terms of post-secondary education, for the total pooled sample Malays have lower returns than Chinese and Indians but it is not significant.

5.3 Cohort Analysis

The next question is how does the NEP affect the young and the old? In order to answer this question the sample is stratified into the younger age group who are between 15-34 years old and the older group who are 35-54 years old.[19] The implementation of the NEP created a significant increase in the demand for Malays workers with higher education. At the same time, the NEP also increased the supply of Malay workers with higher education through the racial quota system for admissions to institutions of higher learning. But it is expected that the supply of college educated Malays would lag behind the demand for Malay college workers after the NEP policy was implemented. This is because college education takes a long time to complete and the intake of students in universities are limited. In addition, the expansion of Universities require a lot of resources and time. The greater increase in demand for Malays with post-secondary

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respondents that have earnings data in 1965-69 would join the labor force before NEP.

[19] The cut-off age of 54 years of completed age is because the official mandatory retirement age in Malaysia is 55 years old.

education relative to its supply is expected to result in a higher premium attached to Malay workers with post-secondary education after the NEP. Malays in the older cohorts are expected to complete their education before the NEP and have less labor market mobility. Malays in the younger cohorts are expected to make schooling decisions that would take advantage of the favorable policies contained in the NEP. As a consequence the better educated younger cohorts are expected to be in a better position to gain employment in higher paying jobs. Therefore, it is expected that the NEP would benefit the younger Malays more than the older Malays. Overall, the return to post-secondary education of Malays relative to non-Malays is expected to improve after the NEP.

The estimated results of the younger and older age cohorts are in Table 11 and 12 respectively. Among the younger age cohort, it is observed that there is no significant difference in the returns to primary education of Chinese relative to the Malays during the pre-NEP and early post-NEP period. However, the return to primary education of Chinese is significantly lower than Malays during the late-post NEP period. As for Indians, the results show that the return to primary education of Indians is lower than Malays but the coefficients are insignificant for all time periods. As for secondary education, the return to education of Chinese is significantly lower than Malays during the pre-NEP (14.5%) and early post-NEP period (13.1%). However the differential return to secondary education is reduced to (4.9%) with the Malays still enjoying significantly higher returns. A similar picture is obtained for the differential in returns to secondary education for Indians and Malays. Although the return to secondary education of Indians is significantly lower than Malays over all time periods, there is a declining trend from (8.3%) during pre-NEP to 7.1% (early post-NEP) and 3.8% (late post-NEP, total pooled

sample). As for the return to post-secondary education, the Chinese have a substantially higher (24.1%) return than Malays during the pre-NEP period. But the return to post-secondary education narrowed considerably during the early post-NEP period as the Chinese only have significantly higher (11.0%) return than Malays during the early post-NEP period. During the late post-NEP period, the relative return to post-secondary education is further reduced for the panel and children sample (8.4% higher for Chinese), and insignificantly different for the new sample. Overall, for total pooled sample the Chinese have a significantly higher return to post-secondary education of 4.4% only during the late post-NEP period. The younger cohort Indians also has a substantially higher (22.3%) return to post-secondary education than Malays during the pre-NEP period. This differential is reduced to 4.7% (not significant) during the early NEP and 5.3% during the late post-NEP period (total pooled sample). Indians have a significantly higher return to post-secondary education than Malays by 11.6% during the post-NEP period (panel and children sample). The above results show that the returns to post-secondary education of Malays (relative to Chinese and Indians) in the younger age cohort improved substantially during post-NEP period.

Next, the discussion is focussed on the results of the older age cohort in Table 12. It is observed that there is significantly lower (9.0%) return to primary education of Chinese compared to the Malays during the pre-NEP period. However, there is no significant difference in the return to primary education between the Chinese and Malays in the early post-NEP period, late post-NEP period. The results show that the return to primary education of Indians is significantly lower (8.6%) than Malays during the pre-NEP period. It remained significantly lower by 7.8% in the early post-NEP period and

5.0% during the late post-NEP period (pooled panel, children and new sample). In terms of secondary education, the return to education of Chinese is higher than Malays but insignificant during the pre-NEP period. But in the early post-NEP period the return to secondary education relative to Malays is lower but insignificant. However, the return is significantly lower (4.1%) during the late post-NEP period (total pooled sample). The return to secondary education of Indians relative to Malays also declined from the pre-NEP to early post-NEP and late post-NEP periods. Among the older cohorts, the Malays experienced a greater improvement in the return to post-secondary education than the Chinese and Indians during the early and late post-NEP periods. However, among the Malays there is no significant difference in the returns to education of younger and older cohort Malays.

6. Cross-section Analyses

Cross-section results in 1976 are shown in Table 13. The 1976 cross-section results indicate that the returns to education at the primary, secondary and post-secondary level are qualitatively similar to the 1971-76 period. The cross-section results based on current earnings from main job and all jobs in 1988 are shown in Table 14. Besides providing the opportunity to compare with 1984-88 results, it can also address the concern over the difference in the use of the definition of earnings between main job earnings (second wave) and all job earnings (first wave). The main finding is that the results from earnings of main job and all jobs are qualitatively similar for the panel, panel and children, new, as well as total pooled sample. However, the results based on main job earnings have smaller standard errors and higher R-squared for all the relevant samples.

This result is important because it confirms that the difference in the definition of earnings in the first wave and second wave is not a serious problem.

Next the comparison of return to education for the panel and children sample for 1984-88 (Table 8) is compared with the 1988 cross-section results (Table 14). The return to primary education interacted with race for panel and children are both insignificant but have different signs. On the other hand, the returns to secondary and post-secondary education have qualitatively similar results.

For the new sample, the comparison of 1988 cross-section and 1984-88 results in terms of returns to primary, secondary and post-secondary education interacted with race yield similar results qualitatively. As for the total pooled sample, the return to primary education interacted with Indians is qualitatively different between the 1988 cross-section and 1984-88 results. The return to secondary education interacted with race are qualitatively similar. The returns to post-secondary education interacted with race are both insignificant but have the same signs based on cross-section 1988 and 1984-88 period. With a few exceptions, it is observed that the overall cross-section results in 1976 and 1988 are qualitatively similar to the results of 1971-76 and 1984-88.

7. Conclusion

The NEP does seem to have played a role in narrowing the earnings differential of the Malays relative to Indians and Chinese. From the pre-NEP to early post-NEP period, the earnings gap of Chinese and Malays was reduced by about 7.6%. From the early post-NEP period to late post-NEP period (total pooled sample) the earnings gap further decreased by 22.9%. The earnings gap of Indians and Malays also reduced by about 13.5% from the pre-NEP to the early post-NEP period. This gap further declined by 12.8% from the early post-NEP to late post-NEP period (total pooled sample). The decline in relative earnings can be attributed to the faster rate of increase in the level of education and improvements in the returns to education (particularly post-secondary education) of Malays. Another related reason is the larger shift from the agricultural occupations to the more urban, higher paying occupations of Malays relative to Chinese and Indians. However, despite the substantial convergence in relative earnings differential, much work remains to done. This is evident as the Chinese and Indians still earn more than Malays by 68.5% and 13.1% respectively during the late post-NEP period (total pooled sample).

The estimated results show that there is increasing returns to education during the pre-NEP and post-NEP periods. However, there is a convergence in returns to education over time that may be attributed to the rapid increase in supply of more educated workers in the labor market during the post-NEP period. When the linear spline education variable is interacted with race, the most striking result concerns the return to post-secondary education. Prior to the NEP, the Chinese and Indians had considerably higher

returns to post-secondary education than the Malays. This advantage of Chinese and Indians was substantially reduced during the early post-NEP period. By the late post-NEP period, this edge enjoyed by Chinese and Indians no longer existed. This result may be attributed to the NEP, which is targeted to increase the demand for more skilled and educated Malays in the labor market.

The analyses of the sample who join the labor force before NEP showed that the returns to post-secondary education of Malays relative to Chinese and Indians have improved during the early and late post-NEP periods. The analyses by cohorts reveal that the NEP that both the younger and older Malays experience improvements in returns to education relative to Chinese and Indians during the post-NEP period. However, there is no significant difference in the returns of post-secondary education between the younger Malays and older Malays.

The use of cross-sectional and longitudinal data yields qualitatively similar results, which means that the results obtained are quite robust. It also indicates that the difference in the definition in earnings of main jobs and all jobs is not a serious one.

In conclusion, the NEP has made some progress in narrowing the relative earnings differential as well as improving the returns to post-secondary education of Malays.

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Table 1. Descriptive Statistics by Sample and Time of Malays

Sample	Panel	Panel	Panel & Children	New	Total[1] Pooled
Year	65-69	71-76	84-88	84-88	84-88
Variables					
Log monthly Real earnings	5.35 (.952)	5.57 (.856)	5.77 (.689)	6.11 (.660)	5.93 (.696)
age	31.25 (9.85)	36.81 (10.6)	34.30 (12.7)	33.42 (6.99)	33.87 (10.3)
experience	20.58 (11.5)	25.91 (12.3)	20.42 (15.4)	18.90 (8.67)	19.68 (12.6)
years of education	4.67 (3.19)	4.90 (3.33)	7.88 (4.07)	8.52 (3.52)	8.19 (3.82)
mother's education	.634 (1.35)	.678 (1.44)	1.52 (2.22)	1.62 (2.07)	1.57 (2.15)
father's education	1.98 (2.10)	2.08 (2.22)	2.57 (2.33)	2.77 (2.38)	2.67 (2.36)
small town	.190	.186	.221	.363	.290
large town	.053	.054	.070	.137	.103
city	.063	.069	.046	.042	.044
no. of obs	756	1232	1441	1356	2797

Note: Standard deviations for continuous variables are in parentheses
(1) Total pooled sample includes panel, children and new sample in MFLS2

Table 2. Descriptive Statistics by Sample and Time of Chinese

Sample	Panel	Panel	Panel & Children	New	Total[1] Pooled
Year	65-69	71-76	84-88	84-88	84-88
Variables					
Log monthly Real earnings	6.06 (.826)	6.24 (.734)	6.21 (.714)	6.72 (.641)	6.45 (.726)
age	30.29 (8.96)	36.50 (9.47)	36.12 (14.2)	35.88 (6.70)	36.01 (11.3)
experience	18.40 (10.5)	24.38 (11.2)	22.37 (16.5)	21.72 (8.05)	22.06 (13.2)
years of education	5.90 (3.61)	6.12 (3.67)	7.75 (3.84)	8.17 (3.48)	7.95 (3.68)
mother's education	.847 (1.80)	.913 (1.94)	1.70 (2.46)	1.72 (2.43)	1.71 (2.44)
father's education	2.42 (2.57)	2.49 (2.61)	3.17 (2.66)	3.22 (2.84)	3.20 (2.75)
small town	.306	.301	.561	.461	.514
large town	.184	.183	.126	.253	.186
city	.066	.067	.089	.132	.110
no. of obs.	708	1091	613	553	1166

Note: Standard deviations for continuous variables are in parentheses
(1) Total pooled sample includes panel, children and new sample in MFLS2

Table 3. Descriptive Statistics by Sample and Time of Indians

Sample	Panel	Panel	Panel & Children	New	Total[1] Pooled
Year	65-69	71-76	84-88	84-88	84-88
Variables					
Log monthly Real earnings	5.70 (.754)	5.82 (.696)	5.96 (.688)	6.17 (.550)	6.09 (.619)
age	31.03 (9.08)	35.84 (10.0)	32.81 (12.6)	32.36 (7.31)	32.54 (9.82)
experience	19.26 (10.7)	24.05 (11.3)	18.65 (13.4)	18.57 (8.02)	18.61 (10.6)
years of education	5.77 (3.82)	5.80 (3.69)	8.16 (3.58)	7.79 (3.36)	7.94 (3.46)
mother's education	1.28 (2.23)	1.13 (2.00)	2.39 (2.57)	1.92 (2.24)	2.12 (2.39)
father's education	2.92 (2.75)	2.72 (2.51)	2.78 (2.51)	2.72 (2.63)	2.74 (2.58)
small town	.239	.250	.358	.269	.306
large town	.144	.138	.084	.160	.129
city	.112	.112	.068	.029	.046
no. of obs.	222	340	380	543	923

Note: Standard deviations for continuous variables are in parentheses
(1) Total pooled sample includes panel, children and new sample in MFLS2

Table 4. Relative Probability to be Employed in Certain Occupations in 1976 and 1988

Occupation	Panel Sample 1976	New Sample 1988	Difference 1988-1976
Agriculture			
Chinese	- 25.96%**	- 14.77%**	11.19%
Indian	- 6.98%	- 4.04%	2.94%
Professional			
Chinese	1.01%	- 2.13%	-3.14%
Indian	- 2.66%	0.19%	2.85%
Manager			
Chinese	1.23%	6.76%**	5.53%
Indian	- 0.04%	- 0.20%	-0.16%
Clerical			
Chinese	3.85%*	- 4.28%**	-8.13%
Indian	5.03%*	- 2.47%	-7.50%
Sales			
Chinese	16.78%**	20.45%**	3.67%
Indian	- 4.83%	1.03%	5.86%

Table 4 (cont'd).

Service			
Chinese	- 1.43%	-21.52%**	-20.09%
Indian	0.49%	-12.90%**	-13.39%
Production			
Chinese	12.31%*	7.36%**	-4.95%
Indian	- 1.94%	2.15%	4.09%
Transport			
Chinese	- 0.52%*	8.89%**	9.41%
Indian	2.44%	14.69%**	17.13%
Laborer			
Chinese	- 1.43%**	- 0.76%	0.67%
Indian	0.49%*	1.56%	1.07%

Note: * = significant at 5% level ** = significant at 1% level
Relative probabilities are based on linear probability model computed separately for each occupation category.
Reference group = Malays.

Table 5. Real Earnings Regression – Simple Specification

Sample	Panel	Panel	Panel & Children	New	Total[1] Pooled
Year	65-69	71-76	84-88	84-88	84-88
Chinese	.688	.649	.457	.624	.522
	(.046)	(.032)	(.032)	(.032)	(.024)
Indian	.332	.230	.163	.068	.123
	(.061)	(.045)	(.038)	(.029)	(.023)
experience	.041	-.004	.036	.022	.038
	(.007)	(.006)	(.003)	(.006)	(.003)
experience^2	-.001	-.0002	-.0007	-.0008	-.0008
	(.0001)	(.0001)	(.00006)	(.0001)	(.00005)
66/72/85	.128	.131	.118	-.004	.049
	(.068)	(.061)	(.057)	(.052)	(.039)
67/73/86	.072	.116	.010	.060	.021
	(.072)	(.059)	(.058)	(.053)	(.040)
68/74/87	.088	-.017	.024	.091	.019
	(.068)	(.058)	(.059)	(.063)	(.044)
69/75/88	.231	.046	.205	.313	.237
	(.068)	(.061)	(.049)	(.040)	(.032)
76		.120			
		(.049)			
constant	4.96	5.72	5.37	5.82	5.50
	(.089)	(.077)	(.050)	(.066)	(.037)
R^2	.1557	.1728	.1448	.1951	.1758
n	1686	2663	2434	2452	4886

Note: Robust standard errors are in parentheses. Year dummies are based on the relevant time period. (1) Total pooled sample includes panel, children and new sample in MFLS2

Table 6. Real Earnings Regression – with Additional Controls

Sample	Panel	Panel	Panel & Children	New	Total[1] Pooled
Year	65-69	71-76	84-88	84-88	84-88
Chinese	.522	.464	.362	.527	.435
	(.042)	(.029)	(.030)	(.029)	(.021)
Indian	.131	.084	.137	.147	.159
	(.046)	(.033)	(.030)	(.025)	(.019)
experience	.089	.050	.060	.059	.066
	(.007)	(.006)	(.003)	(.006)	(.003)
experience^2	-.002	-.0008	-.0009	-.0011	-.001
	(.0002)	(.0001)	(.00006)	(.0001)	(.00005)
66/72/85	.127	.113	.077	-.028	.015
	(.060)	(.053)	(.051)	(.047)	(.035)
67/73/86	.061	.070	.0008	.002	-.017
	(.062)	(.051)	(.051)	(.046)	(.035)
68/74/87	.065	-.084	-.044	-.019	-.061
	(.060)	(.050)	(.053)	(.055)	(.038)
69/75/88	172	-.034	-.067	-.020	-.079
	(.060)	(.050)	(.059)	(.058)	(.042)
76		-.008			
		(.042)			
Education	.067	.055	.031	.031	.028
(0-6 years)	(.012)	(.009)	(.009)	(.010)	(.007)
Education	.136	.159	.112	.091	.109
(7- 12 years)	(.014)	(.010)	(.008)	(.007)	(.005)
Education	.290	.200	.172	.187	.177
(13 + years)	(.030)	(.016)	(.015)	(.011)	(.009)
Mother's	.011	.019	.011	.014	.012
Education	(.010)	(.007)	(.006)	(.005)	(.004)
Father's	.034	.020	-.008	.004	-.002
Education	(.009)	(.006)	(.006)	(.005)	(.004)

Table 6 (cont'd).

Small town	.251 (.044)	.207 (.030)	.221 (.027)	.110 (.024)	.174 (.018)
Large town	.189 (.056)	.181 (.039)	.167 (.045)	.187 (.033)	.219 (.027)
City	.314 (.056)	.350 (.042)	.168 (.048)	.265 (.053)	.226 (.037)
Number of jobs	.072 (.064)	.022 (.036)			
Start earnings			-.252 (.048)	-.226 (.050)	-.252 (.036)
End earnings			-.125 (.051)	-.131 (.054)	-.134 (.038)
constant	3.72 (.129)	4.39 (.092)	4.71 (.089)	4.99 (.098)	4.78 (.065)
R^2	.3574	.4140	.4060	.4425	.4342
n	1686	2663	2434	2452	4886

Note: Robust standard errors are in parentheses. Year dummies are based on the relevant time period. (1) Total pooled sample includes panel, children and new sample in MFLS2

Table 7. Real Earnings Regression – Simple Specification
(Common panel sample for 3 periods)

Sample Year	Panel 65-69	Panel 71-76	Panel 84-88
Chinese	.625 (.061)	.612 (.043)	.579 (.055)
Indian	.493 (.085)	.335 (.062)	.326 (.089)
experience	.026 (.011)	-.011 (.008)	-.053 (.016)
experience^2	-.0006 (.0003)	.000005 (.0001)	.0003 (.0002)
66/72/85	.123 (.096)	.120 (.081)	.183 (.128)
67/73/86	.077 (.092)	.121 (.075)	.288 (.146)
68/74/87	.072 (.088)	-.0005 (.070)	.211 (.159)
69/75/88	.204 (.093)	.005 (.081)	.480 (.112)
76		.084 (.060)	
constant	5.07 (.126)	5.78 (.106)	6.81 (.321)
R^2	.1260	.1538	.2543
n	861	1366	668

Note: Robust standard errors are in parentheses. Year dummies are based on the relevant time period. There are more observations for respondents who change jobs more frequently. This sample excludes those who joined the labor force after NEP (1970).

Table 8. Real Earnings Regression by Sample with interaction between Race and Years of Education

Sample	Panel	Panel	Panel & Children	New	Total Pooled
Year	65-69	71-76	84-88	84-88	84-88
Education	.086	.060	.033	.058	.039
(0 – 6 years)	(.018)	(.012)	(.011)	(.016)	(.009)
Chinese*(edu	-.031	.009	-.009	-.072	-.027
0 – 6 years)	(.022)	(.015)	(.020)	(.029)	(.017)
Indians*(edu	-.058	-.052	-.027	-.042	-.028
0 – 6 years)	(.024)	(.017)	(.022)	(.021)	(.014)
Education	.202	.204	.129	.101	.124
(6 – 12 years)	(.022)	(.015)	(.010)	(.008)	(.006)
Chinese*(edu	-.104	-.086	-.059	-.027	-.046
6 – 12 years)	(.027)	(.019)	(.017)	(.014)	(.011)
Indians*(edu	-.022	-.003	-.029	-.013	-.023
6 – 12 years)	(.032)	(.023)	(.016)	(.013)	(.010)
Education	.125	.156	.156	.199	.178
(13 + years)	(.046)	(.022)	(.018)	(.014)	(.012)
Chinese*(edu	.201	.073	.054	-.034	.004
13 + years)	(.067)	(.035)	(.037)	(.027)	(.023)
Indians*(edu	.178	.031	.050	-.028	-.0005
13 + years)	(.062)	(.034)	(.042)	(.024)	(.026)
Chinese	.731	.497	.525	1.01	.688
	(.097)	(.066)	(.099)	(.161)	(.088)
Indian	.360	.297	.339	.416	.366
	(.107)	(.073)	(.109)	(.112)	(.073)
experience	.089	.051	.061	.060	.067
	(.007)	(.006)	(.003)	(.006)	(.003)
experience^2	-.002	-.0008	-.0009	-.0011	-.001
	(.0002)	(.0001)	(.00005)	(.0001)	(.00005)
66/72/85	.111	.111	.081	-.028	.017
	(.059)	(.053)	(.051)	(.047)	(.035)

Table 8 (cont'd).

67/73/86	.043 (.062)	.059 (.050)	-.003 (.051)	.006 (.046)	-.016 (.035)
68/74/87	.059 (.059)	-.088 (.050)	-.041 (.053)	-.029 (.055)	-.063 (.038)
69/75/88	156 (.059)	-.043 (.050)	-.074 (.059)	-.029 (.058)	-.086 (.042)
76		-.016 (.042)			
Mother's Education	.011 (.010)	.020 (.007)	.011 (.006)	.013 (.005)	.012 (.004)
Father's Education	.034 (.009)	.018 (.006)	-.008 (.006)	.005 (.005)	-.002 (.004)
Small town	.237 (.045)	.189 (.031)	.211 (.027)	.102 (.024)	.163 (.018)
Large town	.185 (.055)	.188 (.039)	.163 (.045)	.179 (.033)	.215 (.027)
City	.289 (.056)	.333 (.043)	.186 (.048)	.273 (.053)	.242 (.037)
Number of jobs	.078 (.065)	.031 (.037)			
Start earnings			-.258 (.048)	-.227 (.050)	-.253 (.036)
End earnings			-.132 (.051)	-.130 (.054)	-.136 (.038)
constant	3.62 (.143)	4.33 (.103)	4.66 (.094)	4.79 (.118)	4.67 (.073)
R^2	.3680	.4208	.4116	.4496	.4396
No of. Obs.	1686	2663	2434	2452	4886

Note: Robust standard errors are in parentheses. Year dummies are based on the relevant time period. Total pooled sample includes panel, children and new sample in MFLS2.

Table 9. Real Earnings Regression by Sample with interaction between Race and Years of Education
(Respondents that join labor force before NEP)

Sample	Panel	Panel	Panel & Children	New	Total Pooled
Year	65-69	71-76	84-88	84-88	84-88
Education	.086	.057	.031	.063	.038
(0 – 6 years)	(.018)	(.013)	(.012)	(.020)	(.010)
Chinese*(edu	-.031	.006	.011	-.069	-.009
0 – 6 years)	(.022)	(.015)	(.023)	(.033)	(.018)
Indians*(edu	-.058	-.050	-.014	-.054	-.034
0 – 6 years)	(.024)	(.018)	(.034)	(.032)	(.023)
Education	.202	.212	.139	.119	.125
(6 – 12 years)	(.022)	(.016)	(.018)	(.015)	(.011)
Chinese*(edu	-.103	-.094	-.060	-.037	-.039
6 – 12 years)	(.027)	(.020)	(.031)	(.022)	(.018)
Indians*(edu	-.022	-.023	.032	.025	.026
6 – 12 years)	(.032)	(.024)	(.030)	(.023)	(.018)
Education	.125	.122	.183	.146	.159
(13 + years)	(.046)	(.027)	(.046)	(.042)	(.031)
Chinese*(edu	.201	.144	-.078	.003	-.072
13 + years)	(.067)	(.037)	(.094)	(.102)	(.073)
Indians*(edu	.178	.109	-.109	-.039	-.055
13 + years)	(.062)	(.043)	(.091)	(.050)	(.065)
Chinese	.731	.506	.425	.988	.612
	(.097)	(.066)	(.107)	(.180)	(.092)
Indian	.360	.274	.173	.431	.323
	(.107)	(.076)	(.172)	(.174)	(.119)
experience	.089	.045	.034	.076	.035
	(.007)	(.006)	(.010)	(.018)	(.007)
experience^2	-.002	-.0007	-.0005	-.0013	-.0006
	(.0002)	(.0001)	(.0001)	(.0003)	(.0001)
66/72/85	.111	.118	.267	.044	.153
	(.059)	(.054)	(.090)	(.083)	(.062)

Table 9 (cont'd).

67/73/86	.043 (.062)	.071 (.052)	.229 (.092)	.092 (.081)	.169 (.061)
68/74/87	.059 (.059)	-.079 (.051)	.229 (.102)	.036 (.092)	.133 (.070)
69/75/88	156 (.059)	-.038 (.051)	.151 (.133)	-.070 (.102)	.055 (.083)
76		-.010 (.043)			
Mother's Education	.011 (.010)	.026 (.007)	.005 (.013)	.016 (.009)	.013 (.008)
Father's Education	.034 (.009)	.022 (.006)	-.012 (.010)	.011 (.008)	.001 (.006)
Small town	.237 (.045)	.189 (.031)	.250 (.046)	.035 (.037)	.136 (.028)
Large town	.185 (.055)	.178 (.041)	.248 (.090)	.122 (.050)	.198 (.043)
City	.289 (.056)	.359 (.041)	.115 (.092)	.247 (.083)	.250 (.066)
Number of jobs	.078 (.065)	.032 (.037)			
Start earnings			-.361 (.117)	-.387 (.089)	-.371 (.071)
End earnings			-.079 (.118)	-.235 (.096)	-.159 (.074)
constant	3.62 (.143)	4.42 (.113)	4.86 (.230)	4.51 (.273)	5.02 (.159)
R^2	.3680	.4194	.4015	.4171	.4162
No of. Obs.	1686	2548	1052	1143	2195

Note: Robust standard errors are in parentheses. Total pooled sample includes panel, children and new sample in MFLS2.

Table 10. Real Earnings Regression by Sample with interaction between Race and Years of Education
(Respondents that join labor force after NEP)

Sample Year	Panel & Children 84-88	New 84-88	Total Pooled 84-88
Education (0 – 6 years)	.073 (.033)	.056 (.022)	.064 (.019)
Chinese*(edu 0 – 6 years)	-.098 (.060)	-.101 (.059)	-.104 (.051)
Indians*(edu 0 – 6 years)	-.071 (.039)	-.031 (.027)	-.046 (.023)
Education (6 – 12 years)	.115 (.013)	.099 (.011)	.117 (.008)
Chinese*(edu 6 – 12 years)	-.045 (.023)	-.038 (.022)	-.048 (.017)
Indians*(edu 6 – 12 years)	-.047 (.020)	-.034 (.017)	-.042 (.013)
Education (13 + years)	.159 (.019)	.212 (.014)	.186 (.012)
Chinese*(edu 13 + years)	.089 (.038)	-.035 (.030)	.034 (.024)
Indians*(edu 13 + years)	.105 (.036)	-.009 (.026)	.038 (.022)
Chinese	.978 (.330)	1.22 (.332)	1.12 (.285)
Indian	.612 (.208)	.362 (.139)	.478 (.123)
experience	.108 (.008)	.069 (.011)	.111 (.006)
$experience^2$	-.0025 (.0004)	-.0013 (.0004)	-.0025 (.0003)

Table 10 (cont'd).

85	-.026 (.058)	-.071 (.055)	-.062 (.040)
86	-.138 (.057)	-.056 (.056)	-.122 (.040)
87	-.202 (.059)	-.070 (.064)	-.180 (.043)
88	-.234 (.064)	-.031 (.067)	-.190 (.047)
Mother's Education	.016 (.006)	.011 (.006)	.013 (.004)
Father's Education	-.002 (.007)	.0009 (.006)	.00006 (.004)
Small town	.172 (.033)	.149 (.032)	.168 (.023)
Large town	.110 (.048)	.205 (.042)	.203 (.032)
City	.193 (.056)	.303 (.063)	.237 (.043)
Start earnings	-.184 (.052)	-.118 (.058)	-.162 (.040)
End earnings	-.132 (.056)	-.053 (.062)	-.100 (.043)
constant	4.36 (.205)	4.72 (.156)	4.36 (.127)
R^2	.4704	.5032	.4991
No of. Obs.	1382	1309	2691

Note: Robust standard errors are in parentheses. Total pooled sample includes panel, children and new sample in MFLS2.

Table 11. Real Earnings Regression by Sample with interaction between Race and Years of Education
(age cohort 15-34 years)

Sample	Panel	Panel	Panel & Children	New	Total Pooled
Year	65-69	71-76	84-88	84-88	84-88
Education	.055	.074	.043	.041	.039
(0 – 6 years)	(.021)	(.020)	(.025)	(.024)	(.018)
Chinese*(edu	.014	.037	-.102	-.102	-.101
0 – 6 years)	(.030)	(.027)	(.056)	(.050)	(.041)
Indians*(edu	-.044	-.043	-.060	-.023	-.030
0 – 6 years)	(.031)	(.028)	(.031)	(.029)	(.021)
Education	.247	.225	.119	.080	.111
(6 – 12 years)	(.020)	(.015)	(.012)	(.011)	(.008)
Chinese*(edu	-.145	-.131	-.040	-.029	-.049
6 – 12 years)	(.026)	(.021)	(.023)	(.020)	(.016)
Indians*(edu	-.083	-.071	-.050	-.021	-.038
6 – 12 years)	(.036)	(.028)	(.020)	(.018)	(.014)
Education	.127	.195	.127	.221	.170
(13 + years)	(.051)	(.024)	(.021)	(.015)	(.014)
Chinese*(edu	.241	.110	.084	-.037	.044
13 + years)	(.080)	(.043)	(.038)	(.033)	(.026)
Indians*(edu	.223	.047	.116	-.011	.053
13 + years)	(.066)	(.035)	(.044)	(.055)	(.034)
Chinese	.507	.472	.989	1.16	1.08
	(.140)	(.139)	(.306)	(.282)	(.226)
Indian	.380	.410	.544	.322	.389
	(.142)	(.130)	(.165)	(.150)	(.113)
experience	.126	.068	.113	.091	.120
	(.014)	(.015)	(.008)	(.012)	(.006)
experience^2	-.003	-.0012	-.003	-.0025	-.003
	(.0005)	(.0005)	(.0004)	(.0004)	(.0003)
66/72/85	.147	.144	-.029	-.024	-.045
	(.068)	(.064)	(.056)	(.049)	(.037)

Table 11 (cont'd).

67/73/86	.042 (.071)	.080 (.064)	-.116 (.057)	.012 (.050)	-.089 (.037)
68/74/87	.075 (.066)	-.086 (.063)	-.160 (.058)	-.044 (.060)	-.132 (.041)
69/75/88	.192 (.067)	-.008 (.065)	-.208 (.063)	.022 (.065)	-.148 (.046)
76		-.017 (.054)			
Mother's Education	.015 (.013)	.006 (.009)	.013 (.007)	.009 (.006)	.010 (.005)
Father's Education	.014 (.011)	.003 (.008)	-.003 (.007)	.007 (.006)	.003 (.004)
Small town	.141 (.053)	.133 (.043)	.149 (.032)	.114 (.031)	.137 (.023)
Large town	.090 (.068)	.065 (.052)	.114 (.049)	.149 (.042)	.176 (.032)
City	.168 (.069)	.175 (.061)	.200 (.055)	.254 (.065)	.222 (.043)
Number of jobs	.065 (.074)	.072 (.046)			
Start earnings			-.187 (.052)	-.141 (.060)	-.177 (.041)
End earnings			-.101 (.056)	-.047 (.062)	-.083 (.043)
constant	3.62 (.171)	4.09 (.154)	4.53 (.163)	4.77 (.170)	4.50 (.119)
R^2	.3475	.4805	.3898	.4153	.4149
No of. Obs.	1115	1203	1369	1361	2730

Note: Robust standard errors are in parentheses. Total pooled sample includes panel, children and new sample in MFLS2.

Table 12. Real Earnings Regression by Sample with interaction between Race and Years of Education (age cohort 35-54 years)

Sample	Panel	Panel	Panel & Children	New	Total Pooled
Year	65-69	71-76	84-88	84-88	84-88
Education (0 – 6 years)	.121 (.035)	.058 (.018)	.043 (.013)	.056 (.021)	.043 (.012)
Chinese*(edu 0 – 6 years)	-.090 (.038)	-.029 (.021)	.031 (.027)	-.063 (.036)	-.011 (.022)
Indians*(edu 0 – 6 years)	-.086 (.042)	-.078 (.024)	.027 (.043)	-.078 (.037)	-.050 (.027)
Education (6 – 12 years)	.033 (.076)	.198 (.036)	.114 (.020)	.130 (.016)	.123 (.012)
Chinese*(edu 6 – 12 years)	.075 (.087)	-.054 (.041)	-.076 (.032)	-.036 (.021)	-.041 (.018)
Indians*(edu 6 – 12 years)	.134 (.078)	.021 (.037)	.044 (.035)	-.002 (.022)	.012 (.018)
Education (13 + years)	.146 (.122)	.048 (.050)	.243 (.036)	.183 (.026)	.198 (.021)
Chinese*(edu 13 + years)	.063 (.127)	.134 (.060)	-.010 (.081)	-.018 (.047)	-.038 (.044)
Indians*(edu 13 + years)	.071 (.121)	.130 (.062)	-.088 (.065)	-.025 (.035)	-.041 (.031)
Chinese	.950 (.136)	.554 (.077)	.395 (.127)	.971 (.197)	.661 (.113)
Indian	.323 (.168)	.301 (.093)	-.040 (.216)	.553 (.204)	.413 (.144)
experience	-.050 (.054)	.057 (.024)	.023 (.024)	.081 (.029)	.043 (.016)
experience^2	.0007 (.0008)	-.001 (.0004)	-.0003 (.0004)	-.0014 (.0005)	-.0007 (.0003)
66/72/85	.040 (.120)	.028 (.087)	.299 (.098)	.012 (.118)	.150 (.079)

Table 12 (cont'd).

67/73/86	.076 (.127)	-.001 (.081)	.315 (.102)	.116 (.109)	.201 (.077)
68/74/87	.018 (.122)	-.132 (.083)	.214 (.110)	.089 (.119)	.129 (.083)
69/75/88	.055 (.121)	-.092 (.081)	.100 (.126)	-.014 (.117)	.058 (.088)
76		-.041 (.069)			
Mother's Education	.002 (.017)	.033 (.011)	-.005 (.015)	.022 (.009)	.013 (.008)
Father's Education	.066 (.016)	.027 (.009)	-.002 (.010)	.002 (.008)	-.0007 (.006)
Small town	.461 (.088)	.227 (.046)	.246 (.048)	.079 (.040)	.158 (.030)
Large town	.348 (.091)	.293 (.062)	.307 (.090)	.178 (.051)	.255 (.043)
City	.513 (.090)	.459 (.054)	.126 (.110)	.271 (.084)	.269 (.068)
Number of jobs	.093 (.105)	.005 (.050)			
Start earnings			-.422 (.110)	-.330 (.086)	-.354 (.070)
End earnings			-.336 (.107)	-.217 (.092)	-.248 (.071)
constant	5.40 (.917)	4.41 (.413)	5.03 (.412)	4.41 (.441)	4.88 (.276)
R^2	.4428	.4113	.5140	.4726	.4924
No of. Obs.	551	1352	835	1090	1925

Note: Robust standard errors are in parentheses. Total pooled sample includes panel, children and new sample in MFLS2.

Table 13. Real Earnings Regression by Sample in 1976 Cross-section

Sample	Panel
Education	.050 (.016)
Chinese*(education 0 – 6 years)	.004 (.024)
Indians*(education 0 – 6 years)	- .038 (.036)
Education (6 – 12 years)	.202 (.023)
Chinese*(education 6 – 12 years)	- .062 (.030)
Indians*(education 6 – 12 years)	.007 (.043)
Education (13 + years)	.152 (.060)
Chinese*(education 13 + years)	.052 (.079)
Indians*(edu 13 + years)	.006 (.099)
Chinese	.447 (.108)
Indian	.236 (.166)
experience	.043 (.008)
experience^2	-.0006 (.0001)
Mother's Education	.013 (.014)

Table 13 (cont'd).

Father's Education	.018 (.010)
Small town	.216 (.053)
Large town	.220 (.070)
City	.391 (.082)
Number of Jobs	-.005 (.044)
constant	4.52 (.157)
R^2	.4422
No of. Obs.	937

Note: Standard errors are in parentheses.

Table 14. Real Earnings Regression by Sample in 1988 Cross-section

Sample	Panel		Panel & Children		New		Total Pooled	
Source of Earnings	Main	All	Main	All	Main	All	Main	All
Education (0 – 6 years)	.024 (.018)	.013 (.018)	.029 (.014)	.021 (.014)	.039 (.016)	.035 (.016)	.028 (.010)	.022 (.011)
Chinese*(edu 0 – 6 years)	.019 (.029)	.034 (.029)	.008 (.024)	.017 (.024)	-.041 (.026)	-.036 (.026)	-.003 (.017)	.006 (.017)
Indians*(edu 0 – 6 years)	.005 (.060)	.014 (.060)	.030 (.041)	.055 (.041)	-.007 (.028)	.005 (.029)	.011 (.023)	.028 (.024)
Education (6 – 12 years)	.156 (.030)	.147 (.030)	.142 (.014)	.129 (.014)	.136 (.010)	.123 (.010)	.149 (.008)	.135 (.008)
Chinese*(edu 6 – 12 years)	- .116 (.044)	-.118 (.044)	-.085 (.023)	-.076 (.023)	-.050 (.016)	-.039 (.016)	-.068 (.014)	-.056 (.014)
Indians*(edu 6 – 12 years)	.030 (.067)	.039 (.066)	- .030 (.028)	-.032 (.028)	-.056 (.018)	-.046 (.018)	-.052 (.016)	-.045 (.016)
Education (13 + years)	.123 (.063)	.115 (.061)	.173 (.023)	.174 (.023)	.198 (.019)	.206 (.019)	.178 (.015)	.183 (.015)
Chinese*(edu 13 + years)	.101 (.094)	.111 (.092)	.080 (.045)	.068 (.046)	-.031 (.037)	-.043 (.037)	.019 (.029)	.007 (.029)
Indians*(edu 13 + years)	-.176 (.119)	-.174 (.118)	-.015 (.054)	.002 (.054)	-.017 (.039)	-.028 (.039)	-.010 (.032)	-.010 (.032)
Chinese	.427 (.135)	.296 (.135)	.498 (.115)	.381 (.117)	.885 (.141)	.821 (.142)	.621 (.088)	.515 (.089)
Indians	-.009 (.302)	-.127 (.301)	.032 (.213)	-.138 (.217)	.302 (.151)	.202 (.152)	.201 (.122)	.061 (.123)
Experience	.026 (.015)	.023 (.014)	.072 (.004)	.072 (.005)	.076 (.009)	.079 (.009)	.077 (.003)	.078 (.003)
Experience^2	.0005 (.0002)	-.0004 (.0002)	-.001 (.00007)	-.001 (.00007)	-.001 (.0002)	-.001 (.0002)	-.001 (.00006)	-.001 (.00006)

Table 14 (cont'd).

Mother's education	-.010 (.170)	-.010 (.169)	.006 (.009)	.008 (.009)	.010 (.006)	.010 (.007)	.009 (.005)	.009 (.005)
Father's education	.006 (.014)	.004 (.014)	.003 (.008)	.002 (.008)	.014 (.006)	.014 (.006)	.009 (.005)	.009 (.005)
small town	.319 (.069)	.297 (.068)	.254 (.041)	.229 (.041)	.152 (.031)	.148 (.032)	.206 (.025)	.187 (.025)
large town	.426 (.117)	.399 (.116)	.253 (.063)	.234 (.064)	.212 (.041)	.193 (.042)	.257 (.035)	.235 (.036)
city	.221 (.187)	.188 (.186)	.277 (.084)	.251 (.086)	.319 (.064)	.280 (.065)	.317 (.052)	.283 (.053)
constant	5.23 (.316)	5.49 (.300)	4.37 (.102)	4.54 (.104)	4.50 (.126)	4.59 (.127)	4.39 (.075)	4.53 (.076)
R^2	.4468	.3984	.4477	.4124	.4853	.4595	.4781	.4474
No of. Obs.	580	580	1272	1272	1409	1409	2681	2681

Note: Standard errors are in parentheses. Total pooled sample includes panel, children and new sample in MFLS2. Main refers to earnings from main job only. All refers to aggregate earnings from all jobs.

CHAPTER 2

DISTRIBUTION OF SCHOOLING AND EARNINGS INEQUALITY IN MALAYSIA

1. Introduction

Income inequality is an important policy issue because if distributions of income within and between groups are uneven, then large segments of the population are not reaping the benefits of economic growth. It is even more important in Malaysia because of the sensitivity of income inequality among the races. This is reflected in the New Economic Policy (NEP) which has the prime objective to reduce poverty and income disparities.

A number of strategies are employed by policy makers to reduce income inequality. These strategies are designed to promote economic growth with equity.[1] It is essential to enlarge the economic pie to ensure that in the course of restructuring society to enable Bumiputra[2] to participate in higher income earning activities, other groups in the Malaysian society do not experience any sense of loss or feel a sense of deprivation. One of the major policy instruments utilised in raising overall income and reducing inequality in Malaysia is through the expansion of education.[3] The emphasis on education is evident from the sizeable budget allocation of development expenditure for social services. In 1988, 1.1 billion ringgit was allocated for education that is 71.2% of

[1] Fifth Malaysia Plan 1986-1990 pp. 21-28 provides a discussion of the strategies for growth and distribution issues.
[2] Bumiputra comprises mainly Malays and a very small fraction of indigenous ethnic group.
[3] Mahatir Mohamed (1998) also concurred with the importance of the role of education in raising overall income and reducing income inequality.

total development expenditure for social services.[4] Moreover, the importance of education in the process of economic development is well documented. The importance of education is evident from the numerous advantages of educational investment and expansion.[5] For instance, education provides direct satisfaction to persons during school and later in life. It is an important means to provide trained and skilled manpower, which is essential for the expanding industrial and manufacturing sector in Malaysia. Education enhances productivity and income, and thus contributes to economic growth.

Education investments in Malaysia are aimed at boosting economic growth, achieving wider diffusion of economic opportunities and reducing income inequality. However, it should to be pointed out that the NEP complements the education policies to reduce income inequality. The NEP is considered as a socio-economic engineering program that is intended to redistribute wealth and to provide equitable spread of education and employment opportunities to reflect the racial composition of Malaysia. The NEP, through the strategy of employment restructuring, is designed to enable the disadvantaged group to benefit more from increases in the quantity and quality of employment. The significance and emphasis on education in Malaysia provided the motivation to examine the role of education on the earnings distribution in Malaysia.

The main focus of this paper is on the effect of education on earnings inequality. The key research goals are:

(I) to establish the link between the distribution of education and the distribution of earnings over time with reference to the education policy and New Economic Policy; and

[4] It accounts for 18.3% of total development expenditure for 1988.

(2) to examine the intergenerational transmission of schooling over time;

2. Literature Review

The initial studies on the effects of education on income distribution are at the aggregate level across countries. Most of these studies, Chiswick (1971), Adelman and Morris (1973), Chenery and Syrquin (1975), Park (1996), De Gregorio and Kim (1999) found that higher educational attainment and more equal distribution of education have a significant role in making income distribution more equal. However, Ram (1984) with a sample of 28 countries find that higher level of schooling have a mild (insignificant) equalizing effect as most studies have suggested. But larger education variance leads to more equality in income distribution, which is contrary to most findings. Ram (1989) with a different data set found that there is no significant relationship between mean schooling on income inequality for the full sample of 27 countries.

In recent years, studies of the linkage between the distribution of schooling and income distribution at the individual level within a single country have gained prominence. Knight and Sabot (1990) used establishment survey data of workers in Kenya and Tanzania in 1980 to investigate the different approaches taken by the respective governments to compress wages. They found that the educational expansion adopted by Kenya was more effective in reducing the earnings inequality than Tanzania's pay equalization policy which is only effective in the public sector. This is reflected by the pay premium of secondary education in Kenya which is about 20% lower than in

[5] Schultz (1963), World Bank (1980, pp. 12-15) and Ram (1989) provide a discussion on the benefits of education.

Tanzania. It is also noted that in 1971, the premium of secondary education was significantly higher in Kenya than in Tanzania.

Lam and Levinson (1992) used household survey data from Brazil to study the relationship of the distribution of schooling to earnings inequality. It was found that mean level of schooling experienced steady increases and schooling inequality measured by the coefficient of variation declined significantly. The variance in years of schooling increased from the older cohorts 1925-27 and peaked with the 1949-51 cohort. For subsequent younger cohorts, the variance in years of schooling declined. The cohort effect is disequalizing for older age groups and equalizing for younger cohorts. However, the overall increase in residual variance from 1976 to 1985 for both age groups and birth cohorts was large enough to overcome the equalizing effects of declining variance in years of schooling and declining returns to schooling. Brazil's experience showed that even substantial improvements in the schooling component of earnings inequality did not guarantee overall declines in earnings inequality. But the beneficial effect of lower schooling inequality on overall earnings inequality is expected to be more evident as post-1950 birth cohort become an increasing proportion of the labor force.

Lam (1999) used large household surveys from South Africa and Brazil to show the important differences between the two countries in the link between the distribution of education and the distribution of income. Lam applied a decomposition technique to identify the contribution of the various factors that determine earnings inequality. An interesting feature in his study is the use of estimated coefficients of the earnings regression and the distribution of characteristics to simulate counterfactual distribution of earnings. The findings reveal that inequality of schooling is an important determinant of

income inequality in both countries, and plays a key role in the transmission of inequality across generations.

Cameron (1998) used the National Socio-economic Survey (SUSENAS) at the household level to analyze the changes in income inequality in Java between 1984 and 1990. It was found that the increase in income inequality between 1984 and 1990 was mainly due to the movement out of agricultural sector and to increases in mean incomes in the traditionally better paid industries relative to agriculture. The increase in the number of people with higher levels of education significantly increased inequality but the increased supply of better-educated individuals resulted in the flattening of the education-earnings profile. As such, the net effect of increased education level was a modest increase in inequality.

Levy and Murnane (1992) in their survey of studies on earnings inequality in the United States summarized that earnings inequality was relatively stable in the 1970s but has increased rapidly in the 1980s. For men, annual earnings inequality moved from stability or gradual increases in the 1970s to rapid increases in the 1980s. For women, annual earnings inequality moved from modest decline in the 1970s to increases in the 1980s. For both men and women, increased earnings inequality was driven by the increase in wage variation. The single most important change within the male earnings distribution is the declining position of young, less educated men. For young males who are not college graduates, the economy of the 1980s provided a much reduced opportunity to earn a middle class income.

Juhn, Murphy and Pierce (1993) used data from the March Current Population Survey and found that wage inequality remained stable or even declined slightly in the

1960s and then increased steadily through 1989. The trend toward greater wage inequality is due to increases in the premia on both unobserved and observed dimensions of skills such as education. In decomposing the level of wage inequality, it was found that residual component appeared to be the most important for the overall increase in inequality. In particular, returns to unobservable skills have shown a steady increase since 1970.

It is noted that the above studies were in the context of rising income inequality in both developing and developed countries. Malaysia presents an interesting alternative case for analysis as earnings inequality has fallen over time. It would be useful for policy makers to understand how development with equity is achieved.

The second key goal of this paper is to examine the linkage between parents' schooling and children's schooling. This is because intergenerational transmission of schooling provides an important link between schooling inequality and earnings inequality. The strength of the relationship of parents' schooling and children's schooling would suggest the degree of importance of intergenerational transmission of earnings inequality.

Dennis deTray (1988) used the first wave of the Malaysian Family Life Survey (MFLS) to study the differentials in school attendance among children who were 6-18 years old in 1976. The main finding of this study is that Malaysian families respond to conditions in their household and communities when they decide whether or not to send their children to school. Another finding is that government action has substituted effectively for a shortfall of private resources among Malay families. Lillard and Willis (1994) studied the relationship between parents' education and children's education

using the second wave of MFLS. They examined the effects of parental education on the progress of their children through elementary, secondary, and post-secondary school. The finding is that mothers' and fathers' education have positive and significant effects on their children's educational attainment. The introduction of measured time-varying economic, demographic, and environmental factors weakens the direct effects of parental schooling, but does not weaken the correlation of unmeasured components between parents and children. Lee (1998) analyzed the ethnic differences in fertility and child schooling in Malaysia using data from the second wave of MFLS. He found that the parents' education is a less important determinant of child's education after the NEP.

Previous studies have either used the first or second waves of MFLS for analysis. In contrast, this study is utilizing the data from both the first and second waves of MFLS for analysis. Specifically, the children sample is obtained by extracting the children from the panel sample in MFLS1 which is then pooled with the children of the New and Senior Samples of MFLS2. The advantage of using the children of the panel sample from the first wave is that the problem of relatively higher attrition rate of Chinese can be avoided. In terms of the regression specification, the approach by Lee (1998) is the most appropriate as it can be applied to establish the relationship between parents' and children's schooling and also to test whether this relationship weakened after the implementation of NEP and changes in educational policies. Another difference is that this study focus on the differences in schooling between Malays and non-Malays.

3. Theoretical Linkages between Education and Earnings Distribution

Based on the human capital model of earnings by Mincer (1974) an earnings generating function is expressed as follows:

$$\log Y_s = \log Y_0 + \sum_{j=1}^{s} \log(1 + r_j) + u, \qquad (1)$$

where Y_s is the earnings of a person with S years of schooling, Y_0 with zero schooling, r_j is the rate of return to the jth year of schooling and u represents the omitted variables. Using the approximation $\log(1 + r) = r$, equation (1) can be written as:

$$\log Y_s = \log Y_0 + rS + u, \qquad (2)$$

where r is the average private rate of return to investment in S years of schooling. Taking variances on both sides of equation (2), the distribution of earnings can be written as:

$$Var(\log Y_s) = Var(rS) = \bar{r}^2 Var(S) + \bar{S}^2 Var(r) + 2\bar{r}\bar{S}Cov(r, S), \qquad (3)$$

where a bar over a variable indicates its mean. Holding other variables constant, the model predicts a reduction in earnings inequality if schooling inequality (Var(S)) is reduced. If the rate of return and schooling level are independent, an increase in the level of schooling leads to greater earnings inequality. However, if the level of schooling and rate of return are dependent, the covariance term can take on a negative or positive value. If the covariance between the return to schooling and level of schooling is negative, then an increase in schooling attainment shall reduce earnings inequality. As such, the effect of an increase in schooling attainment on earnings inequality is an empirical question.

However, Lam (1999) pointed out that if schooling inequality is measured by a mean-invariant measure of inequality such as coefficient of variation, then it is possible that a decrease in schooling inequality can be associated with an unchanged or even an

increase in earnings inequality.[6] For instance, an increase in mean schooling with its variance constant implies that the coefficient of variation of schooling decreases but the variance of log earnings remains unchanged. On the other hand, if the variance of schooling increases by a smaller rate than mean schooling, it will also result in the decrease in the coefficient of variation of schooling but then earnings inequality increases. This implies that there is no theoretical reason to expect a more equal distribution of schooling should lead to a more equal earnings distribution. Therefore, the effect of schooling inequality (coefficient of variation of schooling) on earnings inequality is also an empirical question.

Knight and Sabot (1990) explained the linkage between educational expansion and earnings distribution through the composition effect and wage compression effect. The composition effect tend to increase income inequality due to the increases in the relative size of the group with more schooling and higher earnings. The wage compression effect is due to the increase in supply of educated labor relative to demand, which compresses wages and results in lower income inequality.[7]

The literature review reveals that the study of distribution of education on the distribution of earnings has not been attempted on Malaysian setting. As such, this study shall make a contribution by replicating Lam's study using the Malaysian data set.

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[6] Lam's derivation is focussed only on relationship with the first term on the right hand side of equation (3).

[7] See Psacharopoulos and Woodhall (1985, p.267) for a more detailed illustration of the mechanisms by which educational invesment can affect income distribution.

4. Data

The analysis is based on the first and second wave of the Malaysian Family Life Survey (MFLS) data conducted by RAND and the National Population and Family Development Board of Malaysia. The first wave was carried out in 1977 and the second wave during the period August 1988 through January 1989. The data on the schooling distributions is based on the household roster information which contains basic demographic and education information for each household member of those interviewed. The sample for schooling distribution is constructed by pooling the Panel sample in the first wave and the New and Senior samples of the second wave. After deleting those who were born before 1919 and after 1969, and those with missing data on education, the sample includes 9788 respondents.

The data for the analysis of earnings inequality is obtained by merging the household roster information with data on employment history in the first wave. This is to obtain earnings data for 1967-69 and 1976 which represent the period before NEP and early post-NEP period respectively. The period 1967-69 is used so that the earnings data of respondents can be captured at least once during this period. This is because earnings data before 1976 is collected retrospectively once every 3 years or whenever there is a job change. As for the second wave, the household roster information is merged with data on current income activities which contain data on earnings in 1988 that is late post-NEP period. After deleting respondents that are out of the specified age range (20-54)[8],

[8] The choice of the age range 20-54 is due to several reasons. First is the MFLS1 panel sample is small and sample size problems will arise particularly when stratified by cohorts or race if the age range 30-49 is used as in Lam's study. Second, the age range 20-54 is appropriate because it reduces problem of

females and those with missing data, the number of respondents for pre-NEP period is 827, early post-NEP period is 892 and late post-NEP is 4018.

The data analysis for intergenerational transmission of schooling is constructed by pooling the children of Panel sample in the first wave and the children of New and Senior samples in the second wave. The sample of children aged 17 and above at the time of survey comprises 1217 males and 826 females. For children age 20 and above, 947 are males and 627 are females.

5. The Evolution of Schooling Distribution

The expansion of education in Malaysia has been impressive. Table 1 shows the summary statistics for the schooling of Malays and non-Malays[9] in Malaysia by five-year birth cohorts. It provides an idea of the history of schooling from cohorts born in 1919 to 1968. The number of observations by ethnic group is shown in Columns 1-2. The mean years of completed schooling are given in Columns 3-4. Overall, the average years of schooling for Malays (6.06 years) is lower than non-Malays (6.25 years). However, it is worthwhile to note that for older birth cohorts (1953 and below), the mean schooling for non-Malays is higher than for Malays, while this trend is reversed for younger birth cohorts (1954 and above). Consistent with the trends observed in Brazil, South Africa and Java, education levels are rising over time in Malaysia, for both Malays and non-Malays. However, the rate of increase in schooling is higher for Malays from a mean of

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selectivity of schooling decision and the cut-off point of 54 is because the mandatory retirement age in Malaysia is 55 years.

[9] Non-Malays include Chinese, Indians and other races. The decision to stratify by Malays and non-Malays is mainly because this classification is of interest to policy makers who are interested in how the Malays fare vis-a-vis the non-Malays. The other reason is that this classification uses all possible observations in the survey which alleviates to a certain extent the problem of small sample size in MFLS1.

1.74 (birth cohort 1919-1923) to 9.57 years of schooling (birth cohort 1964-68). For non-Malays the mean years of schooling for those in birth cohort 1919-1923 is 2.97 and 8.82 for those in birth cohort 1964-68. These trends appear to be compatible to two main factors: (i) the overall expansion of educational opportunities which increases the level of education of all groups; and (ii) the narrowing of schooling inequalities between Malays and non-Malays due to the Education Act in 1961 and the New Economic Policy in 1970 which provided conditions which encouraged the more rapid increase in schooling of Malays relative to other races among younger cohorts.

Columns 5-6 of Table 1, show the standard deviation in years of schooling by birth cohorts and ethnic group. The standard deviation of schooling of Malays by birth cohort is observed to be lower than non-Malays. Columns 7-8 of Table 1 shows the coefficient of variation in years of schooling by birth cohorts and ethnic group. Overall, a declining trend in the coefficient of variation from the older cohorts to the younger cohorts can be observed for both Malays and non-Malays. This suggest that schooling inequality is decreasing over time.

The mean years of schooling for males and females by ethnic groups are plotted in Figures 1 and 2 respectively. In analysing the trends in schooling in Malaysia it is important to bear in mind that there are four major policy changes which can affect schooling decisions among Malays and non-Malays. The first three are related to the Education Act, 1961[10]. First is that the Malayan Secondary School Entrance Examination

[10] One salient feature of the Education Act, 1961 is the policy of education expansion by providing free primary education and automatic promotion from Standard One (Grade 1) to Form Three (Grade 9). The other important feature is the conversion to Malay medium of instruction for secondary schools and higher education institutions. The prime objective of using Malay as the national language is to achieve national unity. See Soloman (1988), Wong and Hong (1975) for a more detailed illustration of education system in Malaysia.

(MSSEE) was abolished in 1964. It was replaced by the Lower Certificate of Examination (LCE) which is public examination taken at Form 3 (Grade 9) to gain promotion to upper secondary school. This meant that from 1965 onwards, students at Grade 6 were automatically promoted to secondary level up to Form 3. This policy revision has the effect of increasing educational levels of all groups. Second is the criteria is that a student needs to at least obtain a pass in Malay language to secure a pass in LCE. A pass in LCE is a pre-requisite to progress to upper secondary school. The requirement to pass the Malay language is expected to affect the non-Malays more as it is not their mother tongue and also Malay language was not as widely used during that time. It is expected to affect those who were born from 1950 (age 15 in 1965) onwards. Third is the policy decision to convert all secondary school into Malay medium of instruction which affected those born from 1961 onwards.[11] Fourth is the specification of racial quotas for admission to universities which were favorable to the Malays. This decision affected those born from 1953 onwards as they would have been in Form 5 in 1970. The NEP, by limiting the number of places to higher education by ethnic groups affected the student's perception of their chances to gain admission to Universities. This was revealed in the study by Wang (1980) who found that the NEP raised Malays' educational aspirations and their expectation of being successful in gaining places in local Universities. As a result, he found that Malays were more likely than Chinese to continue to Form Six (Grade 12). However, it should also be cautioned that even though the timing of the above government policy changes are known, it is still hard to pinpoint when the

[11] The conversion to Malay medium of instruction was fully achieved in secondary schools by 1978 and at the university level by 1983.

government policy actually take effect. It is even more difficult to ascertain the timing as there are implementation lags in policy interventions.

In the light of the education expansion policy coupled with the educational policies that favor Malays, it is expected that mean schooling levels would increase for the younger cohorts but the rate of increase in schooling for Malays should be higher than for non-Malays. Based on Figure 1, which shows mean years of schooling of males by ethnic group, it is obvious that both Malays and non-Malays have rising levels of education over time. For cohorts born before 1953 it is noted that the mean level of schooling of non-Malays is higher than Malays. But the trend is reversed for the birth cohort after 1953 as the Malays obtain higher mean levels of schooling than non-Malays.

Figure 2 shows the mean years of schooling of females by ethnic group. Just like the trend for females, both Malays and non-Malays receive rising levels of schooling from the older cohorts to younger cohorts. For the older birth cohorts (before 1947) it appears that the mean level of schooling Malays is lower than non-Malays. This trend is reversed for the younger birth cohorts (1957 onwards) as the mean levels of schooling are higher for Malays.

For the schooling of males and females, it is unclear where the timing of structural breaks in the trends in mean schooling level occurs. Therefore, a test of structural break shall be presented in the subsequent section to determine the timing of the effect of government policies on schooling distribution among Malays and non-Malays.

Figure 3 and 4 plots the standard deviation of years of schooling which is one measure of schooling inequality for males and females respectively. From Figure 3, it is

noted that Malay males in the birth cohort (before 1943 and after 1956) have lower standard deviation of years schooling than non-Malay males. As for females, Figure 4 shows that for the birth cohort 1953 and below, Malays have lower standard deviation in years schooling than non-Malays.

Figure 5 and 6 plots the coefficient of variation of years of schooling of males and females respectively. First it is noted that there is overall decline in schooling inequality for both males and females in each ethnic group. Second the schooling inequality of male Malays is slightly higher than for non-Malays males for the birth cohort 1947 and below. For the birth cohort after 1954, it appears that the non-Malays males have a marginally higher schooling inequality than Malay males. For Malay females the decline in schooling inequality for the birth cohort before 1946 is more drastic compared to non-Malay females. For the both Malay and non-Malay females in birth cohort 1948-1956 have similar level of schooling inequality. For those who were born after 1958. Malay females have a slightly lower schooling inequality compared to non-Malay females.

Table 2 shows another way of analysing the evolution of schooling distribution across cohorts. Columns 1 and 2 presents the mean years of schooling by schooling decile for respondents age 55-59 and 25-29 in 1988 respectively. Column 3 indicates the increases in mean years of schooling across cohorts by schooling decile. Similar to the results in Brazil and South Africa, it is worthwhile to note that the increases in mean level of schooling has been associated with the compression of the schooling distribution. This is evident as the top deciles have smaller increases in mean schooling than deciles around the middle of the distribution. The biggest improvements are in the 4^{th} to 7^{th} deciles of the schooling distribution. The mean, standard deviation, coefficient of

variation and Gini coefficient of years of schooling by age groups are presented in the last four rows of Table 2. The mean years of schooling confirms the rising levels of education over time, while the coefficient of variation and Gini coefficients confirm the observation that the schooling distributions have become more equal.

Figure 7 plots Lorenz curves for the schooling distributions of the age groups 25-29 and 55-59 of the total population in 1988. The Lorenz curves confirm the observation above that the schooling distribution of the age group 25-29 is unambiguously more equal than the age group 55-59. Figure 8 plots Lorenz curves for the schooling distributions of the age groups 25-29 and 55-59 in 1988 stratified by Malays and non-Malays. It is of interest to note that among the old cohort (age 55-59) Malays appear to have greater schooling inequality than non-Malays. The Gini coefficients for Malays and non-Malays (age 55-59) are .660 and .594 respectively. But the trend is reversed among the young cohort (age 25-29) where non-Malays have greater schooling inequality than Malays. The Gini coefficients for Malays and non-Malays (age 25-29) are .182 and .228 respectively. On the whole, both Malays and non-Malays have substantial reductions in schooling inequality over time. As the Lorenz curves are unaffected by the mean of the distribution, they cannot be used to rank distributions in terms of social welfare.[12] Therefore, the generalized Lorenz curves of schooling by age group and ethnic group is presented in Figure 9. It is noted that among the older age group (55-59) non-Malays are better off in terms of schooling distribution. But for the younger age group (25-59) Malays are better off in terms of schooling distribution. Both Malays and non-Malays in

[12] See Cowell (1995) and Deaton (1997) which provides an excellent illustration and discussion on the measures of inequality which includes the Lorenz curve and generalized Lorenz curve.

the younger age group have substantially higher social welfare ranking in schooling compared to the older age group.

5.1. Tests for Parameter Stability

The analysis on the trends of distribution of schooling among Malays and non-Malays in Section 5 above, do not provide any clear evidence of the effect of policy changes on levels of schooling and schooling inequality. In order to test for a structural break in mean schooling levels and schooling inequality of Malays and non-Malays, a test of parameter stability proposed by Hansen (1999) is utilized to determine the timing of the effect of government policies on schooling distribution among Malays and non-Malays. The statistical procedure introduced by Hansen is useful because the test for parameter stability makes no a priori assumptions about location of a break, or even if one exists. The main difference is that instead of testing for a break at a particular point in the time series, the test examines the entire time series for the location of a break point. However, it is important to caution that even when a break can be ascertained, it can only be indirectly attributed to the government policies as what has been found is a break in the parameters of a regression relationship. It has not been proven that this break is caused by government policy intervention. The Hansen test has the additional advantage over the Andrews test because it is more general and more appropriate for this analysis. This is because the Hansen test for structural change allows for non-stationary regressors and heteroskedastic error process. Similar to the Andrews test, this technique allows for only one break in the time series.

The regression relationship of interest is as follows:

$$Y = \alpha + \beta C + e,$$

Y equals mean years of schooling or measures of schooling inequality by birth cohort, ethnic group and gender, C is birth cohort e is the error term. The above regression model is applied separately to Malays and non-Malays by gender to test for constancy in β. The structural change in null hypothesis is that the parameters of interest do not change between periods (birth cohorts) are as follows:

$$\beta_i = \begin{cases} \beta, & i < t_0 \\ \beta + \theta, & i \geq t_0. \end{cases}$$

The parameter $t_0 \in [t_1, t_2]$ indexes the relative timing of the structural shift, and θ indexes the magnitude of the shift. The test of $H_0: \theta = 0$ against $H_1: \theta \neq 0$.

Table 3 reports the results, trimming 15 percent off each end of the birth cohorts[13]. Trimming parameter specifies how far into the sample (as a percentage of the full sample) one starts looking for a break, with a symmetric fraction of the sample left after the latest break evaluated. Trimming is necessary to have sufficient observations before the earliest break and after the latest break to estimate the parameters. An F-test for the null hypothesis of whether the estimated variances of the regressions in the two relevant periods are equal is tested to determine whether to use homoskedastic bootstrap or heteroskedastic bootstrap results. The F statistic = $s_1^2/s_2^2 \sim F_{T1-k,\ T2-k}$ where s_1^2 = estimated variance of regression 1 and s_2^2 = estimated variance of regression 2. For the mean level of schooling, the maximum bootstrap value (24.067) of Malay males occurred in the birth cohort 1954. As for non-Malay males, the maximum bootstrap value (40.32)

[13] The results were obtained by using the GAUSS program that implements the empirical techniques introduced by Hansen. This program was downloaded from the website: www.ssc.wisc.edu/~bhansen.

occurred in the birth cohort 1935. As for Malay females, the maximum bootstrap value (31.95) occurred in birth cohort 1938 and in 1934 non-Malays females (maximum bootstrap, 40.489). All the above bootstrap values are significant at less than 1% significance level with 15% trimming.

In terms of standard deviation of schooling, the break is significant and it occurred in the birth cohort 1947 Malay. For non-Malay males, the break is for birth cohort 1947 but it is not significant. As for females, the break happened in the birth cohort 1953 for Malay females (significant) and in the birth cohort 1939 for non-Malay females (insignificant). With regard to the coefficient of variation of schooling, the structural break occurred in 1954 for Malay males, 1935 for non-Malay males, 1938 for Malay females and 1934 for non-Malay females. The tests for breaks in the coefficient of variation by ethnic group and gender are all significant. However, the above tests of structural break provide different timing of breaks for Malays and non-Malays. In some instances the timing of break do not occur during the policy intervention periods. However, this does not mean that government policy does not have an effect on schooling. Some evidence on the effect of government policy on schooling attainment shall be discussed in Section 7.2.

6. Male Earnings Inequality

The distribution of schooling and monthly earnings among males age 20-54 in the periods 1967-69[14], 1976 and 1988 are shown in Tables 4, 5, and 6 respectively. Columns 1-3 show the frequency distribution of schooling. It is noted that 45.8% of the sample are

Malays and 54.2% are non-Malays in 1967-69. In 1976 the sample comprises 45.9% Malays and 54.1% non-Malays. As for 1988 the sample of Malays and non-Malays are 50.5% and 49.5% respectively. It is also striking that the percentage with zero schooling has declined over time. It is observed that those with zero schooling are very low for both Malays (4.7%) and non-Malays (2.9%) in 1988. This is a remarkable achievement as the percentage of population with no schooling in South Africa is 10.4% and Brazil is 14.9% in 1995.

Columns 4-6 of Tables 4, 5 and 6 show mean monthly earnings[15] that are normalized to Malays without schooling. The mean do not include men with zero earnings as the interview for current income was carried out only for those involved in income earning activities.[16] In 1967-69, Malay men with post-secondary education received about 4.32 times higher than earnings of Malays with no schooling. But non-Malay men earn much higher (10.8 times) than Malays with no schooling. In 1976, Malay and non-Malay men with post-secondary education respectively earn about 6.73 and 8.99 times higher than Malays with no schooling. But in 1988, earnings gap for men with post-secondary education and men without schooling appears to have narrowed to about 3.98 times (Malay) and 5.69 times (non-Malays). From 1967-69 period to 1976, it appears that the mean earnings relative to the mean earnings of Malays with zero schooling declined for most of the schooling levels except for Malays in upper secondary and post-secondary level and non-Malays in the upper secondary level. From 1976 to

[14] The period 1967-69 captures only the latest real earnings of the individual if more than one observation on earnings are available during this period.
[15] Earnings here is defined as monetary earnings that include wages and bonus.
[16] Although those who are unpaid family workers are interviewed, the number of cases recorded is only 7 and is thus not included in the computation of mean earnings.

1988, mean monthly earnings relative to Malays with zero schooling declined for all schooling levels for both Malays and non-Malays.

6.1 Decomposition of Earnings Inequality

The regression results of log monthly earnings of all males aged 20-54 on ethnic group, schooling, age and its square in 1967-69, 1976 and 1988 are presented in Table 7.[17] The log variance of earnings which is a measure of earnings inequality is presented in the third last row of Table 7. Overall, it can be seen that earnings inequality has been declining over time.

The decomposition of log variance of earnings is based on the regression estimates in Table 7. The decomposition of variance of log earnings is intended to determine the extent of the contributions of age, race and schooling to earnings inequality. The decomposition results of the simulations based on the respective time period coefficients and the characteristics during the same period are shown Table 8. The first simulation uses the coefficients on age and its square only. It provides a baseline level of inequality corresponding to the situation in which the coefficients on race and schooling are assumed to be zero and without residual variance. The second simulation adds the effect of race. It represents the case when the partial effect of schooling is zero. The contribution of age and race to earnings inequality would be 11.3% (1967-69), 6.8% (1976) and 19.6% (1988) if the racial distribution and the effects of race on earnings remained the same. When the residual variance of the respective period is added, the

[17] The real earnings regression for 1967-69 include year dummies to control for year effects and number of jobs, and the regressions for 1976 include number of jobs variable. Number of jobs are included because the earnings data are based on earnings for all jobs which is due to the nature of earnings data collected in MFLS1, while the earnings data in 1988 covers main job only.

simulated variance of log earnings equals 81.3% (1967-69), 69.4% (1976) and 85.2% (1988).

The fourth simulation examines the effect of age and schooling on inequality when the partial effect of race goes to zero. Consistent with the results in Brazil and South Africa, schooling has a substantial effect on earnings inequality. Schooling inequality explains 17.8% (1967-69), 28.7% (1976) and 28.7% (1988) of actual earnings inequality. The addition of residual variance in row 5 explains about 87.7% (1967-69), 91.4% (1976) and 94.3% (1988) of the actual earnings inequality. The simulation of the combined effect of age, race and schooling is shown in row 6. It accounts for about 29.6% (1967-69), 36.9% (1976) and 34.4% (1988) of total inequality. The residual variance is added in Row 7 and it reproduces the total variance in log earnings for the respective time periods.

6.2 Decomposition of Earnings Inequality by Ethnic Group

Separate regressions for Malay and non-Malay males (age 20-54 years) over the 3 time periods are presented in Tables 9 and 10 respectively. These estimated coefficients are used for the decomposition of log variance of earnings. The results of the simulations for each of the time periods based on four simulations for each combination of coefficients are presented in Table 11. In the first set of simulations, Malay coefficients (Table 9) are applied to the Malay sample. In the second set of simulations, non-Malay coefficients (Table 10) are applied to the Malay sample. For the third set of simulations, non-Malay coefficients are applied on non-Malay sample. The final set of simulations involves the use of Malay coefficients on non-Malay sample. The simulation in row 3 of

Panel A, B, and C is of interest as it measures the contribution of schooling to earnings inequality. For the within Malay simulations, it is observed that the contribution of schooling increases by a significant percentage from 19.1% (1967-69) to 32.3% (1976) and remained stable at 32.6% in 1988. The within non-Malay simulation shows that the contribution of schooling also increases by a significant percentage from 23.6% (1967-69) to 31.3% (1976) and declined slightly to 29.4% in 1988. The increase in the contribution of schooling in explaining earnings inequality between the pre and post-NEP period is greater for the Malays relative to non-Malays. It is noted that the simulation of non-Malay schooling coefficients on the Malay sample accounts for a lower contribution of earnings inequality. This means that if Malays had the same effects of schooling on earnings as non-Malays, Malay's earnings inequality would be lower. Other the other hand, the simulation of Malay schooling coefficients on non-Malay characteristic explains a higher percentage of the schooling inequality. This implies that if non-Malays had the same effects of schooling on earnings, non-Malay's earnings inequality would be much greater.

It is noteworthy that the earnings inequality (variance of log earnings) of Malays and non-Malays declined respectively by 29.7% from 1967-69 to 1976. It further declined by 11.68% from 1976 to 1988. As for non-Malays earnings inequality also declined but by a slower margin that is from 1967-69 to 1976, it recorded a decline of 4.45%. From 1976 to 1988, the decline in earnings inequality for non-Malays is 9.3%. The faster rate in decline in earnings inequality for Malays may be attributed to the relatively higher increase in level of education accompanied by earnings compression at the secondary and lower levels of education. It is also driven by the faster decline in

schooling inequality of Malays over time. These findings appears to be compatible with most of the empirical findings by other studies and is also consistent with the theoretical linkages between distribution of schooling and earnings inequality.

But the interesting point to highlight is that the unobserved component measured by the residual variance seems to be the biggest factor (56-78%) in explaining earnings inequality. Another interesting finding is that the residual variance is declining by a substantial margin for Malays from .696 (1967-69) to .417 (1976) and .372 (1988). For non-Malays the decline in residual variance is small over time from .455 (1967-69) to .399 (1976) and .365 (1988). The big drop in residual variance for Malays from 1967-69 to 1976 is noteworthy. It could be due to three possible reasons. First is that it may be attributed to the implementation of NEP in 1970 which brought about the relatively higher contribution of schooling towards explaining earnings inequality and thus shrinking the unobserved component of earnings inequality. The second possibility of higher residual variance is that the distribution of occupations which is a important policy variable for the NEP may account for a substantial portion of the residual variance. As such, occupation dummy variables were added to the next set of regressions to determine the role of occupation in explaining earnings inequality. The third possible reason could be due to measurement error in the collection of retrospective earnings. This is because earnings in 1967-69 are based on retrospective data which is subject to recall error. On the other hand, the earnings in 1976 and 1988 are based on current earnings and are therefore subject to less measurement error. The relatively higher residual variance for Malays in 1967-69 could be due to the Malays with less education reporting their

retrospective earnings less accurately. Therefore the measurement error in earnings may be translated into higher residual variance in earnings of Malays.

6.2.1 Measurement Error in Earnings

In order to address the question of measurement error in earnings, the data from the panel sample of MFLS1 and MFLS2 are used. By doing so, two sets of earnings data can be obtained by matching the earnings from the same individual, occupation and year that were collected during the first and second waves of the survey. For example, a respondent is interviewed in 1976 (MFLS1) about his earnings and occupation in 1973. The same respondent is interviewed again in 1988 and information about his earnings and occupation in 1973 is collected assuming that there is a job change. However, for comparability and consistency in earnings data between MFLS1 and MFLS2, only those having one job are included in the sample. This is because of the different nature of earnings data collected in the two waves[18] of MFLS. The sample that can be matched are 389 observations which is about 15% of total possible matches.

The key question is whether Malays have relatively higher measurement error variance when recalling past earnings compared to non-Malays. The dependent variable is the difference in reported log earnings square which equals $\left(\ln Y_{it}^{88} - \ln Y_{it}^{76}\right)^2$ where $\ln Y$ is monthly earnings in natural log, superscript 76 and 88 indicates the survey year and subscript i and t represents individual i and time t which is the year that the earnings data are being recalled. The difference in reported log earnings square is regressed with

[18] MFLS1 earnings data were based aggregated earnings from all jobs if the respondent has more than one job. While earnings data from main and secondary job were collected separately in MFLS2. Since, MFLS2 earnings data were recorded only when there is a job change it is not possible to obtain total earnings for all jobs (without interpolation) when the starting or ending date of main and secondary jobs differ.

the number of retrospective years from 1976, non-Malay dummy variable and its interaction with number of retrospective years from 1976 in Model 1. From this point onwards, number of retrospective year refers to number of retrospective years from 1976. Model 2 is based on the number of retrospective years and its square, non-Malay dummy variable and the interactions between the quadratic specification of number of retrospective years and non-Malay dummy variable. The regression results of Model 1 and 2 are shown in Table A5 of Appendix A.

The difference in reported log earnings square is considered as a measure of the variance of measurement error in earnings. Based on Model 1, it is interesting to note that the estimated coefficient for the number of retrospective years is positive and significant. This implies that the variance of measurement error is increasing and significant for both Malays and non-Malays. This finding is consistent with the hypothesis that the variance of measurement error is positively associated with the number of years of recall. It is also interesting to note that the number of retrospective years interacted with non-Malay dummy variable is negative but insignificant. Based on the usual standard of inference, it is observed that there is no significant difference in the rate of forgetting between Malays and non-Malays. However, from the view of point estimates, the rate of forgetting of Malays is faster than non-Malays. It is noted that the magnitude of the non-Malay and number of retrospective years interaction term (-0.37) is considered large relative to the estimated coefficient of number of retrospective years (.042). At the mean number of retrospective years for non-Malays, the effect of the non-Malay interaction term estimates reduces the measurement error variance of non-Malays by .555[19] compared to

[19] Please see Appendix A for details.

Malays. This magnitude is substantial bearing in mind that the mean variance of measurement error is between .7423 (Malays) and .8865 (non-Malays). However, caution needs to be exercised when interpreting the point estimates because the estimated coefficient is extremely imprecise. The imprecise estimate could be due to the small sample size which is unable to detect the subtle differences in measurement error between Malays and non-Malays.

Based on the quadratic specification for the number of retrospective years in Model 2, it is noted that the variance of measurement error decreases initially for both Malays and non-Malays. Subsequently, the variance of measurement error increases after 10 years of recall for Malays and for non-Malays it increases after 18 years recall. This finding is counter-intuitive and I do not have a reasonable explanation for this result.

To sum up, the results based on the linear specification of number of retrospective earnings in Model 1 appears to be more reasonable and is preferred over Model 2. Model 1 shows that the measurement error variance increases with the number of retrospective years for both Malays and non-Malays. However, with regard to differences in the rate of increase in variance of measurement error by number of years of recall (rate of forgetting) between Malays and non-Malays, Model 1 offers two contrasting conclusions depending on which point of view is being considered. Based on the statistical point of view, the rate of forgetting between Malays and non-Malays is not a major factor in explaining the high residual variance in log earnings of Malays during the 1967-69 period. Conversely, if the results are examined from the view of point estimates, then the difference in rate of forgetting between Malays and non-Malays is substantial. But the

drawback is that the point estimates are extremely imprecise. The details of the analysis of measurement error in earnings are elaborated in Appendix A.

6.2.2 Effect of Occupation on Earnings Inequality and Residual Variance

This section attempts to examine the impact of changes in occupation distributions over time on earnings inequality and also on the residual variance of log earnings. The regression estimates of earnings which include occupation variables over time for Malays and non-Malays are shown in Table 12 and 13 respectively. When occupation dummy variables are added to the regression the coefficient estimates of returns to schooling remain significant but decline substantially for both Malays and non-Malays. The reference group for occupation dummies is the agricultural workers, farmers and fishermen. Among Malays, laborers appear to have the lowest earning capacity in 1967-69 followed by those respondents engaged in the agricultural sector (although the coefficients are not significantly different. In 1988, agricultural occupations have on average the lowest earnings among the various occupational groups. Among non-Malays, occupations in the agricultural sector also have the lowest earnings on average in 1967-69 and 1976 periods. In 1988 non-Malay laborers have lower earnings (not significant) than non-Malay respondents involved in agricultural occupations. For both Malays and non-Malays, occupations such as managers and professionals, clerical, sales, service, production related occupations, transport related occupation all have significantly higher earnings than agricultural occupations for all the three time periods. It is also noted that there is a compression of earnings among occupations over time for both Malays and non-Malays.

The decomposition of earnings inequality taking into account the occupation variables are presented in Table 14. With the addition of occupation dummies, the contribution of schooling is lower but still remained substantial. For the within Malay simulations, the contribution of schooling in explaining earnings inequality increased over time from 5.4% in 1967-69 to 10.6% in 1976 and 15.6% in 1988. A similar trend is also observed for non-Malays as the contribution of schooling in explaining earnings inequality also increased over time from 7.73% in 1967-69, 9.84 in 1976 and 18.2% in 1988. The addition of occupation variable to schooling and age increases the explanatory power in explaining income inequality by a significant margin. For Malays, age, schooling and occupation accounts for 32.2% of earnings inequality in 1967-69, 44.9% in 1976 and 42.5% in 1988. As for non-Malays, age, schooling and occupation explains 36.7% of earnings inequality in 1967-69, 42.7% in 1976 and 37.7% in 1988. These results imply that besides schooling, occupation variables are important in accounting for the variations in earnings inequality. The effect of the occupation factor is driven by the movement of agricultural workers to higher paying jobs. In addition, the compression of earnings by occupation over time also contributed towards the reduction in earnings inequality.

The application of non-Malay coefficients on Malay sample results in a lower contribution towards explaining earnings inequality of Malays. However, when Malay coefficients are applied to the non-Malay sample the opposite effect occurs that is it results in a higher contribution towards the explanation earnings inequality of non-Malays. This implies if the effect of schooling and occupation were switched between

Malays and non-Malays, we would expect to see lower earnings inequality among Malays and higher earnings inequality among non-Malays.

It is of interest to note that even with the addition of occupation variables, the unobserved effect on earnings inequality remained high. However, the residual variance of Malays declined by a large margin from .587 (1967-69) to .344 (1976) and .318 (1988). As for non-Malays, the decline in residual variance is more gradual that is from .377 (1967-69), .332 (1976) and .322 (1988). The addition of occupation variable is still unable to explain the exceptionally high residual variance of Malays during the 1967-69 period. The separate regression analysis on monthly real earnings of younger cohort Malays (age 20-34) and older cohort (age 35-54) were carried out. The estimated results are presented in Tables B1 and C1 of the Appendix. It is interesting to note that the residual variance of log monthly earnings of both the young and old cohort Malays during the 1967-69 period are also unusually high.

In short, the above findings seem to suggest that the NEP has a significant role in the reduction of residual error variance in log earnings of Malays in 1976.

6.3 Social Welfare Ranking of Earnings Distributions

The above results indicate that earnings inequality have fallen over time which appears to suggest that the government policies in Malaysia have been effective to some extent in redistributing the benefits of economic development more equitably. Next, it would be interesting to rank the earnings distribution by ethnic group over time by using the generalized Lorenz curve. The horizontal axis for the generalized Lorenz curve is the cumulative fraction of the population and the vertical axis shows the cumulative share of

earnings multiplied by mean earnings. The generalized Lorenz curve is useful to compare different distributions with different means and different aggregates. If the generalized Lorenz curve in one period (group) lies above another period (group), it implies that for all p from 0 to 100 percent of population, the poorest p percent of the population in the higher generalized Lorenz curve will have more resources in total. Therefore, the higher generalized Lorenz curve will be preferred by any equity respecting social welfare function. In order to make comparisons over time valid, the real earnings from all jobs are computed using the Consumer's Price Index with the base year being 1980. The generalized Lorenz curves corresponding to Malays and non-Malays over two time periods, 1967-69 and 1988 are presented in Figure 10. Comparing over the two respective time periods, it is observed that the generalized Lorenz curves of non-Malays dominates those of Malays. Therefore, by any equity-preferring social welfare function, the distribution of real earnings of non-Malays is preferred over Malays in each of the respective time period. But it is noteworthy the gap between the generalized Lorenz curves between Malays and non-Malays are narrowing over time. This implies that the government policies have made some progress to improve the position of Malays relative to non-Malays. But it also indicates that real earnings of Malays are still lagging behind non-Malays and that the policies to uplift the economic position of Malay may still be needed for years to come.

7. Intergenerational Transmission of Schooling

The results above highlight the importance of schooling in explaining the distribution of earnings in Malaysia. Since parents' schooling is an important factor in

determining children's schooling, the intergenerational transmission of schooling provides an important link between schooling inequality and earnings inequality. Therefore, the strength of the relationship of parents' schooling and children's schooling over time is interesting because the implementation of educational policies and NEP would affect schooling decisions. The lower degree of intergenerational transmission of schooling inequality has the potential to lower earnings inequality in the long run.

7.1 Regression Specification and Variables

In order to study the relationship of parents' and children's schooling, the basic regression specification is as follows:

$$S = P\beta + C\gamma + H\delta + \varepsilon$$

where S is that cumulative years of schooling of child, P is parents' schooling variables, C is child characteristics such as birth cohorts and ethnic group, H is a set of household and community variables. The summary statistics of variables used in this analysis are shown in Table 15. The dependent variables are the number of years schooling completed of children up to age 17 and 20.[20] The number of years schooling up to age 17 provide information on whether the child completed lower secondary education and entered upper secondary education, while number of years schooling up to age 20 indicates whether the child completed upper secondary education and entered post-

[20] A set of regressions based on years of schooling per year of age since age six yielded similar results. Since the number of years schooling is easier to interpret, the regressions using this dependent variable is preferred and presented in this study.

secondary education.[21] Ethnicity is classified into Malay and non-Malay. Household variables are based place of residence when the child is at age 12. The variables used are dummy variables for urban residence and availability of pipe water which is measured at the household level. This availability of pipe water attempts to capture the effect of different household conditions on schooling decisions. Community variables are measures of schooling availability which are constructed by matching the migration history data to the community data set. The migration history data provides information on the date of move and location which is identified by district at each move. The community data contain data on the history of school availability in 398 Enumeration Blocks (EBs) and 52 Primary Sampling Units (PSUs).[22] Unfortunately, while we only know the child's place of residence at the district level, retrospective migration data at the EB or PSU level is not available.[23] With this limitation, the proportion of sampled EBs and PSUs within a district that reported having a school of a given type open at a particular point in time is calculated. The availability of schools measures are obtained for each child at the relevant time periods. For instance, the availability of primary schools is measured at the time when the child is at age 6 and availability of secondary school is measured when the child is 12 years old.

[21] The schooling system in Malaysia is similar to the British system. The primary level of education consists of 6 years of schooling. This is followed by lower secondary level (3 years) and upper secondary level (2 years). Post-secondary education is 2 years at Form Six and 3-4 years at college or university level.
[22] The EBs represent communities from which the New and Senior samples resided in at the time of survey. The PSUs represent communities from which the Panel sample resided in at time of survey.
[23] Several EBs or PSUs would make up one district.

7.2 Empirical Results

The regression estimates of child schooling on parents' schooling and other controls for male and female children aged 17 and above are presented in Table 16 and 17 respectively. The schooling regression estimates for male and female children aged 20 and above are shown in Table 18 and 19.

7.2.1 Parents' Schooling

The regression estimates of years of schooling of sons and daughters aged 17 and 20 or more indicate that mother and fathers' schooling have a significantly positive effect on their children's schooling as shown in column 2 of Tables 16-19. The effect of parents' schooling on children's schooling attainment remained positive and significant even with the inclusion of controls of place of residence and school availability measures. This implies that parental schooling plays an important role in the intergenerational transmission of human capital.

The government has pursued a policy of general development through the expansion of education system. At the same time, in the pursuit of development with equity, a set of education and employment policies that are favorable to the disadvantaged group have been implemented. The effect of the NEP and education policies on intergenerational educational mobility is of great interest. In order to test for such an effect, father and mothers' level of schooling are interacted with children born

from 1960 onwards. The reason is that cohorts born from 1960 onwards were exposed to the educational policy changes as well as the NEP.[24]

It is observed that the estimated coefficients of parents' schooling interacted with the 1960 cohort variable are mostly negative and jointly significant for the sample of sons and daughters aged 17 and above. However, in the sample of sons and daughters aged 20 and above the interaction terms of parents' schooling and the 1960 cohort variable are not significant although the estimated coefficients are mainly negative. In general, these results suggest that the effect of parents' schooling weakened after the implementation of the NEP and educational policies. This further implies that there are greater schooling opportunities for the offspring of less educated parents. From the policy perspective, the reduction in the effect of parents' schooling on children's schooling is desired as it has the potential to promote greater educational equality and reduce earnings inequality in the long run.

7.2.2 Birth Cohorts, Ethnicity and Government Policies

Birth cohorts are included in the regression specification to pick up the effects of shifts in government policies and changes in the economy. Three-year birth cohort dummies are included with the left-out category being those born before 1957. The regression estimates of birth cohort in column 1 of Table 16-19 are significantly positive. It also shows an increasingly positive trend for younger cohorts which mean that there is a rising level of education for both males and females. The inclusion of parents' schooling in column 2 and adding of cohort interaction terms, schooling availability and

[24] It is noted that the Hansen tests for structural break fail to produce any clear indication of the timing of

household background variables do not affect the significant positive trend of the birth cohort estimates.

The interaction of non-Malay variable with 1960 birth cohort is intended to capture the differential rate of increase in schooling of Malays and non-Malays who are affected by both the NEP and changes in education policies. For all the three regression specifications, the estimates of this interaction term are significantly negative for both sons and daughters age 17 and above. However, for sons and daughters aged 20 and above, this estimated coefficient of this interaction term is significantly negative except for the specification that includes community and place of residence variables.

7.2.3 School Availability

School availability is considered an important variable in the schooling attainment equation because it is related to the costs of schooling. The availability of school in the local community lowers the costs of schooling and is expected to have a positive effect on schooling attainment. At the primary school level, parents have the choice to send their children to schools with Malay, Chinese or Tamil medium of instruction. Therefore, at the primary level, the medium of instruction is an important consideration. Since all races attend Malay medium primary schools it is interacted with both Malays and non-Malays. While Chinese are more likely to attend Chinese schools, and Indians more likely to attend Tamil schools, it is interacted with non-Malay dummy variable. At the secondary level, the language of instruction is not important especially for the younger cohorts as Malay language is the only medium of instruction for national secondary

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government policies on level of schooling and schooling inequality for Malays and non-Malays.

schools. As such, the availability of secondary school variable is introduced without interacting with the language of instruction.

The estimated coefficients of school availability variables are shown in column 3 of Tables 16-19. On the whole, the estimated coefficients have the expected signs for both the male and female children but are mostly insignificant. For instance, coefficients for Malay interacted with Malay medium primary are positive and non-Malay interacted with Malay medium schools are negative. Non-Malays interacted with Chinese or Tamil schools result in positive coefficients. Had these estimated coefficients been statistically significant, it would suggest that Malays have the advantage if the medium of instruction is Malay. It also suggest that availability of Chinese or Tamil primary schools increases schooling attainment of non-Malay children. As for the availability of secondary schools in the district, a positive coefficient is observed for both male and female children. However it is only significant for male children aged 20 and above.

7.2.4 Place of Residence

The place of residence is intended to capture some features of the broader environment in which schooling decisions are made. After controlling for school availability and family background characteristics, urban place of residence has positive but insignificant coefficients in both male and female children schooling regression. The availability of piped water is a proxy measure of household assets and the socio-economic position of families at the relevant time of the schooling decision.[25] The

[25] Data on household assets are only available at the current time of survey. The use of income of earnings as a time-varying measure is problematic because the retrospective earnings data for MFLS2 is only recorded when there are job changes. As a result very few matches of earnings data to the period of schooling decision can be obtained.

coefficients of availability of piped water at the household level are generally positive and significant except for female children age 17 and above which is positive but not significant.

8. Conclusion

The trend analysis of mean schooling by birth cohorts show that the levels of education are increasing from the older to younger cohorts for both sexes of Malays and non-Malays. Schooling inequality measured by coefficient of variation, Gini coefficient and Lorenz curves indicate that schooling inequality has been decreasing from the older to younger cohorts. A trend of declining earnings inequality for both Malays and non-Malays has been observed. The decomposition of earnings inequality reveal that schooling and occupation are important variables in explaining earnings inequality for both Malays and non-Malays. The contribution of the schooling factor is due to rising level of education and the compression of returns to education especially at the secondary and lower level of schooling. The decrease in schooling inequality also contribute to lower earnings inequality. The contribution of occupation towards lower earnings inequality operates through two major sources. First is the movement out of agriculture to better paying jobs in the modern sector and second is the compression of earnings by occupation over time. Although the residual variance in log earnings are declining over time, the biggest contribution towards explaining earnings inequality are still the unobserved factors. Of particular interest is the unusually high residual variance in log earnings of Malays during the pre-NEP period, and the sharp drop in residual variance during the early post-NEP period. Even with the addition of occupation variables this

phenomenon remains. The difference in the variance of measurement error in earnings by years of recall into the past between Malays and non-Malays is not a major factor in explaining the high residual variance. Hence, it is plausible that the effect of NEP contributed towards the substantial shrinking of the residual variance during the post-NEP period.

The generalized Lorenz curves of real earnings of Malays and non-Malays indicate that non-Malays are better off than Malays during the pre-NEP and post-NEP periods. It also suggests that the NEP has played a role in improving the position of Malays relative to non-Malays. But the Malays still lag behind in terms of social welfare ranking of real earnings distribution. These results point to the need to maintain the policies intended to uplift the economic position of the disadvantaged group.

The Hansen tests of parameter stability on the timing of the effect of government policy on mean schooling and schooling inequality produce different results for Malays and non-Malays. It is unable to provide a clear picture on the timing of the effect of government policy on schooling. However, using cohort analysis, the results are compatible with the notion that education policies and NEP do affect schooling attainment of Malays and non-Malays. It is observed from the regression analysis that non-Malay children born after 1960 do have significantly lower schooling attainment than Malays.

Of great relevance to this study is that the link between parents' schooling and children's schooling weakened significantly for cohorts born after 1960. It implies that the educational policies and NEP policies are quite effective in providing better educational opportunities for children with parents with lower education. The weaker

intergenerational transmission of schooling tends to reduce schooling inequality. The greater equality of education has potential benefits in the future as greater equality in human capital is associated with greater earnings equality.

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Table 1. Summary Statistics for Distribution of Schooling by Five Year Birth Cohort

Birth Cohort	Number of Observations		Years of Completed Schooling					
			Mean		Standard Deviation		Coefficient of Variation	
	Malays	Non-Malays	Malays	Non-Malays	Malays	Non-Malays	Malays	Non-Malays
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
19-23	165	203	1.74	2.97	2.55	3.75	1.47	1.26
24-28	266	277	2.22	3.50	2.54	3.62	1.14	1.03
29-33	367	464	2.32	3.21	3.10	3.64	1.33	1.14
34-38	460	490	2.94	4.29	3.07	3.89	1.04	0.91
39-43	443	556	4.58	5.23	3.52	4.18	0.77	0.80
44-48	487	650	5.56	6.38	3.64	3.86	0.65	0.61
49-53	655	804	6.93	7.12	3.41	3.84	0.49	0.54
54-58	576	655	8.10	7.60	3.67	3.70	0.45	0.49
59-63	593	590	9.37	8.28	3.31	3.45	0.35	0.42
64-68	496	591	9.57	8.82	2.93	3.25	0.31	0.37
Total	4508	5280	6.06	6.25	4.26	4.19	0.70	0.67

Table 2. Mean Years of Schooling by Schooling Decile
(All persons age 25-29 and 55-59 in 1988)

Schooling Decile	Age 55-59	Age 25-29	Increase
	(1)	(2)	(3)
1	0	1.93	1.93
2	0	5.77	5.77
3	0	6.03	6.03
4	0	8.40	8.40
5	0.66	9.00	8.34
6	2.39	9.53	7.14
7	3.66	11.00	7.34
8	4.97	11.00	6.03
9	6.01	11.05	5.04
10	10.39	14.45	4.06
Total:			
No. of. obs	831	1183	2014
Mean	2.82	8.82	6.00
Std. Dev.	3.44	3.43	-0.01
C.V.	1.22	0.34	-0.88
Gini	0.62	0.21	-0.41

Table 3. Parameter Instability in Years of Completed Schooling: Breaks in Mean, Standard Deviation and Coefficient of Variation

Years of schooling	Malay		Non-Malay	
	Max. Test Statistic	Birth Cohort Of Max.	Max. Test Statistic	Birth Cohort Of Max.
A. Males				
Mean	24.067	1954	40.32	1935
p-value: test in breaks	(.0001)		(.0000)	
p-value: $H_0 : \sigma_1^2 = \sigma_2^2$	.2187		.3129	
Standard Deviation	23.294	1947	7.076	1944
p-value: test in breaks	(.0080)^H		(.5370)^H	
p-value: $H_0 : \sigma_1^2 = \sigma_2^2$	.0000		.0000	
Coefficient of Variation	38.007	1954	80.71	1935
p-value: test in breaks	(.0150)^H		(.0000)^H	
p-value: $H_0 : \sigma_1^2 = \sigma_2^2$	.0000		.0000	
B. Females				
Mean	31.950	1945	40.489	1934
p-value: test in breaks	(.0000)		(.0000)	
p-value: $H_0 : \sigma_1^2 = \sigma_2^2$	.2539		.3779	
Standard Deviation	41.768	1953	14.055	1939
p-value: test in breaks	(.0000)		(.1090)^H	
p-value: $H_0 : \sigma_1^2 = \sigma_2^2$	.2722		.0289	
Coefficient of Variation	35.809	1938	32.975	1934
p-value: test in breaks	(.0220)^H		(.0030)^H	
p-value: $H_0 : \sigma_1^2 = \sigma_2^2$	.0000		.0001	

Notes: The above results are computed based on Hansen test of parameter stability (Hansen, 1999). N = 46 single-year birth cohorts, 1923-1968. An F-test for the null hypothesis of whether the estimated variances of the regressions in the 2 relevant periods are equal is tested. The F statistic = $s_1^2/s_2^2 \sim F_{T1-k,\,T2-k}$ where s_1^2 = estimated variance of regression 1 and s_2^2 = estimated variance of regression 2 to determine whether to use homoskedastic or heteroskedatic tests. The relevant homoskedastic or heteroskedastic bootstrap p-values are shown in parentheses. Superscript H indicates heteroskedstic p-values. Bootstrap replications = 1000 and trimming = 15%.

Table 4. Monthly Earnings by Highest Grade Completed for Males Age 20-54 in 1967-69

Schooling	Percentage in Schooling Group			Mean Monthly Earnings (relative to Malays with zero schooling)		
	Malay (1)	Non-Malay (2)	Total (3)	Malay (4)	Non-Malay (5)	Total (6)
None	16.1%	9.2%	12.3%	1.00	2.16	1.47
Grade 1-3	18.7%	20.3%	19.6%	1.36	1.99	1.71
Grade 4-5	26.1%	17.6%	21.5%	1.55	2.46	1.96
Grade 6	25.1%	21.0%	22.9%	1.54	3.14	2.33
Grade 7-9	5.5%	15.4%	10.9%	2.43	3.16	3.00
Grade 10-12	6.6%	12.3%	9.7%	3.55	4.35	4.10
Upper 6 & Tertiary	1.9%	4.2%	3.2%	4.32	10.8	9.05
Total	100%	100%	100%	1.66	3.17	2.48
No. of obs.	379	448	827			
Percentage	45.8%	54.2%	100%			

Table 5. Monthly Earnings by Highest Grade Completed for Males Age 20-54 in 1976

Schooling	Percentage in Schooling Group			Mean Monthly Earnings (relative to Malays with zero schooling)		
	Malay (1)	Non-Malay (2)	Total (3)	Malay (4)	Non-Malay (5)	Total (6)
None	12.7%	7.3%	9.8%	1.00	1.71	1.28
Grade 1-3	16.1%	19.1%	17.7%	1.21	1.69	1.49
Grade 4-5	24.2%	15.9%	19.7%	1.53	2.07	1.76
Grade 6	30.1%	21.7%	25.6%	1.38	2.36	1.83
Grade 7-9	7.3%	18.4%	13.3%	2.27	2.97	2.79
Grade 10-12	7.3%	12.4%	10.1%	3.90	4.91	4.57
Upper 6 & Tertiary	2.2%	5.2%	3.8%	6.73	8.99	8.40
Total	100%	100%	100%	1.71	2.90	2.35
No. of obs.	409	483	892			
Percentage	45.9%	54.1%	100%			

Table 6. Monthly Earnings by Highest Grade Completed for Males Age 20-54 in 1988

Schooling	Percentage in Schooling Group			Mean Monthly Earnings (relative to Malays with zero schooling)		
	Malay (1)	Non-Malay (2)	Total (3)	Malay (4)	Non-Malay (5)	Total (6)
None	4.7%	2.9%	3.8%	1.00	1.39	1.15
Grade 1-3	6.7%	7.3%	6.9%	1.07	1.68	1.39
Grade 4-5	7.1%	7.0%	7.0%	1.24	2.25	1.73
Grade 6	25.2%	22.9%	24.1%	1.25	2.09	1.65
Grade 7-9	20.2%	30.6%	25.3%	1.43	2.02	1.79
Grade 10-12	26.9%	20.7%	23.8%	1.98	2.85	2.36
Upper 6 & Tertiary	9.2%	8.8%	9.0%	3.98	5.69	4.81
Total	100%	100%	100%	1.71	2.51	2.10
No. of obs.	2031	1987	4018			
Percentage	50.5%	49.5%	100%			

Table 7. Log Monthly Earnings for Males Age 20-54 in 1967-69, 1976 and 1988

Variable	1967-69		1976		1988	
	Coef.	SE	Coef.	SE	Coef.	SE
Non-Malay	.518	.056	.330	.046	.387	.019
Schooling:						
1-3 years	.213	.100	.086	.088	.140	.062
4-5 years	.360	.097	.321	.086	.307	.061
6 years	.448	.099	.316	.085	.336	.054
7 – 9 years	.753	.117	.759	.097	.533	.055
10 –12 years	1.08	.122	1.20	.102	.842	.055
>=13 years	1.86	.174	1.85	.135	1.39	.060
Age	.149	.026	.093	.023	.163	.008
Age Squared	-.0020	.0004	-.0011	.0003	-.0019	.0001
1968	-.040	.070	-.049	.051		
1969	.093	.067				
number of jobs	.058	.078				
Constant	2.35	.445	3.42	.426	2.19	.152
N	827		892		4018	
R-squared	.300		.374		.344	
Variance (Log Y)	.839		.661		.567	
Explained Variance	.252		.247		.195	
Residual Variance	.587		.414		.372	

Table 8. Simulated Variance of Log Earnings for Males 20-54 in 1967-69, 1976 and 1988

Based on Coefficients for Variables	Simulated Variance of Log Earnings					
	1967-69		1976		1988	
	Var	%	Var	%	Var	%
1. Age	.030	3.58	.016	2.4	.077	13.6
2. Age + race	.095	11.3	.045	6.8	.111	19.6
3. Age + race + residual	.682	81.3	.459	69.4	.483	85.2
4. Age + schooling	.149	17.8	.190	28.7	.163	28.7
5. Age + schooling + residual	.736	87.7	.604	91.4	.535	94.3
6. Age + race + schooling	.248	29.6	.244	36.9	.195	34.4
7. All * + residual	.839	100	.661	100	.567	100

Notes: Simulations are based on distribution of age, race, and schooling and coefficients from Regressions in Table 7.

Simulations for each group use coefficients for variables shown, with all other coefficients set to zero.

* All includes coefficients for year dummies and number of jobs for 1967-69 and coefficients for number of jobs for 1976.

Table 9. Log Monthly Earnings Regressions for Malay Males Age 20-54 in 1967-69, 1976 and 1988

Variable	1967-69		1976		1988	
	Coef.	SE	Coef.	SE	Coef.	SE
Schooling:						
1-3 years	.275	.151	.070	.122	.099	.082
4-5 years	.468	.140	.405	.112	.246	.081
6 years	.468	.146	.320	.115	.320	.070
7 – 9 years	1.06	.225	.934	.157	.600	.074
10 –12 years	1.44	.211	1.40	.155	.956	.073
>=13 years	1.78	.347	2.10	.241	1.50	.081
Age	.187	.044	.147	.033	.170	.012
Age Squared	-.0027	.0006	-.0018	.0004	-.0020	.0002
1968	-.142	.111				
1969	.129	.108				
number of jobs	-.062	.106	-.089	.064		
Constant	1.92	.757	2.45	.615	1.99	.218
N	379		409		2031	
R-squared	.217		.333		.326	
Variance (Log Y)	.889		.625		.553	
Explained Variance	.193		.208		.180	
Residual Variance	.696		.417		.372	

Table 10. Log Monthly Earnings Regressions for non-Malay Males Age 20-54 in 1967-69, 1976 and 1988

Variable	1967-69		1976		1988	
	Coef.	SE	Coef.	SE	Coef.	SE
Schooling:						
1-3 years	.102	.131	.058	.128	.163	.095
4-5 years	.197	.133	.205	.130	.359	.095
6 years	.356	.132	.261	.127	.354	.085
7 – 9 years	.538	.139	.623	.131	.482	.085
10 –12 years	.843	.148	1.04	.139	.723	.086
>=13 years	1.75	.194	1.69	.169	1.30	.093
Age	.124	.030	.038	.033	.156	.012
Age Squared	-.0015	.0004	-.0003	.0004	-.0018	.0002
1968	.093	.087				
1969	.080	.082				
number of jobs	.356	.123	.036	.084		
Constant	2.95	.525	4.71	.640	2.73	.213
N	448		483		1987	
R-squared	.249		.311		.294	
Variance (Log Y)	.606		.579		.517	
Explained Variance	.151		.180		.152	
Residual Variance	.455		.399		.365	

Table 11. Simulated Variance of Log Earnings for Males Age 20-54 in 1967-69, 1976 and 1988 by Malays and non-Malays

Based on Coefficients for Variables	Simulated Variance of Log Earnings							
	Malay with Malay coefficients		Malay with non-Malay coefficients		Non-Malay with non-Malay coefficients		Non-Malay with Malay coefficients	
	Var	% [a]	Var	% [a]	Var	% [b]	Var	% [b]
A. 1967-69								
1. Age	.036	4.0	.032	3.6	.037	6.1	.043	7.1
2. Age + residual	.732	82.3	.728	81.9	.492	81.2	.498	82.2
3. Age + schooling	.170	19.1	.085	9.56	.143	23.6	.249	41.1
4. Age + schooling + residual	.866	97.4	.781	87.8	.598	98.7	.704	116
5. All [c] + residual	.889	100	.796	89.5	.606	100	.716	118
B. 1976								
1. Age	.029	4.6	.013	2.1	.012	2.1	.023	4.0
2. Age + residual	.446	71.4	.430	68.8	.411	70.1	.422	72.9
3. Age + schooling	.202	32.3	.106	17.0	.180	31.1	.315	54.4
4. Age + schooling + residual	.619	99.0	.523	83.7	.579	100	.714	123
5. All [d] + residual	.625	100	.523	83.7	.579	100	.716	124
C. 1988								
1. Age	.084	15.2	.070	12.7	.079	15.3	.094	18.2
2. Age + residual	.456	82.6	.442	80.1	.444	85.9	.459	88.8
3. Age + schooling	.180	32.6	.125	22.6	.152	29.4	.279	54.0
4. Age + schooling + residual	.552	100	.497	90.0	.517	100	.644	125

Notes: Simulations are based on distribution of age, race, and schooling and coefficients from Regressions for 1967-69, 1976 and 1988 in Tables 9 and 10.
Simulations for each group use coefficients for variables shown, with all other coefficients set to zero. Residual variance is from same ethnic group as coefficients.

a. % calculated based on total variance of log earnings of Malays.
b. % calculated based on total variance of log earnings of non-Malays.
c. All includes coefficients for year dummies and number of jobs.
d. All includes number of jobs for 1976.

Table 12. Log Monthly Earnings Regressions for Malay Males Age 20-54 in 1967-69, 1976 and 1988 (include occupation variables)

Variable	1967-69		1976		1988	
	Coef.	SE	Coef.	SE	Coef.	SE
Schooling:						
1-3 years	.146	.141	-.073	.113	.099	.076
4-5 years	.334	.132	.282	.104	.191	.075
6 years	.231	.141	.117	.109	.225	.065
7 – 9 years	.575	.224	.522	.158	.361	.070
10 –12 years	.559	.251	.642	.183	.552	.072
>=13 years	.698	.383	1.06	.283	.924	.083
Age	.130	.042	.112	.030	.152	.011
Age Squared	-.0019	.0006	-.0014	.0004	-.0018	.0002
1968	-.129	.104				
1969	.122	.101				
number of jobs	.058	.103	.001	.060		
Managers	1.17	.220	1.06	.174	.862	.058
Clerical	.834	.258	.703	.187	.628	.055
Sales	.850	.189	.611	.130	.331	.053
Service	.738	.181	.647	.156	.603	.040
Production	.574	.201	.483	.135	.386	.051
Transport	.575	.124	.504	.094	.429	.043
Laborer	-.166	.166	-.142	.205	.228	.059
Constant	2.74	.719	3.03	.569	2.24	.206
N	379		409		2031	
R-squared	.340		.450		.425	
Variance (Log Y)	.889		.625		.553	
Explained Variance	.302		.281		.235	
Residual Variance	.587		.344		.318	

Table 13. Log Monthly Earnings Regressions for non-Malay Males Age 20-54 in 1967-69, 1976 and 1988 (include occupation variables)

Variable	1967-69		1976		1988	
	Coef.	SE	Coef.	SE	Coef.	SE
Schooling:						
1-3 years	.069	.120	.028	.118	.133	.090
4-5 years	.155	.122	.213	.120	.342	.090
6 years	.236	.122	.200	.117	.291	.081
7 – 9 years	.213	.133	.405	.123	.354	.080
10 –12 years	.275	.160	.543	.146	.493	.084
>=13 years	1.02	.213	1.01	.182	.867	.094
Age	.099	.028	.020	.031	.146	.011
Age Squared	-.0013	.0004	-.0014	.0004	-.0017	.0002
1968	.112	.081				
1969	.101	.076				
number of jobs	.414	.114	.088	.079		
Managers	1.17	.146	1.11	.131	.797	.058
Clerical	.707	.144	.727	.129	.328	.063
Sales	.459	.091	.436	.082	.501	.046
Service	.588	.173	.477	.172	.296	.062
Production	.566	.097	.470	.088	.369	.046
Transport	.509	.104	.437	.089	.309	.043
Laborer	.216	.155	.095	.133	-.062	.066
Constant	3.13	.492	4.85	.592	2.75	.204
N	447		483		1987	
R-squared	.380		.426		.377	
Variance (Log Y)	.608		.579		.517	
Explained Variance	.231		.247		.195	
Residual Variance	.377		.332		.322	

Table 14. Simulated Variance of Log Earnings for Males Age 20-54 in 1967-69, 1976 and 1988 by Malays and non-Malays (include occupation variables)

Based on Coefficients for Variables	Simulated Variance of Log Earnings							
	Malay with Malay coefficients		Malay with non-Malay coefficients		Non-Malay with non-Malay coefficients		Non-Malay with Malay coefficients	
	Var	% [a]	Var	% [a]	Var	% [b]	Var	% [b]
A. 1967-69								
1. Age	.019	2.14	.011	2.02	.021	3.45	.021	3.45
2. Age + residual	.606	68.2	.345	68.1	.398	65.5	.398	65.5
3. Age + schooling	.048	5.40	.029	3.26	.047	7.73	.059	9.70
4. Age + schooling + residual	.635	71.4	.616	69.3	.424	69.7	.436	71.7
5. Age + school + occupation	.286	32.2	.213	24.0	.223	36.7	.310	51.0
6. Age + school + occupation + residual	.873	98.2	.800	89.9	.600	98.7	.687	113
7. All [c] + residual	.889	100	.801	90.1	.608	100	.696	114
B. 1976								
1. Age	.014	2.24	.005	0.80	.005	0.86	.011	1.89
2. Age + residual	.358	57.3	.349	55.8	.337	58.2	.343	59.2
3. Age + schooling	.066	10.6	.034	5.44	.057	9.84	.097	16.8
4. Age + schooling + residual	.410	65.6	.378	60.5	.389	67.2	.429	74.1
5. Age + school + occupation	.281	44.9	.222	35.5	.247	42.7	.313	54.1
6. Age + school + occupation + residual	.625	100	.566	90.6	.579	100	.645	111
7. All [d] + residual	.625	100	.561	89.8	.579	100	.645	111
C. 1988								
1. Age	.063	11.4	.059	10.7	.066	12.8	.071	13.7
2. Age + residual	.381	68.9	.377	68.2	.388	75.0	.393	76.0
3. Age + schooling	.086	15.6	.076	13.7	.094	18.2	.109	21.1
4. Age + schooling + residual	.404	73.1	.394	71.2	.416	80.5	.431	83.4
5. Age + school + occupation	.235	42.5	.181	32.7	.195	37.7	.225	43.5
6. Age + school + occupation + residual	.553	100	.499	90.2	.517	100	.547	106

Note: Simulations are based on distribution of age, race, and schooling and coefficients from Regressions for 1967-69, 1976 and 1988 in Tables 12 and 13. Simulations for each group use coefficients for variables shown, with all other coefficients set to zero. Residual variance is from same ethnic group as coefficients.

a. Calculated based on total variance of log earnings of Malays.
b. % calculated based on total variance of log earnings of non-Malays.
c. All includes coefficients for year dummies and number of jobs.
d. All includes number of jobs for 1976.

Table 15. Means and Standard Deviations of Selected Variables

Variables	Children sample at age 17		Children sample at age 20	
	Son	Daughter	Son	Daughter
Child's schooling:				
Malays	8.83	8.40	8.72	8.17
	(2.52)	(3.12)	(2.97)	(3.60)
Non-Malay	8.27	7.96	8.37	7.97
	(2.61)	(2.88)	(3.04)	(3.34)
Mother's schooling:				
Malays	3.08	3.22	2.54	2.73
	(2.95)	(3.19)	(2.72)	(2.88)
Non-Malays	3.34	3.33	3.08	2.85
	(3.46)	(3.38)	(3.33)	(3.32)
Father's schooling:				
Malays	3.21	3.35	3.01	3.11
	(2.93)	(3.17)	(2.72)	(2.95)
Non-Malays	3.35	3.78	3.38	3.77
	(3.33)	(3.43)	(3.33)	(3.49)
Child's birth cohort:				
Below 1957	.237	.239	.305	.314
1957-1959	.186	.226	.239	.298
1960-1962	.081	.076	.105	.101
1963-1965	.120	.095	.154	.124
1966-1968	.164	.128	.197	.163
1969-1971	.212	.236	-	-
SMK	.166	.164	.126	.122
	(.248)	(.257)	(.225)	(.236)
Malay SRK	.398	.410	.378	.406
	(.340)	(.340)	(.353)	(.362)
Chinese SRK	.106	.104	.098	.084
	(.218)	(.209)	(.212)	(.191)
Tamil SRK	.061	.069	.060	.065
	(.147)	(.161)	(.157)	(.173)
Urban	.148	.143	.118	.105

Table 15 (cont'd.)

Piped Water	.487	.501	.450	.469
No. of observations:				
Malays	549	333	397	248
Non-Malays	668	493	550	379
Total	1217	826	947	627

Notes: Means are reported with standard deviations in parentheses. SRK represents national primary schools, SMK represents national secondary schools. The means are computed for non-missing values, therefore the number of observations decreases slightly for those variables.

Table 16. Regressions on Years of Schooling of Male Children Age 17 and above

Variable	(1)		(2)		(3)	
	Coef.	SE	Coef.	SE	Coef.	SE
Child's birth cohort:						
1957-1959	.184	.230	.121	.224	.154	.227
1960-1962	1.18	.364	1.08	.357	1.17	.472
1963-1965	1.69	.318	1.54	.314	1.58	.441
1966-1968	1.94	.300	1.67	.297	1.64	.440
1969-1971	1.94	.283	1.64	.283	1.56	.432
Non-Malay	.133	.236	.055	.230	-.245	.242
Non-Malay*cohort(≥1960)	-.799	.308	-.739	.298	-.457	.336
Mother's schooling:						
Primary			.668	.178	.957	.250
Secondary			1.58	.332	2.43	.671
Father's schooling:						
Primary			.375	.163	.079	.264
Lower Secondary			1.11	.356	1.19	.640
Upper Secondary			2.43	.448	2.65	.707
Mother's schooling*birth cohort≥1960:						
Primary*cohort≥1960						
Secondary* cohort≥1960					-.708	.363
					-1.35	.786
Father's schooling*birth cohort≥1960:						
Primary*cohort≥1960						
Lower Secondary* cohort≥1960					.482	.338
Upper Secondary* cohort≥1960					-.152	.774
					-1.03	.916
F-test for parent's Schooling* cohort≥1960						
F-statistic					2.45	
p-value					(.032)	

Table 16 (cont'd.)

Malay SRK*Malay			.170	.499
Malay SRK*Non-Malay			-.396	.537
Chinese/Tamil SRK*Non-Malay			.290	.575
SMK			.546	.438
Urban			.261	.241
Piped Water			.411	.167
R-squared	.073	.148	.173	
No. of observations	1217	1217	1217	

Notes: Missing values for parent's schooling and community variables on are changed to zero, and a dummy variable was included for these variables to account for the missing values.

Table 17. Regressions on Years of Schooling of Female Children Age 17 and above

Variable	(1)		(2)		(3)	
	Coef.	SE	Coef.	SE	Coef.	SE
Child's birth cohort:						
1957-1959	.429	.291	.387	.282	.382	.282
1960-1962	2.92	.479	2.72	.466	3.21	.629
1963-1965	3.01	.454	2.86	.443	3.26	.610
1966-1968	3.66	.418	3.33	.413	3.64	.603
1969-1971	3.09	.376	2.72	.373	3.04	.580
Non-Malay	.236	.299	.054	.294	.146	.331
Non-Malay*cohort(≥1960)	-1.04	.406	-.889	.394	-.645	.434
Mother's schooling:						
Primary			.446	.238	.485	.312
Secondary			1.40	.531	2.20	.864
Father's schooling:						
Primary			.797	.228	1.31	.355
Lower Secondary			1.97	.438	2.68	.645
Upper Secondary			2.42	.518	3.25	.830
Mother's schooling*birth cohort≥1960:						
Primary*cohort≥1960					-.100	.489
Secondary*cohort≥1960					-.981	1.02
Father's schooling*birth cohort≥1960:						
Primary*cohort≥1960					-.951	.463
Lower Secondary* cohort≥1960					-1.67	.886
Upper Secondary* cohort≥1960					-2.23	1.07
F-test for parent's Schooling* cohort≥1960						
F-statistic					2.24	
p-value					(.048)	

Table 17 (cont'd.)

Malay SRK*Malay			.600	.568
Malay SRK*Non-Malay			-.698	.590
Chinese/Tamil SRK*Non-Malay			.849	.705
SMK			.137	.630
Urban			.380	.340
Piped Water			.242	.221
R-squared	.162	.229	.260	
No. of observations	826	826	826	

Notes: Missing values for parent's schooling and community variables on are changed to zero, and a dummy variable was included for these variables to account for the missing values.

Table 18. Regressions on Years of Schooling of Male Children Age 20 and above

Variable	(1)		(2)		(3)	
	Coef.	SE	Coef.	SE	Coef.	SE
Child's birth cohort:						
1957-1959	.072	.262	.028	.252	.064	.252
1960-1962	1.16	.431	1.11	.417	.539	.565
1963-1965	1.70	.372	1.57	.362	.988	.533
1966-1968	1.94	.357	1.64	.349	.940	.540
Non-Malay	.188	.268	-.098	.260	-.168	.273
Non-Malay*cohort(≥1960)	-.801	.394	-.799	.375	-.241	.416
Mother's schooling:						
Primary			.790	.221	1.05	.279
Secondary			2.07	.446	2.77	.747
Father's schooling:						
Primary			.645	.209	.074	.294
Lower Secondary			1.35	.470	1.16	.712
Upper Secondary			3.73	.585	3.08	.789
Mother's schooling*birth cohort≥1960:						
Primary*cohort≥1960					-.726	.463
Secondary*cohort≥1960					-1.29	.954
Father's schooling*birth cohort≥1960:						
Primary*cohort≥1960						
Lower Secondary* cohort≥1960					1.03	.418
Upper Secondary* cohort≥1960					.357	.948
					-.256	1.18
F-test for parent's Schooling* cohort≥1960						
F-statistic					2.09	
p-value					(.064)	

Table 18 (cont'd.)

Malay SRK*Malay			.362	.706
Malay SRK*Non-Malay			-1.30	.715
Chinese/Tamil SRK*Non-Malay			.132	.760
SMK			1.85	.603
Urban			.335	.331
Piped Water			.383	.211
R-squared	.051	.156	.197	
No. of observations	947	947	947	

Notes: Missing values for parent's schooling and community variables on are changed to zero, and a dummy variable was included for these variables to account for the missing values.

Table 19. Regressions on Years of Schooling of Female Children Age 20 and above

Variable	(1)		(2)		(3)	
	Coef.	SE	Coef.	SE	Coef.	SE
Child's birth cohort:						
1957-1959	.363	.327	.314	.313	.360	.313
1960-1962	3.06	.563	2.86	.542	3.17	.774
1963-1965	3.16	.537	3.02	.520	3.27	.754
1966-1968	3.88	.499	3.51	.492	3.55	.765
Non-Malay	.333	.336	-.021	.328	.208	.377
Non-Malay*cohort(≥1960)	-1.08	.535	-.953	.515	-.540	.565
Mother's schooling:						
Primary			.382	.293	.456	.347
Secondary			1.81	.590	2.24	.961
Father's schooling:						
Primary			1.07	.290	1.27	.395
Lower Secondary			2.37	.557	2.77	.718
Upper Secondary			3.57	.676	3.57	.923
Mother's schooling*birth cohort≥1960:						
Primary*cohort≥1960					-.325	.663
Secondary*cohort≥1960					-.901	1.26
Father's schooling*birth cohort≥1960:						
Primary*cohort≥1960					-.629	.594
Lower Secondary* cohort≥1960					-1.35	1.16
Upper Secondary* cohort≥1960					-1.38	1.37
F-test for parent's Schooling* cohort≥1960						
F-statistic					0.77	
p-value					(.574)	

Table 19 (cont'd.)

Malay SRK*Malay			.482	.732
Malay SRK*Non-Malay			-1.05	.773
Chinese/Tamil SRK*Non-Malay			.620	1.02
SMK			1.07	.909
Urban			.378	.491
Piped Water			.562	.278
R-squared	.149	.238	.273	
No. of observations	627	627	627	

Notes: Missing values for parent's schooling and community variables on are changed to zero, and a dummy variable was included for these variables to account for the missing values.

Figure 1. Mean Years of Schooling of Males
(3-year moving averages)

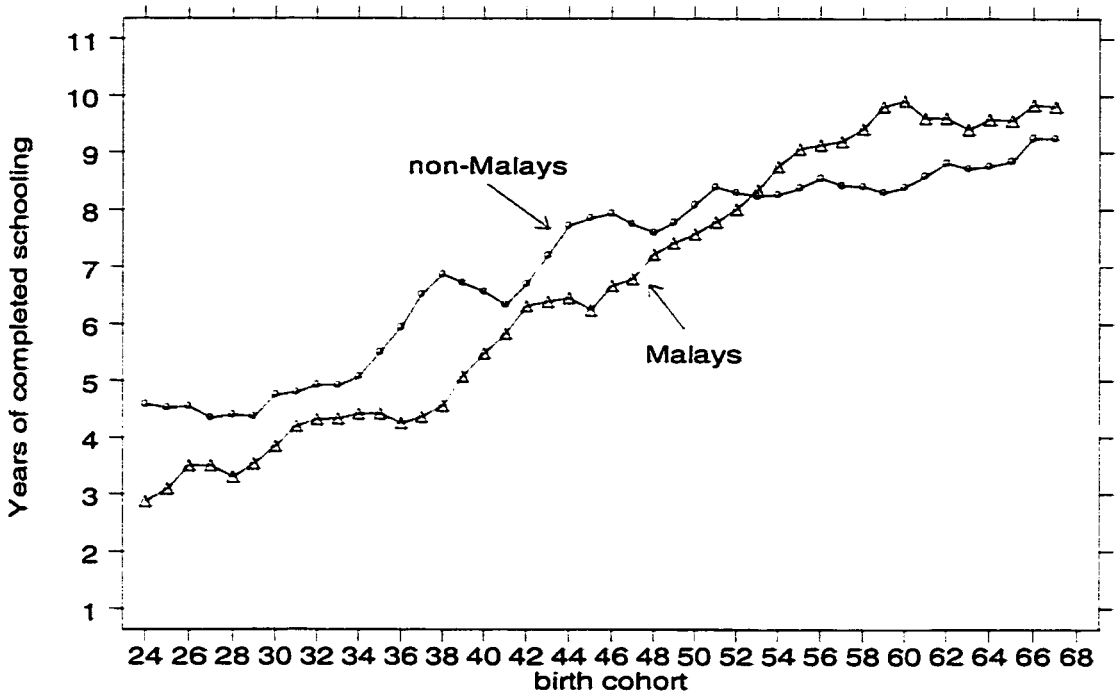


Figure 2. Mean Years of Schooling of Females
(3-year moving averages)

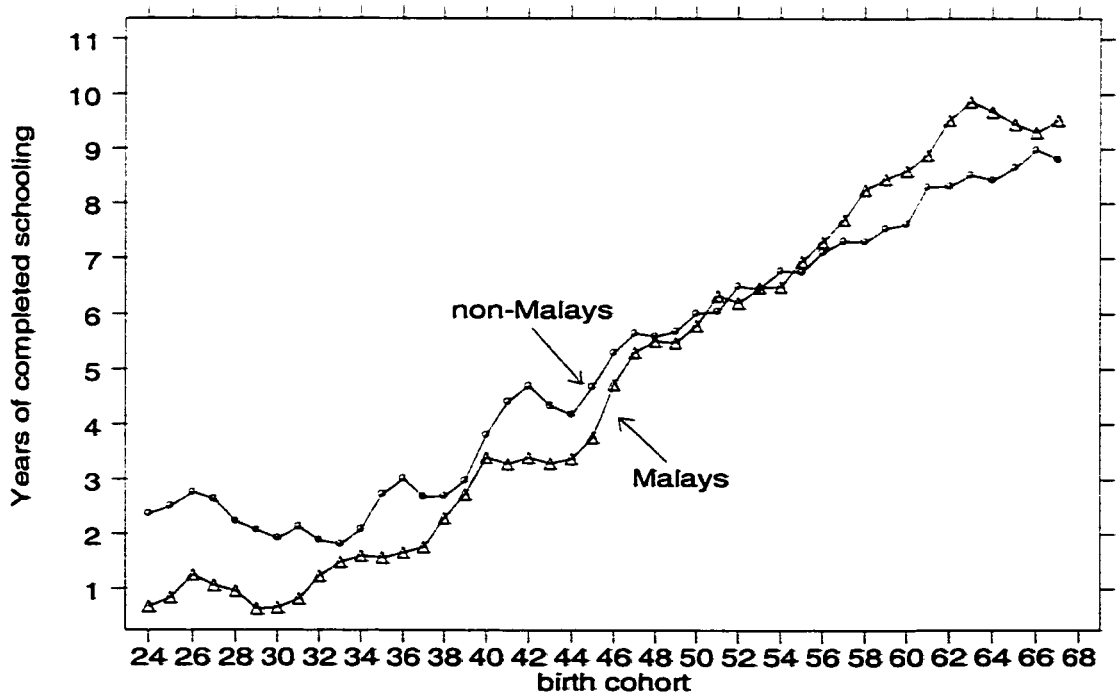


Figure 3. Standard Deviation in Years of Schooling of Males (3-year moving averages)

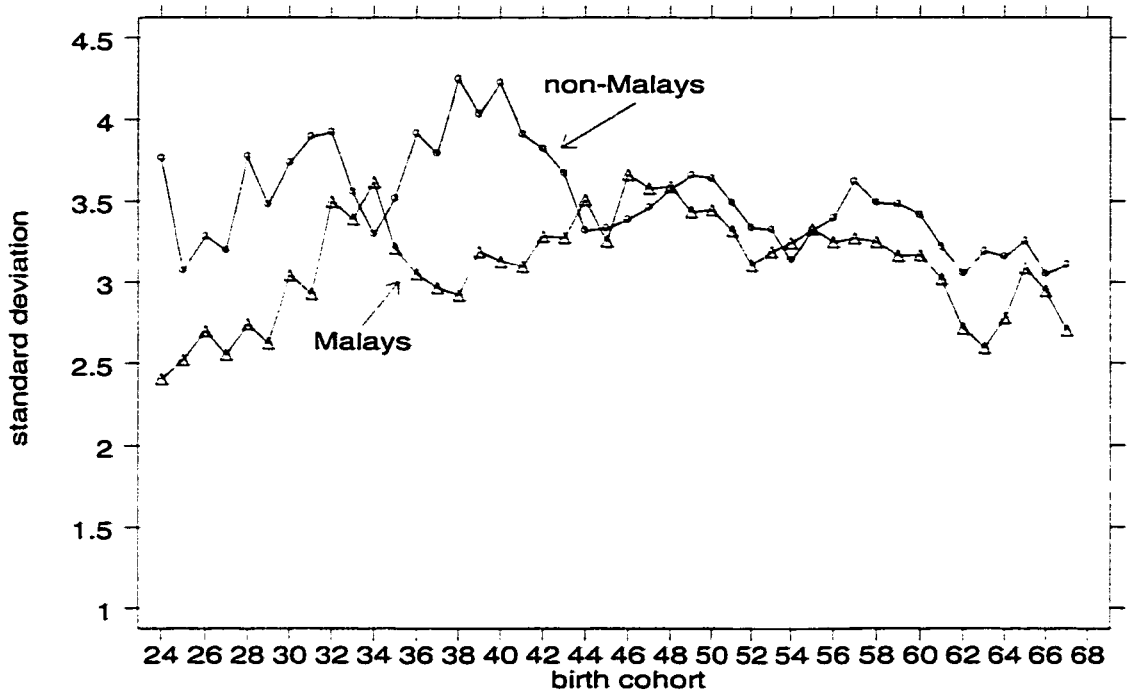


Figure 4. Standard Deviation in Years of Schooling of Females (3-year moving averages)

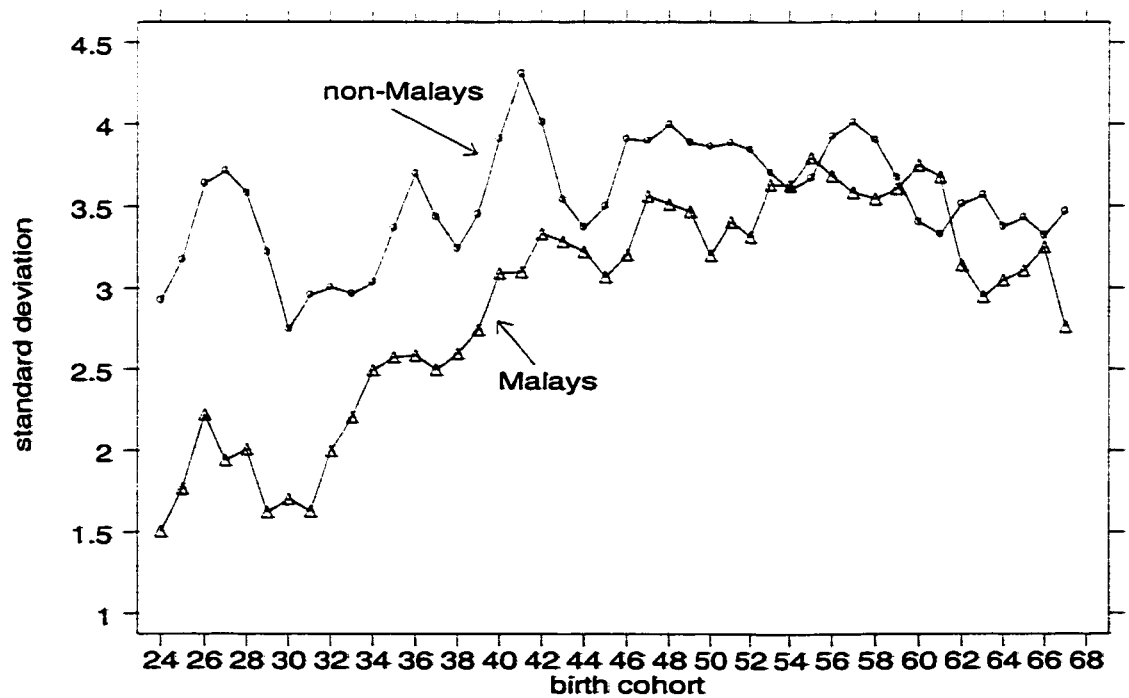


Figure 5. Coefficient of Variation in Years of Schooling of Males (3-year moving averages)

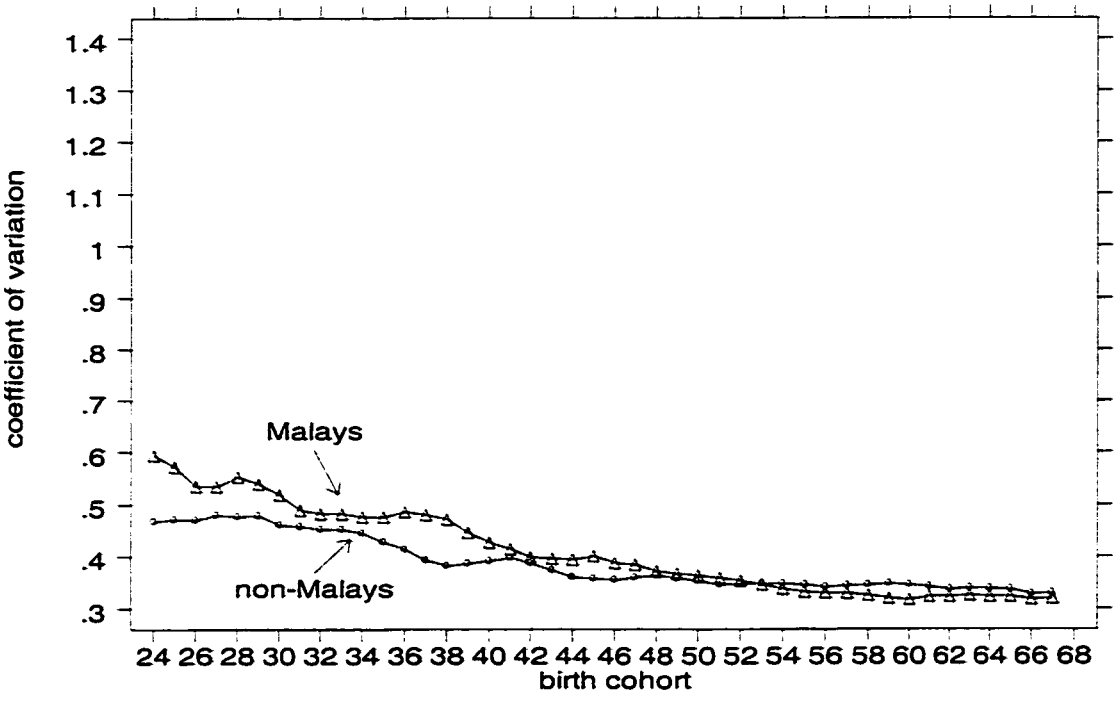


Figure 6. Coefficient of Variation in Years of Schooling of Females (3-year moving averages)

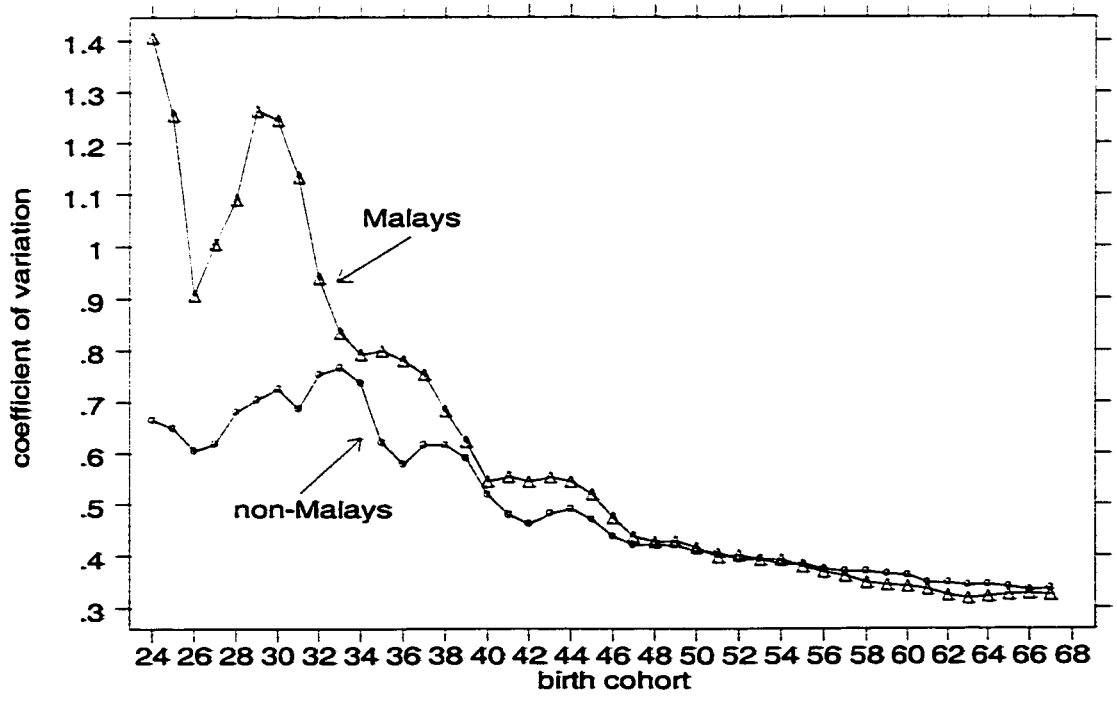


Figure 7. Lorenz Curves for Schooling by Age Group

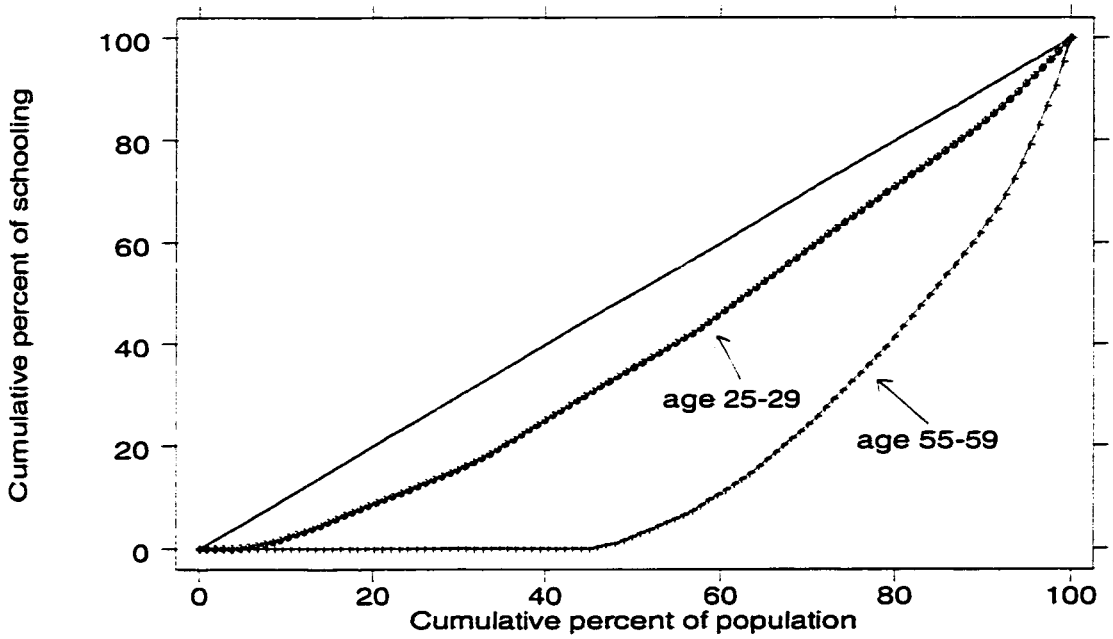


Figure 8. Lorenz Curves for Schooling by Age and Ethnic Group

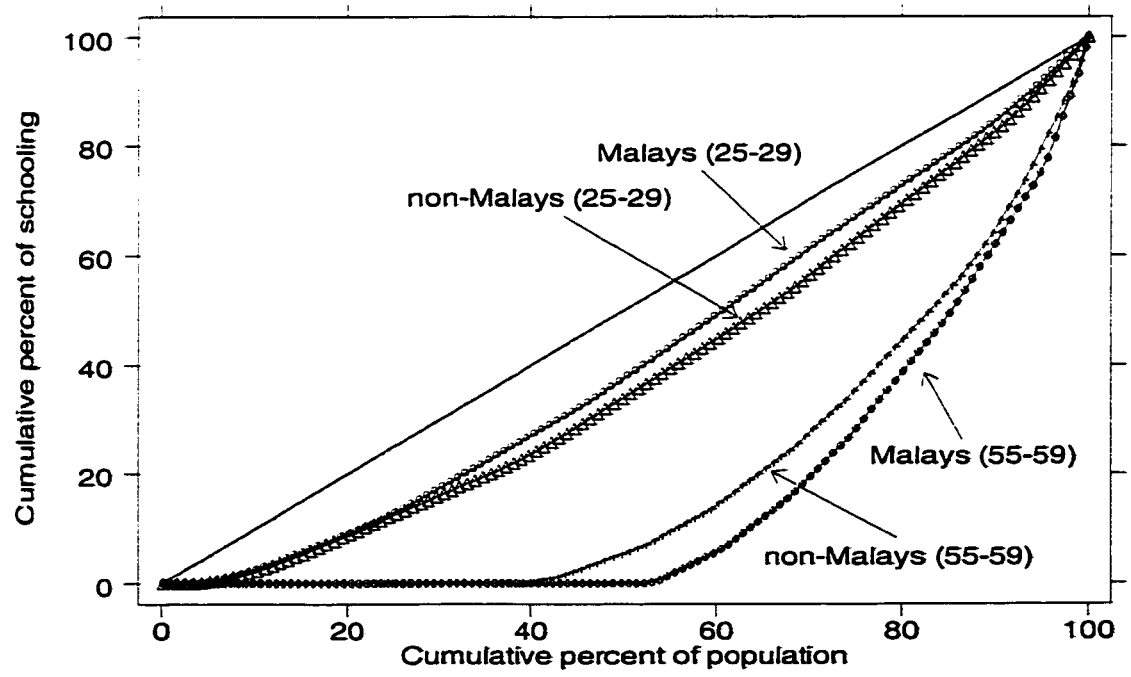


Figure 9. Generalized Lorenz Curves for Schooling by Age and Ethnic Group

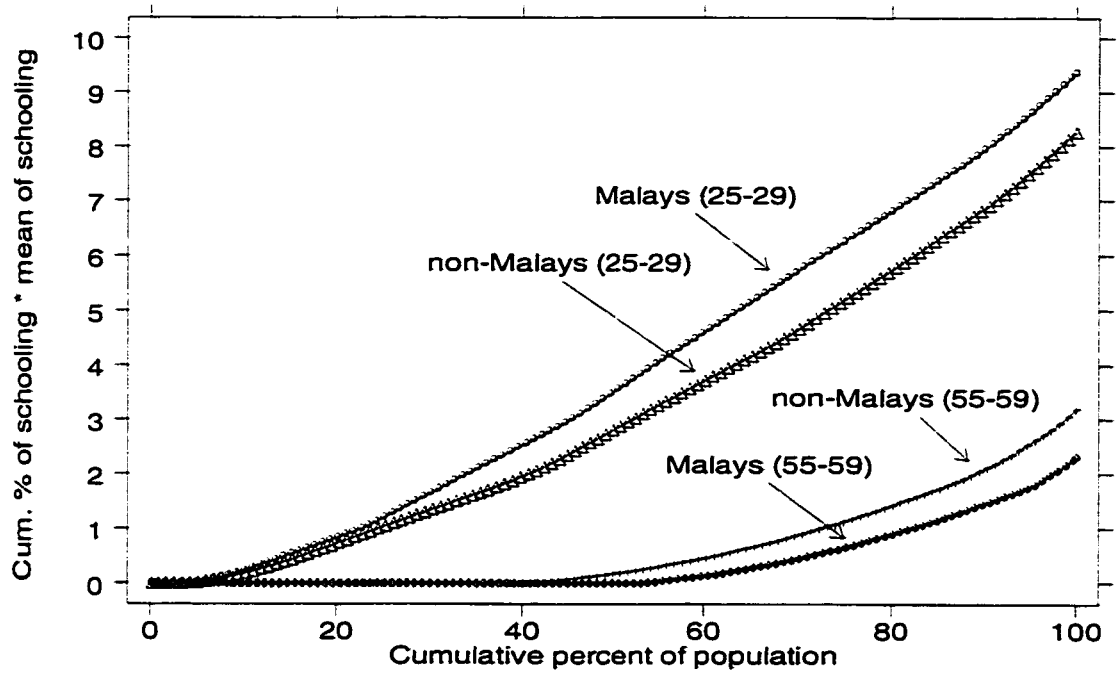
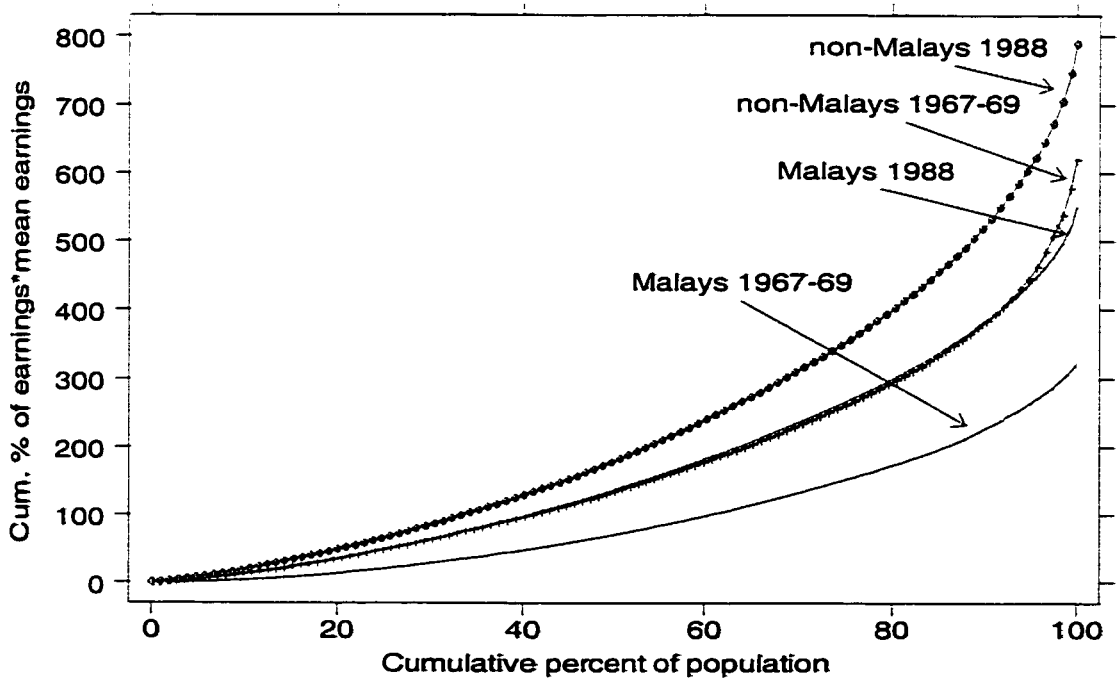


Figure 10. Generalized Lorenz Curves for Real Monthly Earnings by Ethnic Group in 1967-69 and 1988



APPENDIX A

Measurement Error in Earnings

It is observed that the residual variance of log earnings regression of Malays were substantially higher than non-Malays for the period 1967-69. One possible reason is that there is a positive association between the length of recall period and measurement error which is greater for Malays than non-Malays. This could be due to the fact that Malays were less educated than non-Malays during that period and therefore have a relatively higher rate of forgetting. In order to examine this relationship, a model to test whether measurement error is associated with the length of recall period is written down below.

$$\ln Y_{it}(\tau) - \ln Y_{it}^{*} = m_{it}(\tau) = \alpha_0 + \alpha_1(\tau - t) + (\beta_0 + \beta_1(\tau - t))\varepsilon_{it,\tau} \qquad (1)$$

where suscripts i, t, τ indicate individual i, time t and report period in year τ (1976), Y is the observed earnings, Y^{*} is the true earnings, m is the measurement error, α_1 measures the systematic over-reporting or under-reporting of retrospective earnings, β_0 and β_1 estimates a linear trend effect of recall on measurement error in earnings that is random, t is the number retrospective years of earnings being recalled, and ε is the error term.

$$\ln Y_{it}(\tau + k) - \ln Y_{it}^{*} = m_{it}(\tau + k) = \alpha_0 + \alpha_1(\tau + k - t) + (\beta_0 + \beta_1(\tau + k - t))\varepsilon_{it,\tau+k} \qquad (2)$$

where k = 12, since MFLS2 was surveyed in 1988.

Equation (2) – (1),

$$\begin{aligned} \ln Y_{it}(\tau + k) - \ln Y_{it}(\tau) = m_{it}(\tau + k) - m_{it}(\tau) = \alpha_1 k + (\beta_0 + \beta_1(\tau + k)) \cdot \varepsilon_{it,\tau+k} \\ -(\beta_0 + \beta_1(\tau)) \cdot \varepsilon_{it,\tau} + (-\beta_1)\varepsilon_{it,\tau+k} \cdot t - (-\beta_1)\varepsilon_{it,\tau} \cdot t \end{aligned} \qquad (3)$$

Assume that $\varepsilon_{it,\tau} \sim (0, \sigma_\varepsilon^2)$ for all τ, $\varepsilon_{it,\tau+k} \sim (0, \sigma_\varepsilon^2)$ for all $\tau+k$, and $E(\varepsilon_{it,\tau} \cdot \varepsilon_{it,\tau+k}) = 0$,

Therefore, $E[m_{it}(\tau+k) - m_{it}(\tau)] = \alpha_1 k$, (4)

where α_1 may or may not depend on independent variables, X_i such as race and education.

Let,

$$\theta_0 = \beta_0 + \beta_1(\tau+k), \qquad \theta_0' = \beta_0 + \beta_1(\tau), \qquad \text{and} \; \theta_1 = -\beta_1.$$

Then equation (3) can be rewritten as,

$$\begin{aligned} &\ln Y_{it}(\tau+k) - \ln Y_{it}(\tau) = m_{it}(\tau+k) - m_{it}(\tau) = \alpha_1 k + \theta_0 \cdot \varepsilon_{it,\tau+k} \\ &- \theta_0' \cdot \varepsilon_{it,\tau} + \theta_1 \varepsilon_{it,\tau+k} \cdot t - \theta_1 \varepsilon_{it,\tau} \cdot t \end{aligned} \tag{5}$$

Assuming $\alpha_1 = 0$, then

$$\begin{aligned} &E[(m_{it}(\tau+k) - m_{it}(\tau))^2] = \theta_0^2\sigma_\varepsilon^2 + \theta_0'^2\sigma_\varepsilon^2 + 2\theta_0\theta_1\sigma_\varepsilon^2 \cdot t + 2\theta_0'\theta_1\sigma_\varepsilon^2 \cdot t \\ &+ \theta_1^2\sigma_\varepsilon^2 \cdot t^2 + \theta_1^2\sigma_\varepsilon^2 \cdot t^2 = (\theta_0^2 + \theta_0'^2)\sigma_\varepsilon^2 + 2\theta_1(\theta_0 + \theta_0')\sigma_\varepsilon^2 \cdot t + 2\theta_1^2\sigma_\varepsilon^2 \cdot t^2 \end{aligned} \tag{6}$$

Normalizing $\sigma_\varepsilon^2 = 1$, Equation (6) can be rewritten as,

$$E[(m_{it}(\tau+k) - m_{it}(\tau))^2] = (\theta_0^2 + \theta_0'^2) + 2\theta_1(\theta_0 + \theta_0') \cdot t + 2\theta_1^2 \cdot t^2 \tag{7}$$

Empirical Results

A measure of measurement error on earnings is obtained by matching the retrospective earnings data from the same individual, occupation and year from the panel sample of MFLS 1 and 2. Due to the different nature of earnings data collected in the two waves, only those having one job are included in the sample. The sample that can be matched are 389 observations which is about 15% of total possible matches.[1]

[1] There is a concern that the sample used may not be representative. This is because the matching procedure restricts the sample to those who report consistent information for both waves of the survey in terms of occupation, one job only and time of recall period. Imposing such restrictions may generate a sample of respondents that is more reliable than the general population.

Descriptive Statistics

It is useful to provide some descriptive statistics on the dependent and explanatory variables used in the regression analyses of measurement error. The definitions of the relevant variables are as follows:

Simple difference in reported log earnings = $\ln Y_{it}^{88} - \ln Y_{it}^{76}$

Difference in reported log earnings square = $\left(\ln Y_{it}^{88} - \ln Y_{it}^{76}\right)^2$

where $\ln Y$ is monthly earnings in natural log, superscript 76 and 88 indicates the survey year and subscript i and t represents individual i and time t which is the year that the earnings data are being recalled. The descriptive statistics of the relevant variables are shown in Table A1.

The simple difference in reported log earnings is a measure of under-reporting or over-reporting of earnings in 1988 assuming that the data in 1976 is more accurate because it has a shorter recall period of 12 years. It is noted that on average there is over-reporting of earnings for both Malays and non-Malays, but it is slightly higher for Malays. When computing the mean of the simple difference in reported earnings, the under-reporting and over-reporting cancels out when averaged over all respondents within each group. An indicator of measurement error is the difference in reported log earnings square. It is observed that the mean difference in reported log earnings square is higher for Malays than non-Malays. It is also observed that Malays have relatively lower mean years of education than non-Malays. The mean number of retrospective years of recall from 1976 is 17.25 years for Malays and 15.25 years for non-Malays. The earliest year of recall for earnings is 1925.

Zero mean in measurement error

The specification in Equation (4) is applied to examine whether measurement error in earnings have a zero mean using simple difference in reported earnings as the dependent variable. The dependent variable of simple difference in reported earnings indicates over-reporting and under-reporting of earnings. The estimates for the constant term are of interest. The results for the whole sample in Table A2 indicate that the constant term is not significant in Model 1 when the number of retrospective years^2 is the only regressor. The constant term is also not significant in Model 2 when ethnicity is added. In Model 3 years of education is included as an additional control, the constant term remains insignificant. For further analysis, the separate regression results of Malays and non-Malays are presented in Tables A3 and A4 respectively. It is interesting to note that the constant term for Malays are significant at the 1% level but insignificant for non-Malays in both Models 1 and 2. This suggests that the mean measurement error of Malays is non-zero while it is zero for non-Malays.

Another question of interest is whether the under-reporting or over-reporting of earnings is associated with ethnicity, length of recall period and education. The estimates based on the whole sample shown indicates that ethnic dummy, years of education, number of recall years are not significant in explaining over-reporting or under-reporting of earnings. However, number of retrospective years is negative and significant at the 5% level for Malays, but highly insignificant for non-Malays. The negative coefficient for the number of retrospective years implies that the longer the period of recall the larger is the under-reporting of earnings for Malays. The estimated coefficient for years of education

is negative and insignificant for both Malays and non-Malays. However, the negative coefficient means that the higher the level of education the lower is the under-reporting of earnings.

Variance in measurement error

The examination of the variance in measurement error in earnings is of particular relevance to this study. This is because it enables us to shed some light on whether the high residual variance in log earnings for Malays during the 1967-69 period is due to differences in measurement error between Malays and non-Malays. Therefore, it is of interest to find out whether the variance in measurement error in the recall of reported earnings increases faster for Malays than non-Malays. In order to do so, the regression based on the specification in Equation (7) is carried out[3]. Regression results with the difference in reported log earnings square as the dependent variable are shown in Table A5. Model 1 presents the linear specification for number of retrospective years and Model 2 presents the quadratic specification for the number of retrospective years.

The difference in reported log earnings square is a measure of the variance of measurement error in earnings. Based on Model 1, it is interesting to note that the estimated coefficient for the number of retrospective years is positive and significant. This implies that the variance of measurement error is increasing and significant for both Malays and non-Malays. This finding is consistent with the hypothesis that the variance of measurement error is positively associated with the number of years of recall. It is also interesting to note that the number of retrospective years interacted with non-Malay

[2] For ease of illustration, number of retrospective years is referred as number of retrospective years from 1976.

dummy variable is negative but insignificant. Based on the usual standard of inference, it is observed that there is no significant difference in the rate of forgetting between Malays and non-Malays. However, from the point of view of point estimates, the rate of forgetting of Malays is faster than non-Malays. The magnitude of the estimated coefficient of the non-Malay interaction with the number of retrospective years (-.037) is considered large compared to the estimated coefficient of number of retrospective years (.042). Based on the mean retrospective years of non-Malays, it is estimated that the non-Malay interaction term reduces the measurement error variance of non-Malays relative to Malays by .555.[4] However, caution needs to be exercised when interpreting the point estimates because the estimated coefficient is extremely imprecise. The imprecise estimate could be due to the small sample size which is unable to detect the subtle differences in measurement error between Malays and non-Malays. However, it is noteworthy that the joint F-test for number of years of retrospective recall and its interaction with non-Malay dummy variable is jointly significant in Model 1.

Based on the quadratic specification for the number of retrospective years in Model 2, it is noted that the variance of measurement error decreases initially for both Malays and non-Malays. Subsequently, the variance of measurement error increases after 10 years of recall for Malays and for non-Malays it increases after 18 years recall. This finding is puzzling and is counter-intuitive. I am not able to offer a reasonable explanation for this result. However, this may be an area for further research and it is

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[3] By pooling the data of Malays and non-Malays, the regression model included the non-Malay dummy variable and its interaction with number of retrospective years.

[4] Based on the mean retrospective years of non-Malays and the estimated coefficient of number of retrospective years interacted with non-Malay dummy variable in Model 1, its estimated effect on measurement error variance equals (15*–.037) = -.555. This is quite a substantial difference between Malays and non-Malays compared to the mean difference in reported log earnings square which is .7423 (Malays) and .8865 (non-Malays).

suggested that a linear spline specification for the number of retrospective years may yield better results.

The joint F test of the number of years of recall and its square interacted with the non-Malay dummy variable in Model 2 is also not significant. This means that the variance of measurement error in log earnings by years of retrospective recall are not significantly different between Malays and non-Malays.

Conclusion

The unique data set available from the two waves of MFLS has provided a good opportunity to examine the issue of measurement error in retrospective earnings by providing two sets of earnings data which can be matched to the same individual, job and time period. The conclusions that can be derived with regard to the mean of measurement error is that it is not significantly different from zero for non-Malays. But it is significantly different from zero for Malays. The linear specification of number of retrospective years of recall indicates that the variance of measurement error in log earnings is significant and positive. But the quadratic specification of number of years of recall and its square reveals the pattern that the measurement error variance in log earnings initial decreases and then increase after a number of years into the past is contrary to expectation. Following the statistical point of view, the variance of measurement error in log earnings do not vary significantly by years of retrospective recall between Malays and non-Malays. However, the point estimates of the number of retrospective years (linear specification) interacted with non-Malays suggest that the rate of forgetting of non-Malays are substantially lower than Malays.

Table A1. Means and Standard Deviation of Variables Used

Variables	Malays	Non-Malays	Total
Simple difference in reported log earnings	.0535 (.8619)	.0073 (.9442)	.0324 (.8996)
Difference in reported log earnings square	.7423 (2.06)	.8865 (2.59)	.8083 (2.31)
Years of education	5.84 (3.76)	6.67 (4.20)	6.22 (3.98)
No. of Retrospective Years (from MFLS1 in 1976)	17.25 (9.02)	15.25 (10.31)	16.33 (9.67)
No. of obs.	211	178	389

Note: standard deviations are in parentheses

Table A2. Regression of simple difference in reported log earnings

Variable	Model 1		Model 2		Model 3	
	Coef.	SE	Coef.	SE	Coef.	SE
No. of retrospective years	-.0046	.0057	-.0559	.0912	-.0055	.0059
Non-Malay			-.0049	.0057	-.0533	.0921
Years of education					-.0047	.0114
Constant	.1074	.0955	.1379	.0985	.1758	.1496
R-squared	.0024		.0034		.0038	
N	389		389		389	

Note: * significant at 10% level, ** significant at 5% level
SE = robust standard errors

Table A3. Regression of simple difference in reported log earnings of Malays

Variable	Model 1		Model 2	
	Coef.	SE	Coef.	SE
No. of retrospective years	-.0154**	.0089	-.0172**	.0068
Years of education			-.0106	.0151
Constant	.3200 ***	.1492	.4132***	.2393
R-squared	.0261		.0279	
N	211		211	

Note: * significant at 10% level, ** significant at 5% level, *** significant at 1% level
SE = robust standard errors

Table A4. Regression of simple difference in reported log earnings of non-Malays

Variable	Model 1		Model 2	
	Coef.	SE	Coef.	SE
No. of retrospective years	.0047	.0089	.0043	.0093
Years of education			-.0043	.0158
Constant	-.0641	.1491	-.0291	.2393
R-squared	.0026		.0030	
N	178		178	

SE = robust standard errors

Table A5. Regression of difference in reported log earnings square

Variable	Model 1		Model 2	
	Coef.	SE	Coef.	SE
Non-Malay	.798*	.458	.752	.619
No. of retrospective years	.042**	.017	-.062	.050
No. of retrospective years*non-Malay	-.037	.029	-.031	.077
No. of retrospective years square			.003*	.0018
No. of retrospective years square*non-Malay			-.0004	.0022
Constant	.020*	.256	.640**	.268
Joint F-test: no. of retrospective years and non-Malay interaction terms				
F statistic	3.01		3.16	
p-value	(.050)		(.014)	
Joint F-test: non-Malay interaction terms only				
F statistic			1.12	
p-value			(.327)	
R-square	.0156		.0338	
N	389		389	

Notes: * significant at 10% level, ** significant at 5% level,*** significant at 1% level
SE = robust standard errors

APPENDIX B

Table B1. Log Monthly Earnings Regressions of Malay Males Age 20-34 in 1967-69, 1976 and 1988 (include occupation variables)

Variable	1967-69		1976		1988	
	Coef.	SE	Coef.	SE	Coef.	SE
Schooling:						
1-3 years	- .388	.199	-.192	.247	.098	.173
4-5 years	- .393	.191	.151	.221	.299	.176
6 years	- .138	.180	.120	.212	.157	.149
7 – 9 years	.100	.258	.420	.262	.238	.147
10 –12 years	.344	.315	.680	.289	.366	.147
>=13 years	.368	.426	1.29	.390	.599	.155
Age	-.034	.170	-.039	.186	.179	.054
Age Squared	.0013	.0031	.0013	.0033	-.0022	.0009
1968	-.316	.124				
1969	.039	.114				
number of jobs	.012	.124	.119	.088		
Managers	.835	.284	.828	.273	.822	.073
Clerical	.748	.305	.762	.237	.597	.067
Sales	.418	.243	.367	.180	.434	.070
Service	.484	.213	.499	.293	.638	.052
Production	.434	.220	.393	.188	.371	.060
Transport	.475	.147	.501	.172	.476	.058
Laborer	.289	.355	.288	.315	.256	.073
Constant	5.45	2.30	5.04	2.59	1.94	.741
N	220		160		1068	
R-squared	.393		.555		.438	
Variance (Log Y)	.704		.553		.466	
Explained Variance	.277		.307		.204	
Residual Variance	.427		.246		.262	

APPENDIX C

Table C1. Log Monthly Earnings Regressions of Malay Males Age 35-54 in 1967-69, 1976 and 1988 (include occupation variables)

Variable	1967-69		1976		1988	
	Coef.	SE	Coef.	SE	Coef.	SE
Schooling:						
1-3 years	.378	.206	-.065	.134	.098	.088
4-5 years	.802	.196	.312	.127	.174	.086
6 years	.252	.257	.044	.141	.241	.076
7 – 9 years	.103	.503	.713	.235	.343	.090
10 –12 years	.481	.463	.563	.267	.718	.100
>=13 years	1.31	.975	.746	.526	1.44	.125
Age	-.160	.280	.167	.128	.086	.060
Age Squared	.0014	.0032	.0020	.0015	-.0009	.0007
1968	-.049	.179				
1969	.169	.183				
number of jobs	.024	.177	-.062	.082		
Managers	1.22	.370	1.20	.239	.787	.092
Clerical	.692	.459	.572	.307	.710	.097
Sales	.955	.309	.761	.184	.210	.079
Service	.936	.306	.745	.195	.553	.063
Production	.563	.414	.593	.202	.478	.089
Transport	.699	.207	.521	.117	.377	.062
Laborer	-.615	.428	-.331	.273	.174	.095
Constant	8.54	6.02	1.94	2.78	3.49	1.29
N	158		249		963	
R-squared	.405		.424		.459	
Variance (Log Y)	1.14		.673		.647	
Explained Variance	.462		.286		.297	
Residual Variance	.678		.387		.350	