LABOR MARKETS AND ECONOMIC DEVELOPMENT IN MALAYSIA

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I. INTRODUCTION

Since the second World War, a small number of South East Asian countries have undergone a remarkable economic transformation, transiting in a relatively short time span from quite primitive and poor economies to modern economic nations. Policymakers and economists have increasingly turned to these countries to detect lessons of economic growth that will hopefully be transferable elsewhere. Among other things, this postwar experience in these nations offers a unique opportunity to improve our understanding about how labor markets operate in less developed countries, but more important on how sustained and rapid economic development impacts on these labor markets.

This paper studies life-cycle career wage and employment histories of male workers in Malaysia, one of the South East Asian nations that has been undergoing rapid economic development. These labor market histories were investigated with an eye towards identifying the main consequences of economic develop-

Research in Population Economics,
Volume 7, pages 131–156.

ISBN: 0-89232-943-2

ment for the earnings and employment patterns that we observe within labor markets. Particular attention was directed at isolating how the benefits of this growth were distributed between the young and the old, the more and less educated, rural and urban areas of the country, and among Malaysia's three main ethnic groups. An equally important aim was to identify, at least in a Dennison-styled accounting sense, those factors that appear to be the likely contributors to Malaysia's success. To that end, we were able to address a number of prominent hypotheses about the underlying determinants of economic development.

There are three principal conclusions from our research. First, all major subgroups of the Malaysian population benefited from the rising levels of real income over time. There is an understandable concern that the rewards of development can be concentrated on a few, leaving many of the poor untouched. At least in Malaysia, this fear was not realized. But some did gain more than others. In particular, economic growth in Malaysia raised the earnings of the young more than it did those of older men; the more educated relative to those with less schooling; those in urban places relative to rural residents, and; Malays, the poorest ethnic group, relative to the others. Finally, the most important correlate of time-related growth in Malaysian incomes is education. Conditioning on schooling reduces our estimate of per capita income growth over time from 2.4 percent to 0.9 percent per year. The remaining time series growth appears to be due mainly to the emphasis Malaysia has placed on research and development in its principal productive activities. In both its principal commodities, rubber and rice, there has been a continuing introduction of new varieties that have increased output by astonishing amounts.

To give at least a rudimentary sense of place to those unfamiliar with Malaysia, Section II of this paper briefly highlights the principal characteristics of the Malaysian economy. The second section describes the very unique retrospective data set on which this research is based. We also discuss here the statistical framework that serves as the basis for the analysis. In the final section, we summarize the principal conclusions that have emerged from this research.

II. THE MALAYSIAN ECONOMY

Given its record of sustained economic growth during the last thirty years, Malaysia easily merits inclusion in the list of economic success stories in South East Asia. For example, real GNP grew by 6.6% per year between 1961 and 1976. The Malaysian economy is predominately agricultural, heavily dependent upon external trade, and keyed to a few primary commodities. To illustrate, agriculture continues to employ more than half the work-aged population and the value of exports is half of GNP. The critical commodities are natural rubber, tin, rice, tropical hardwoods and, more recently, palm oil and crude petroleum.[1] Table 1 lists levels of production and prices of the major commodities between 1949 and 1978.

Table 1. Production and Real Prices of Major Commodities

Period	*Rubber*	*Palm Oil*	*Tin*[a]	*Sawed Logs*	*Sawed Timber*	*Rice*
			A. Production (in million tons)			
1949–1952	702	50	57.6	NA	NA	488
1953–1956	649	55	61.2	NA	NA	517
1957–1960	731	74	47.6	NA	NA	582
1961–1964	821	113	59.6	5124	1047	711
1965–1968	995	212	71.1	9101	1449	827
1969–1972	1292	524	74.8	12420	2114	1120
1973–1976	1552	1122	67.1	16273	3110	1296
			B. Real Prices (in $ per ton)			
1949–1952	251[b]	876	8253	NA	NA	NA[c]
1953–1956	207	759	6643	NA	NA	545
1957–1960	226	783	6847	NA	NA	444
1961–1964	181	733	8795	82	173	461
1965–1968	139	715	10799	91	184	550
1969–1972	118	675	10426	96	206	431
1973–1976	126	845	12031	106	269	620

Notes:

[a]Volume in tin concentrates.

[b]Price in cents per keg.

[c]Price in real 1979 $U.S. of Thai rice, milled, f.o.b. Bangkok.

Rubber is consistently the most important crop and virtually all of it is exported. Malaysia produces almost half of the total world production of natural rubber. Rubber is produced on both large estates and smallholdings, with smallholdings now accounting for 60% of total output. Between 1949 and 1972, rubber prices (adjusted for inflation) fell by more than half, largely as a result of increased competition from synthetics. This trend reversed after 1972 and real rubber prices have risen. In spite of declining prices, rubber output expanded by 3.1% per year after 1952, with output growth particularly rapid during the 1960s. The principal cushion against falling prices has been the increased use of high-yielding varieties and other technological improvements. During the last decade, estates have increasingly shifted from rubber to palm oil, largely in response to a 50 cent rise in palm oil price relative to rubber. Malaysia now produces over 46% of the total world supply of palm oil, with the major competition coming from other oils and fats (e.g., soybeans).

Rice is the principal domestic field crop. Output has risen substantially over time, most significantly during the 1960s and early 1970s. Production stabilized during the 1970s at levels about 200 million tons below domestic consumption. Agricultural workers in rice are virtually all smallholders and they constitute the poorest segment in the economy. The principal technological developments in

rice are the introduction of new varieties and the increased frequency of double-cropping.

Tin predated rubber as Malaysia's first modern commercial activity. The industry developed rapidly during the late 19th century and was initially dominated by Chinese immigrants. Because of the depletion of known reserves, its economic role is likely to diminish in the future. Tin production was already in a period of decline during the 1970s.

Two-thirds of Malaysia is forested. Timber accounts for 9% of GNP, and Malaysia produces 14% of the world's tropical hardwoods. As its real price rose, timber production increased in the last two decades, rising from 3 million tons in 1961 to 20 million tons by 1976.

Although still small, manufacturing grew rapidly during the 1970s. Manufacturing is predominantly small scale and labor-intensive, and is concentrated in products that rely on low-wage labor. The processing of Malaysia's primary agricultural products—food, wood, and rubber—dominate its industry. The variety of activities has diversified recently with the growth of textile and electronic plants.

Because some serious economic, social, and political tensions exist among them, this short summary is incomplete without mention of Malaysia's three ethnic groups: Malays (53 percent of the total population), Chinese (36 percent), and Indians (10 percent). National unity has been difficult to achieve and in many ways the three live, work, and are schooled apart. Malays are the poorest and are predominantly rural, specializing in smallholdings of rubber and rice and in fishing. Urban Malays are employed primarily in the government sector, where they receive preferential treatment, and in low-skill manufacturing enterprises. In contrast, the Chinese, descendants of earlier immigrants destined for the tin mines, are largely urban, dominate commerce and trade, and have the highest incomes. Rural Chinese work in tin mines and as agricultural smallholders. Indians are about evenly distributed between rural and urban areas. Rural Indians, in consonance with their migratory past, are employed largely on the rubber and palm oil estates, while urban Indians are found mainly in the professions and the service sector. Considerable concern revolves around the disparate standards of living of the three groups and a suspicion that Malays in particular have not shared in the rewards of economic growth. Since the country gained independence, government policy has increasingly emphasized raising the standard of living of Malays and dissipating the rigid association of economic function and race.

III. THE MALAYSIAN DATA

The Malaysian Family Life Survey (MFLS) on which this analysis is based was administered in 1976–1977. The sample consists of 1,262 private households, each containing at least one ever-married woman less than 50 years of age at the

time of the initial visit.[2] These households were located in 52 randomly selected geographic areas of Peninsular Malaysia. Each husband was requested to give a complete retrospective history of his schooling, job training, marital status, migration, occupation, and weeks and hours of work and income. This retrospective history starts at age 15 or first marriage (whichever is earlier) and terminates in 1976. Work and earnings information is recorded at each job change or, if no job change occurred, at 3-year intervals. Given the design of the Malaysian survey, the amount of information available, or the number of observations per person, depends most directly on the age of respondents during the survey year.[3] The older a male is in 1976, the more complete his life-cycle history will be. Conversely, the younger a worker is in 1976, the shorter the length of his work history that we can track from time of first job.[4]

Although the Malaysian data constitute a significant advance in the quality and quantity of information on career wage and employment histories in a less developed country, the data have their deficiencies. The most obvious limitation lies in its retrospective design. Men were required to recall and report accurately on wage and employment events that occurred, in some cases, 20 and 30 years before the interview. Less reliable responses for most distant events are certainly to be expected.[5] The data will provide a test of the usefulness of recall data covering a reference period of 30 years or more. With some reason, the economics profession has been skeptical about the value of surveys that rely heavily on recall questions. The second major problem is that the sample consists of currently married survivors of a cohort. Such men will not be completely representative of their original birth cohorts if employment histories vary by marital status or mortality.

A basic question is the ability of such retrospective data to produce patterns that are "reasonable" enough to warrant analysis. To address this issue, and because our research seeks to explain income patterns over time and across careers, Table 2 lists life-cycle profiles of real[6], monthly[7], income[8] by labor market cohort. Consider, first, actual life-cycle paths for individual cohorts

Table 2. Monthly Income by Labor Market Cohorts

Initial Years of Market Experience	*Years of Experience*				
	1–5	*6–10*	*11–15*	*16–20*	*21–25*
	Mean Real Monthly Income				
1971–1975	196.1				
1966–1970	131.2	203.5			
1961–1965	132.7	190.8	247.0		
1956–1960	122.7	176.2	233.9	242.0	
1951–1955	102.2	156.0	202.6	236.6	281.9

(reading across a row). Real monthly income rises with years of experience, but rates of wage growth diminish as time spent in the labor market lengthens. This quadratic-like wage growth mirrors the standard empirical finding for the United States. Note that the actual experience-related wage growth consistently exceeds that which we would predict from any of the cross-sectional wage profiles (reading down a diagonal). However, the observed life-cycle growth does not reflect only individual investment decisions. Economy-wide productivity growth over time will also increase a cohort's income as time (or experience) accumulates. Table 2 also demonstrates the existence of cohort effects in these data. More recent male labor market cohorts have wage profiles that lie above earlier ones (reading up a column). However, a similar caveat applies to this interpretation of cohort wage growth since economy wide productivity growth will also increase an individual's income, holding years of market experience constant.

Monthly income will serve as a dependent variable expressed in natural logarithms (ln). Observations from all years beginning in 1949 are included in the regressions reported in the next section.[9] It is important to note that all explanatory variables are measured contemporaneously with the income observation. The statistical model we use allows for two error components: an individual-specific, and a standard transitory error component that is uncorrelated over individuals and across time. Maximum likelihood variance components for unbalanced design data are used to capture persistent unobserved individual effects that are uncorrelated across individuals.[10]

To interpret the empirical results in Section IV, a useful conceptual taxonomy separates the determinants of individual wages into vintage, experience, and time effects. Vintage effects encompass all factors that make generations of workers who start their labor market experiences at different times have different lifetime earnings capacities. Under this rubric, we traditionally place rising levels of education, or improvements in its quality, as well as all family background variables. In part, experience effects encompass all factors—health, migration, job skill acquisition—associated with the life-cycle aging process. Finally, time effects measure alterations in marginal productivity of workers in the labor market at time t compared with those at a different time. These time effects derive from short-run business-cycle vagaries as well as from more permanent influences due to advances in technology or knowledge, and from exogenous structural changes that may impinge on the aggregate economy.

Since these effects are likely to be interrelated, this taxonomy should not be interpreted too rigidly. For example, incentives to invest on the job may well be altered by initial human capital stocks.[11] In addition, technological improvements are not costlessly embodied in people or in productive processes. To illustrate, there is some evidence that more educated workers have a comparative advantage in adapting to change in a dynamic environment (see Welch, 1970). If so, at least in timing, incomes of the more educated may be affected first before new knowledge filters down to alter incomes of less educated workers.[12]

While this conceptual trichotomy is a useful one, it carries with it the well known statistical identification problem. If we rely on pure time dating of events alone, we can never identify the separate roles of time, vintage, and experience. Our approach here is to successively move away from time indexing by employing measurable economic variables that reasonably capture the economic forces that time, vintage, and experience ultimately represent. Therefore, in addition to measuring differences across men in an average cross section, our regressors are meant to proxy components of vintage, experience or time effects. Our principal cohort specific variables are years of schooling, literacy, and some measures of family background. Life cycle related variables include years of market experience in all jobs, place of residence, labor supply, health and union status, amount of job training, and type of employment (salaried, self-employed, etc.). Finally, our calendar time related variables are terms of trade, rubber productivity, industrialization and export diversification. Clearly, some of these regressors will not fall neatly into one of these three categories.

IV. EMPIRICAL RESULTS

We start our summary of the empirical findings by first identifying some important distributional consequences of Malaysian growth. In this section, our primary purpose is to examine how the main dimensions of the structure of earnings in Malaysian labor markets were altered as rapid development proceeded. Table 3 lists earnings functions that rely principally on time-indexing to measure effects. Since the cohort index is suppressed, the linear experience term measures the difference between experience and cohort, while the time trend captures the sum of cohort and time effects. The first two columns involve a simple comparison using *ln* nominal and *ln* real monthly incomes as the dependent variable. These estimates imply that nominal income grew at an average rate of 4.1% per year, while deflated income grew by 2.4% per year. This real income growth compares astonishingly well with a 2.3% annual growth in real per-capita Malaysian Gross Domestic Product between 1950 and 1973, as reported in published national accounts data, and speaks well of the quality of this retrospective Malaysian data.

Ethnic differences in average incomes are enormous. Indians earn 60% more than Malays ($e^{.469} - 1$), and Chinese earn 108% more than Malays ($e^{.732} - 1$). Finally, the estimate of ρ—the intra-worker correlation coefficient in income—indicates that, in this simple specification, 60% of residual variance consists of permanent unobserved individual differences in earnings capacities.

In the third column of Table 3, we move away for the first time from simple time indexing. The estimated rate of return of 10.1% per year of additional schooling compares quite favorably with those obtained from micro data in the United States. More important, if one views education (for the moment) as the

Table 3. Wage Regressions—Simple Specification
(t statistics in parentheses below coefficient)

Variable	*Nominal Monthly Income* (1)	*Real Monthly Income* (2)	(3)	(4)
Constant	3.476 (85.8)	3.726 (92.0)	3.323 (69.9)	3.358 (56.0)
Experience	.0452 (14.7)	.0475 (15.4)	.0623 (20.1)	.0592 (12.9)
Experience^2	−.0011 (20.6)	−.0012 (22.3)	−.0013 (22.7)	−.0007 (6.06)
Time	.0406 (16.2)	.0237 (9.49)	.0093 (3.70)	.0153 (3.01)
Indian	.4714 (6.04)	.4691 (6.01)	.3698 (5.16)	.3800 (5.26)
Chinese	.7287 (13.8)	.7321 (13.8)	.6376 (13.1)	.6454 (13.1)
Education			.1008 (13.9)	.0653 (6.60)
Education × time				.0013 (1.96)
Education × experience				.0007 (1.01)
Experience × time				−.0009 (4.89)
ρ	.592	.600	.552	.559
Log likelihood	−42619	−42591	−42504	−42483
R^2	.29	.17	.19	.19

important vehicle through which cohort effects operate, comparison of Columns 2 and 3 indicates that the time-related growth in earnings can be split roughly in half between the effects of cohort improvement and economy-wide productivity growth with calendar time. More precisely, if we condition on education, the combined effect of cohort and time-related growth is reduced by 60%.

The positive education-time interaction reported in the final column of Table 3 can be interpreted to mean that better educated workers benefit more from the introduction of new knowledge and technology over time. In a variety of country settings, researchers have established a link between schooling and the ability to

deal with disequilibria and change. Our evidence for Malaysia adds support for this hypothesis. Similarly, the positive (albeit statistically insignificant) experience-education interaction implies that more educated workers enjoy larger earnings growth over their careers (i.e., schooling increases an individual's investment efficiency in on-the-job investments). Finally, the strongly significant negative time-experience interaction implies a sharply non-neutral effect of economic growth on age earnings profiles, raising the earnings of the young more than it did incomes of the old. In a growing economy, such as Malaysia, undergoing frequent waves of technical change, this strong tilt of age earnings profiles toward the young may not be surprising. Younger workers with much of their investment life before them, can more easily absorb and adapt to the introduction of different methods of production. In contrast, the skills of older workers are increasingly tied to obsolete technologies.

In Malaysia, as in most developing countries, distributional concerns, centering around growth with equity, touch rawer nerves than whether the young or more educated gained more than others. We address some of these issues by examining differential trends by urban-rural areas (in Table 4) and among Malaysia's three ethnic groups (in Table 5).

Table 4 expands our basic earnings function by introducing a set of indicator variables that separate locations in terms of their urbanization. The divisions we used are: Kuala Lumpur, the capital and principal city; Ipoh and Penang, the next two largest cities; other urban areas; and foreign countries.[13] The left-out group are those living in rural areas. In the second column of Table 4, we interact these indicators of urban residence with time and the experience quadratic.[14] On average, residents of urban places earn from 12 to 25% more than those in rural areas. However, column 2 of Table 4 demonstrates that these regional income differentials were not constant over time or over labor market careers. Not surprisingly, income experience profiles grew at a 2% more rapid rate in urban areas than in rural ones. The more novel result is that income grew 0.5% per year more rapidly in urban places than in rural ones. In fact, in 1949, the intercept year in these regressions, income differentials were almost nonexistent between rural and urban areas. Apparently, one consequence of development in Malaysia was the emergence of significant urban-rural income differences among its population. However, this is not to say that rural areas failed to participate in economic growth; average incomes in rural areas merely rose less rapidly than they did in urban places. The final column in Table 4, which includes controls for agricultural workers, is an attempt to determine whether these urban-rural distinctions were solely a result of changes specific to the agricultural labor market. Income growth over time is less rapid in agriculture (albeit still positive) and career wage growth was slightly slower. However, the broad conclusions we have reached between rural and urban places apparently do not simply reflect an agricultural–nonagricultural worker division.

Table 5, which lists estimates of these simple earnings functions separately for

Table 4. Wage Regressions Testing Urban Growth
(t statistics in parentheses below coefficients)

Variables	*(1)*	*(2)*	*(3)*
Constant	3.2945 (70.2)	3.398 (68.8)	3.652 (69.1)
Experience	.0624 (20.3)	.0563 (17.6)	.0569 (16.7)
Experience^2	−.00125 (22.7)	−.00179 (19.3)	−.00133 (16.8)
Time	.0099 (4.01)	.0074 (2.85)	.0095 (3.41)
Indian	.3465 (7.03)	.3349 (4.77)	.3288 (4.91)
Chinese	.6017 (12.4)	.6014 (12.5)	.5278 (11.4)
Education	.0945 (13.1)	.0940 (13.1)	.0787 (11.3)
Kuala Lumpur	.2213 (4.80)	−.0828 (1.45)	−.1329 (2.30)
Ipoh and Penang	.1158 (2.98)	−.1964 (3.80)	−.2307 (4.38)
Other urban	.1409 (5.03)	.0502 (1.18)	.0118 (0.28)
Foreign country	.1817 (2.74)	−.0423 (.59)	−.0728 (1.00)
Time × any urban		.0054 (2.76)	.0054 (2.67)
Experience × any urban		.0204 (6.32)	.0188 (5.72)
Experience^2 × any urban		−.00003 (1.29)	−.0000004 (.17)
Agricultural worker			−.3428 (8.17)
Time × agric.			−.0030 (1.14)
Experience × agric.			−.0012 (.94)
Experience^2 × agric.			.0003 (3.07)
ρ	.541	.542	.523
log likelihood	−42481	−42435	−42295
R^2	.19	.20	.23

Table 5. Wage Regressions—Ethnic Differences
(t statistics in parentheses below coefficients)

	Chinese		*Malays*		*Indians*	
Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Constant	4.361	3.997	3.803	3.285	4.320	3.790
	(99.5)	(63.9)	(73.1)	(46.0)	(61.3)	(41.7)
Experience	.0716	.0842	.0323	.0495	.0249	.0393
	(16.2)	(18.5)	(6.67)	(10.1)	(3.49)	(5.87)
Experience^2	−.0017	−.0017	−.0010	−.0010	−.0006	−.0006
	(19.9)	(2.02)	(11.8)	(12.0)	(3.96)	(3.97)
Time	.0188	.0068	.0268	.0101	.0232	.0087
	(5.44)	(1.89)	(6.74)	(2.51)	(4.11)	(1.70)
Education		.0752		.1267		.1061
		(7.81)		(9.96)		(7.90)
ρ	.519	.483	.628	.585	.590	.496
Log likelihood	−15749	−15721	−17446	−17401	−3852	−3826
R^2	.23	.24	.11	.12	.18	.22

Malays, Chinese, and Indians, indicates that ethnic Malays have been at least coequal participants in the economic resurgence of Malaysia. In fact, we estimate that their money incomes grew at a slightly faster rate over time than did incomes of Chinese, the dominant economic group. In contrast, very large career life-cycle differences prevail between Malays and Chinese, differences that are strongly in favor of Chinese. We find that Chinese incomes increase twice as fast over careers than do incomes of Malays. In terms of money income, Chinese earn substantially more than Malays, and this disparity expands greatly as workers age. The magnitude of these life-cycle changes in favor of Chinese is five times larger than the rate at which we estimate Malays are catching up in money income over time. The relative magnitude of these two distinct time-related wage changes probably accounts for the incorrect impression that economic growth left behind the poorest of the poor.[15]

A. Schooling

Because schools are an important institution for the transmission of skills across generations, we summarize next our empirical findings that highlight the income-education relationship. The strong impact that education had on our estimate of time-related income growth suggests that there must have been a large rise in the schooling levels achieved across the birth cohorts in our data. Indeed, the 20 years between the late 1920s and the late 1940s witnessed a three-

year increase in average male schooling in our sample. For those born between 1930–1934 (ages 42–46 in 1976) 1/5 of the men had no formal schooling, 30% were illiterate, and less than 15% attended school beyond the primary level. In contrast, 90% of the men born between 1950–1954 (ages 22–26) were literate, almost all had attended school, and 40% went beyond the primary level. University attendance remains quite rare, however. Thus, for the men in our sample, in the space of one generation, Malaysian society was fundamentally transformed in terms of the universality and extent of schooling of its people. Our estimates have identified this transformation as the important correlate of time related income growth.

Table 6 contains four regressions that expand on our schooling results in a number of ways. The first two represent a simple attempt to separate the direct and indirect effects (through schooling) of family background variables. When male education is included as a regressor, we are measuring only the direct effect of family background independent of all influences that mediate directly through schools. The third specification isolates one important reason why schools affect income, literacy. In the final column, we test for time-related coefficient drift at different education levels.

While the set of background variables perform in the expected manner, they do not alter in any appreciable way the coefficients on the time and experience variables. Education of both parents and an index of father's occupational position[16] are associated with higher son's incomes, but there appears to be no effect of family size. However, these background variables by themselves do not influence our estimate of time-related income growth. It is only when own education is included, in the second column of Table 6, that our estimate of income growth over time is reduced. This result suggests that schooling has an important role, independent of measurable family background, in promoting growth. Note also that the magnitudes of our estimated background effects are substantially reduced when own education is controlled. One interpretation is that measured family background variables such as mother's schooling mediate through son's education, but background characteristics have little direct market payoff.[17]

Table 6 shows that the proportionate effect of schooling on income is highly nonlinear.[18] Income rates of return are twice as large at the secondary level as they are at the primary level, and are larger still for those few men who attended university. The third column in Table 6 isolates one mechanism through which schools affect incomes.[19] Literacy, a skill largely acquired in school,[20] raises income by 20%. Literacy affects estimated schooling coefficients only at the primary level, where fully one-third of the income benefits from primary schooling is mediated through the achievement of literacy.

This empirical result of rising income rates of return with schooling level has a number of possible explanations. It may reflect real supply-side constraints if school construction has not responded rapidly enough to growth-induced demand. Second, it could capture the widely reputed excessive public sector wages for the educated elite. However, this explanation receives little support from

Table 6. Wage Regressions—Testing the Effect of Schooling (t statistics in parentheses below coefficients)

Variables	*(1)*	*(2)*	*(3)*	*(4)*
Constant	3.413 (57.0)	3.282 (48.3)	3.322 (50.1)	3.228 (42.9)
Experience	.0499 (16.7)	.0610 (20.0)	.0614 (20.1)	.0497 (10.1)
Experience^2	−.0012 (22.4)	−.0013 (22.8)	−.0013 (22.8)	−.0007 (5.81)
Time	.0221 (9.28)	.0113 (4.61)	.0109 (4.43)	.0339 (6.12)
Indian	.4086 (5.56)	.3375 (4.88)	.3383 (4.87)	.3397 (4.84)
Chinese	.5660 (10.7)	.5391 (10.8)	.5726 (11.6)	.5764 (11.55)
Kuala Lumpur	.2362 (5.06)	.2041 (4.42)	.2133 (4.63)	.2330 (5.07)
Ipoh and Penang	.1229 (3.13)	.0935 (2.40)	.1014 (2.61)	.0782 (2.01)
Other urban	.1519 (5.38)	.1326 (4.74)	.1350 (4.82)	.1376 (4.94)
Foreign country	.2046 (5.39)	.1626 (2.44)	.1684 (2.54)	.2448 (3.67)
Education (0–6)		.0551 (4.68)	.0367 (2.41)	.0436 (2.57)
Education (7–12)		.1041 (6.58)	.1195 (7.64)	.0402 (1.82)
Education (13 +)		.1718 (4.05)	.1807 (4.24)	.0096 (.13)
Father's education	.0132 (2.47)	.0099 (1.98)	.0125 (2.59)	.0125 (2.57)
Literate			.1953 (2.31)	.1911 (2.24)
Mother's education	.0216 (2.03)	.0071 (.71)		
Number of siblings	.0020 (.21)	.0007 (.07)		
Father's occupation index	.3427 (6.67)	.2126 (4.31)		

(*continued*)

Table 6. (Continued)

Variables	*(1)*	*(2)*	*(3)*	*(4)*
Education (0–6) × time				−.0027 (3.28)
Education (7–12) × time				.0028 (2.91)
Education (13 +) × time				.0069 (2.50)
Education × experience				.0026 (3.40)
Time × experience				−.0010 (5.43)
ρ	.566	.530	.534	.542
Log likelihood	−42527	−42458	−42464	−42415
R^2	.18	.20	.20	.21

ethnic-specific regressions (not reported here), where the rising income pattern with schooling level repeats itself within each ethnic group. No one has argued that the Chinese have had special access to public sector jobs in Malaysia. However, the fourth column of Table 6 suggests an alternative explanation. The positive time-education interaction that we reported earlier occurs mainly at higher schooling levels. In fact, income rates of return at the primary level appear to have fallen over time, while those at the secondary and especially university level have risen. Thus, as Malaysia went through its sustained and rapid development, the wage premia offered to skills rose. Moreover, the complementary that apparently exists between schools and new technology became concentrated at higher and higher schooling levels, reflecting where the scarcity of skilled labor was now most acute.

B. The Augmented Earnings Functions

Table 7 summarizes results with variables that purport to capture life-cycle wage progression and calendar time-related productivity growth. The life-cycle variables we include fall into six classes: labor supply,[21] health status,[22] trade union membership, employment status,[23] length of time spent in current job, and retrospective information on the existence and amount of formal job-related training. The first two regressions in Table 7 include only the life-cycle variables, while the final specification adds our calendar time regressors. For the life-cycle variables, which we discuss first, our interest centers on the role these variables

play in explaining career wage growth and the changes that have taken place with economic development.

C. Labor Supply

Multiple job holdings are a common practice in Malaysia, particularly in rural areas.[24] Both the possession of multiple jobs and, to a lesser extent, hours worked have a distinct, positive life-cycle trend. Compared with entry levels of about 5%, the fraction of workers with second jobs trebles by the time men achieved 30 years of market work. Similarly, the average workweek lengthens over careers by about 2 to 4 hours. Both labor supply variables have a strong positive and statistically significant impact on monthly income, and life-cycle variation in labor supply contributes to career earnings growth. However, the overall contribution of labor supply to life-cycle earnings is relatively modest. Conditioning on labor supply would only reduce career growth in monthly income by less than 5%. Similarly, over calendar time, there has been only a small reduction of about two hours in the average length of the workweek so that labor supply variables also do not contribute much to calendar time related income growth. Those men who searched for work between their last two income observations are estimated to have 11% higher wages. While this wage premium probably reflects nothing more than selectivity, it is consistent with the spirit of the Harris-Todaro framework, in which wages and unemployment are positively correlated.

D. Migration, Health, and Unionization

Table 8 demonstrates that Malaysia contradicts a number of stereotypes about the character of migration in the Third World. First, economic development did not increase the volume of migration over time.[25] This conflicts with the notion that development necessarily implies large-scale movement of people or relocation of economic activity. Nor was massive urbanization a necessary consequence of development. Most Malaysian migrants moved to places quite similar in urbanness to those they left. Stratified by the urban-rural character of place of origin, Table 8, Part B presents the distribution of migrants by the urbanness of their destination. In fact, for those flows that did involve a change in urban-rural status, the largest flow was from urban to rural areas, and not, as typically assumed, the reverse.

The absence of much life-cycle rural to urban migration implies that even though large urban-rural income differences now exist, the movement of people from rural to urban areas has little to do with experience-wage profiles in Malaysia. Reflecting this, the introduction of regional controls into Table 7 did not alter our estimated average life-cycle experience profile of earnings.

Table 7. Wage Regressions—Augmented Specification
(t-statistics in parentheses below coefficient)

Variable				*Variable*			
Constant	1.612 (16.5)	1.067 (11.2)	−.6553 (.97)	ln weekly hours	.4507 (19.6)	.4131 (18.7)	.4134 (18.8)
Experience	.0482 (14.7)	.0361 (11.4)	.0369 (11.6)	Number of jobs	.0976 (3.77)	.1080 (4.33)	.1141 (4.58)
Experience^2	−.0009 (13.8)	−.0007 (11.2)	−.0007 (11.3)	Looking for work	.1282 (3.30)	.1108 (2.97)	.1050 (3.72)
Time	.0107 (4.50)	.0085 (3.79)	−.0008 (.14)	Health disability	−.1320 (3.33)	−.0966 (2.54)	−.0860 (2.26)
Indian	.2959 (4.43)	.2158 (3.40)	.2156 (3.39)	Trade union member	.1172 (4.25)	.1354 (5.11)	.1360 (2.65)
Chinese	.5344 (11.6)	.5683 (13.0)	.5667 (13.0)	Salaried employee		.8911 (29.2)	.8902 (29.2)
Education	.0842 (11.7)	.0851 (12.5)	.0851 (12.5)	Self Employed		.8082 (23.4)	.8044 (23.3)
Kuala Lumpur	.2171 (4.85)	.1819 (4.25)	.1837 (4.30)	Employer		.9843 (18.9)	.9904 (19.1)

Ipoh and Penang	.0866 (2.29)	.0884 (2.45)	.0943 (2.61)	Exp in current job	.0005 (1.54)	.0010 (3.60)	.0007 (2.31)
Other urban	.1259 (4.62)	.1232 (4.72)	.1243 (4.77)	Exp^2 in current job	−.00003 (2.66)	−.00004 (3.67)	−.000003 (2.49)
Foreign country	.1904 (2.93)	.1262 (2.02)	.1235 (1.98)	Training	.1862 (3.08)	.0755 (1.32)	.0762 (1.32)
				Training × experience	.0271 (5.79)	.0307 (6.84)	.0301 (6.71)
				Training × experience^2	−.0005 (4.08)	−.0006 (4.31)	−.0006 (4.16)
				Terms of trade			.2093 (4.21)
				ln average yield per hectare of rubber estate			.2464 (2.19)
				ρ	.522	.513	.514
				log likelihood	−42221	−41795	−41775
				R^2	.24	.30	.30

Table 8.A. Proportion of Men Who Migrate Between Five Year Work Experience Intervals

Initial Year of Work Experience	*Experience Interval*					
	1–5	*5–10*	*10–15*	*15–20*	*20–25*	*26–30*
1971–1975	38.5					
1966–1970	21.3	23.6				
1961–1965	27.3	28.6	18.2			
1956–1960	32.7	27.5	18.7	13.5		
1951–1955	27.3	30.0	22.0	16.7	12.7	
1946–1950	26.6	25.3	24.7	16.9	11.0	8.4
All Cohorts	27.6	27.6	20.7	16.4	12.0	9.4

8.B. Destination of Migration by Place of Origin (5 Year Intervals)

	Place of Destination			
	Large City	*Other Urban*	*Rural*	*Foreign Country*
Large City[a]	50.5	22.2	24.4	3.3
Other Urban	17.5	43.9	33.4	1.5
Rural	13.8	23.9	60.9	1.3
Foreign Country	18.6	53.4	20.9	7.0

Note: [a]Large city includes Kuala Lumpur, Ipoh, and Penang.

We also found that poor health reduces monthly earnings by about 10%, while membership in a trade union increases income by 14%. While both poor health and union membership are more likely to occur later in the career, neither of these variables accounted for much of the average career growth in incomes.

E. Job Training

Participation in formal job training programs is an important reason for the observed experience-related wage growth. Approximately 20% of all men participated in training programs, and training and schooling were strongly complementary. While only 7% of those with no schooling received formal training, more than half of those with more than 10 years of education were trained.[26] On-the-job training incidents take place after entry into the labor market, but they were concentrated in the early years of the career.[27] In addition, there does appear to be some upward drift over time in the proportion of men who received such training. The coefficients obtained in the second column of Table 7 indicate

that the effect of training on earnings at the start of careers is modest (7.5%) indicating that this training variable is not simply selecting out higher wage men. However, training does significantly increase income growth with experience. In fact, incomes of those with training grow twice as fast over careers as do those of men who report no formal training.

F. Job Mobility

The patterns of job mobility in the Malaysian labor market are remarkably similar to those found in Western developed economies. As Table 9 demonstrates, 35 years into careers, the typical male Malaysian worker had held four distinct primary jobs. This inter-job mobility, a process in which almost all Malaysian male workers participate, indicates that workers are not tied inexorably to initial or second employers, contrary to an all-too-frequent assertion about labor markets in less developed countries. Labor market turnover in Malaysia peaks early in the career (between 5 and 10 years of experience) and declines steadily after that point. Following the dissolution of initial matches, the cementing of the attachment of workers and jobs as the accumulation of specific human capital proceeds and the investment horizon shortens, appears pervasive in countries as different as the United States and Malaysia. Job mobility does appear to have increased over time, a not surprising correlate of rapid development.

In addition to total time spent in the labor force, we include a variable measur-

Table 9. Cumulative Number of Job Changes by Experience
(Number of Job Changes × Years of Experience)

Year of Initial Work Experience	× =						
	5	*10*	*15*	*20*	*25*	*30*	*35*
1971–1975	.91						
1966–1970	.37	1.38					
1961–1965	.44	1.40	2.32				
1956–1960	.34	1.26	1.85	2.37			
1951–1955	.27	1.05	1.61	2.12	2.53		
1946–1950	.30	1.17	1.74	2.12	2.50	2.84	
1941–1945	.23	1.01	1.48	1.79	2.34	2.73	2.87
All	.35	1.25	1.87	2.35	2.73	2.99	3.13
Changes Within Experience Intervals	.35	.90	.62	.48	.38	.26	.14

ing the length of time spent on the current job. Nonzero coefficients for this variable indicate that wage growth is faster, the more stable are employment histories. This positive sign on experience in current job found in this data mirrors findings obtained in similar specifications with U.S. data. The interpretation often given in U.S. studies may apply as well here: Longer duration in a current job increases the amount of job-specific human capital, thereby producing larger earnings-experience growth.

G. Employment Status

In the second column of Table 7, we include controls for type of employment status. The principal difference is between those who were salaried, self-employed, or employers, compared with the left-out group—those working in a family business. On average, workers in the first three groups earn twice as much as those who work in a family business. Table 10 categories describe a career progression that often begins in a family owned enterprise, transits into salaried employment, and for some concludes with ownership of their own businesses. This transition between employment states is an important reason for career wage growth. If we compare the regressions in Table 7 in which we control for employment status to those in which we do not, the average experience-related growth in income declines by a third.

These results indicate that the family may serve an important informal training ground for each new generation of workers, with first jobs frequently in family-owned businesses. Rural Malays typically start careers as agricultural workers on family farms. But their employment on the family farm erodes quickly as workers become salaried employees for other agricultural employers, and eventually (much later in their careers) many become owners of their own farms. Similar to the worker-farmer progression for Malays in agriculture, many Chinese transit from entry-level jobs as assistants and helpers in family-owned shops to ownership of their own businesses.

Table 10. Type of Job—Job Cohort 1946–1950

	Years of Experience					
Type of Job	*1*	*5*	*10*	*15*	*20*	*25*
Salaried	73.9	77.6	76.4	72.0	67.7	64.0
Self-employed	11.2	13.7	18.0	19.9	23.9	27.3
Family Business	14.3	7.5	3.1	3.1	2.5	1.2
Employer	—	0.6	1.2	3.1	4.3	4.3
Home Production	0.6	0.6	1.2	1.2	1.9	3.1

H. Time Related Variables

In the specifications listed, the first two columns of Table 7 which do not include any calendar time variables, there remains an unexplained 1% growth in average male income over time. The regression summarized in the final column of Table 7 contains the two calendar time variables that we found significantly impacted on secular growth in Malaysian incomes. The first variable, Malaysia's commodity terms of trade, is an excellent summary measure of external changes in Malaysia's relative economic position. We found that a 10% increase in export prices relative to import prices would increase average real Malaysian wages by 2%. However, since terms of trade have deteriorated for Malaysia during the post World War II era (largely due to declining rubber prices), secular trends in terms of trade cannot explain Malaysian income growth. Instead, changing world price structures actually reduced income growth of Malaysian men, raising the remaining income growth that is unexplained.

The other calendar time variable is the *ln* of the average yield per hectare in rubber estates, our best available time series proxy for productivity advances in Malaysia's principal economic activity. We estimate that a 1% increase in average yield raised male income by .25%. When this productivity variable is included, there is no time related real income growth left unexplained. Table 11

Table 11.A. Productivity Advances in Rubber and Rice

Rubber			*Rice*	
Year	*Output Per Worker*	*Output Per Planted Acre*	*Year*	*Average Productivity Per Acre*
1915	.20	.07	1934–38	17.2
1933	.89	.14	1955	19.7
1968	2.71	.34	1965	25.7
1972	3.31	.43	1975	30.1

11.B. Extent of Double-Cropping of Rice

	Acreage Planted (thousands)			*Production (thousands of log tons)*	
	Wet Rice				
Year	*Main Season*	*Off Season*	*Dry Rice*	*Main Season*	*Off Season*
1960	864	21	61	868	23
1970	938	326	54	1002	377
1975	920	527	24	1008	668

summarizes the significant time series productivity growth that has occurred both in rubber and rice, reflecting the emphasis Malaysia has historically given to research and development in its important economic activities. The principal technological developments in rice were the introduction of new varieties and the increased frequency of double cropping. Double cropping has expanded in the last fifteen years and accounted for much of the increase in production. Double cropping was greatly facilitated by irrigation projects, and the introduction of new varieties with shorter gestations.

Similarly, the principal cushion against falling rubber prices has been the increased use of high-yielding varieties and other technological improvements[28] that were developed by the Malaysian Rubber Research Institute. In 1920, average yield was about 325 pounds per acre, but by 1970, clones producing in excess of 2,000 pounds per year were in common use. Between 1968 and 1972 alone, output per worker rose by 5% per year. Large estates adopted new varieties more rapidly, but substantial new plantings in high-yield varieties were common even among smallholders by 1976.

Although frequently cited, other explanations, summarized in Table 12, did not appear too promising in the Malaysian context. Industrialization, as indexed by relative size of manufacturing employment, was and remains too small a part of the aggregate Malaysian economy to have played a central role in its national economic growth. Given its relative size of about 10% of total employment, even enormously high growth within the manufacturing sector would not have translated into significant levels of aggregate economic growth.

Similarly, Table 12 indicates that growth in income per capita long preceded any diversification either in the composition of export goods or the nations that are the principal consumers. Before 1965, the proportion of exports accounted for by tin and rubber remained remarkably stable, at levels exceeding 60%.[29] Similarly, (to the extent there is any trend) the dependence on three largest nations as purchasers of its exports may have grown slightly over time.

Table 12. Summary Statistics on Time Related Variables

Year	*% of Total Employment in Manufacturing*	*% of Export Value in Rubber and Tin*	*% of Export Sales to U.S.A., Japan, U.K.*
1947	7.0	59.5[a]	NA
1957	7.4	62.7	32.1[b]
1962	7.7	64.3	43.8
1967	8.5	54.5	46.8
1972	10.2	45.6	38.2
1976	10.2	34.4	41.6

Notes: [a]1949, [b]1958

V. CONCLUSIONS

This paper has investigated some consequences of Malaysian economic growth, and the manner in which development affected labor markets. With regard to equity issues, this research suggests that some care must be exercised in positing tradeoffs between economic growth and equity. While some of the distributional effects we found when measuring standard skill dimensions (i.e., in favor of the more educated or the young) may appear to be in conflict with widely held distributional desires, we also found that economic growth raised the relative income of ethnic Malays, by far the poorest social class in Malaysia.

In this research we have also attempted to identify some reasons for the substantial amount of career and calendar time for Malaysian wage growth. The two factors that seem most crucial for career wage growth are participation in formal training programs and the informal training that takes place as workers transit from family business to salaried employment. The investments made in improving the skills of its people through formal schooling and job training programs, and the emphasis placed on technical advances in its most important commodities, seem the most cogent explanations for Malaysia's growth.

ACKNOWLEDGMENT

This research was supported by a grant from the Agency for International Development.

NOTES

1. Spurred by the quadrupling of oil prices, petroleum production rose from 4,000 to 210,000 barrels a day during the 1970s. Because of its recent emergence, oil had an insignificant part in the economic development of Malaysia during the historical period considered here.

2. Ever-married women were sampled because the primary purpose of the Malaysian Survey was to provide data on economic and biomedical relationships affecting birthspacing, family size, breast-feeding, and contraceptive use. For a description of the survey design and instruments see W. P. Butz and J. DaVanzo, *The Malaysian Family Life Survey: Summary Report*, The Rand Corporation, R-2351-AID, March 1978.

3. It also depends on other factors, especially the extent of job turnover and mobility.

4. The following table summarizes the distribution of the number of employment observations per male:

Number of Observations	*Number of Men*
1	0
2–4	25
5–9	281
10–14	427
15–19	250
20–24	55
25+	9
Total	1,047

5. To mitigate the extent of this bias, considerable care was taken in the survey to cross-reference and check errors across different life events (i.e., employment, marriage, education and training, and births of children). The referencing of employment events with these other life experiences should reduce inconsistencies and provide more accurate timing. In spite of these efforts, misreporting no doubt still exists.

6. With the exception of two episodes, the Malaysian economy experienced remarkable price stability, with a price index no higher in 1970 than it was in 1950. Between 1949 and 1951, prices rose over 30 percent and in the four years after 1972, prices rose by 47 percent. Although these two episodes are short, they may well create problems with retrospective data. First, the interview took place in 1976, following 4 years of rapid nominal price and wage increases. The late 1940 period is also troublesome since we are surely taxing the respondents' ability to remember such conditions 25 years in the past. In this research, real incomes are expressed in 1970 Malaysian dollars. Sources for deflator are available from the author.

7. Because earnings were reported in different time intervals, it was necessary to standardize wage receipts to conform to a common monthly equivalent. Seventy percent of the sample reported their income on a monthly basis. If we add the two next most common intervals, daily and yearly, we account for over 97 percent of the sample. To minimize the number of observations we must adjust, a monthly payment interval was adopted.

8. Direct wage payments and the monetary value of all bonus or in-kind income were summed to obtain the total monthly income. Forty-one percent of the sample received either bonus or in-kind payments, most commonly in the form of a yearly bonus or food and housing payment in kind.

9. Years prior to 1949 were excluded because a price deflator does not exist before then. More important, the 1940s were obviously dominated by the Japanese occupation and the post World War II recovery—events that distort the more general development lessons we seek.

10. Given the retrospective design of the data, this statistical specification could be questioned. Retrospective wage data probably have larger variance, the greater the demands on memory. This consideration argues for heteroscedasticity, but a residual variance plot against time did not suggest that this extension was promising.

11. However, in the most famous of such models—the Ben-Porath variant—investment paths are neutral with respect to levels of initial stocks.

12. Some empirical support for these interactions is reported by Weiss and Lillard using U.S. data on scientists. They found that earnings growth rates at a given year of experience were higher for those of more recent vintages (or equivalently, men observed at a later date.)

13. Malaysia is divided into 70 districts and each district was assigned a code indicating the degree of urbanization in 1970. While our locational indicators signify place of residence at the time of our income observation, so that they vary across time and people, the separation of districts into the other urban and rural areas is based on their status in 1970. Thus, we do not allow a given district to change its classification over time. Foreign country means that one lived outside Malaysia at the time of the specific income observation.

14. For simplicity, time and experience are interacted with residence in any nonrural place. In a more detailed specification, we permitted the effects of time and experience to vary within each of the urban dummies used in Table 4. We did not find any significant differences among the urban places, so the more parsimonious specification of Table 4 is presented in the text.

15. These ethnic specific conclusions summarized in the text are not altered when a more complete set of regressors (urbanization, etc.) are included.

16. This index was constructed from the detailed occupational codes for respondents' fathers. This index scales income relative to production workers, where the income weights were obtained from the 1976 cross-sectional wage by occupations of sons. Clearly, the main problem with this index

is that with limited intergenerational occupational mobility, the index implicitly captures wage differences by son's occupation.

17. This is consistent with the majority of research on status attainment using U.S. data. In addition, this same literature reports that unmeasured family background variables have important direct effects (see Griliches, 1979.)

18. A splined schooling variable is used in Table 6, with the slopes of the linear segments allowed to differ at the primary, secondary, and university levels.

19. In the third and fourth specification in Table 6 we drop three family background variables; mother's education and number of siblings because they are insignificant and father's occupation index because of the difficulty of interpretation mentioned in footnote 16.

20. Illiteracy is defined as the inability to either read or write. As the following indicates, illiteracy is sharply reduced with the accumulation of the first few years of school.

Proportion Illiterate by School Completion

Years of Schooling	*Proportion Illiterate*
0	81.8
1–2	60.9
3	28.6
4–6	8.1
7+	1.2

21. The three labor supply measures are *ln* weekly hours worked, the number of jobs, and a dummy variable for looking for work (i.e., unemployed). All three variables are retrospective and thus pertain to an individual's observation for each year.

22. The Health Status variable is derived from two questions: the existence of a physical illness or disability in 1976 and the duration in years of that illness. Therefore, we exclude any illness that did not exist in 1976.

23. Employment status variables include three dummy variables indicating employment as salaried employee (full or part time), self-employed, or employer. The left-out group are those in family businesses or in home products for sale.

24. Labor supply decisions are clearly endogenous. The goal of this paper is not, however, to model the joint life-cycle wage labor supply decisions, a topic that easily merits a paper of its own. Rather, I am simply trying to determine, in an accounting sense, how much of life-cycle wage variation is due to labor supply. Similar observations would apply to the migration, job mobility and type of worker variables.

25. These life-cycle patterns in Table 8 obey the most persistent law of migration—the concentration of migration among the young and declining migration propensities with age. Perhaps the most remarkable thing about Table 8 is the ability of recall data to pick up this well-established life-cycle shape.

26. The following is the proportion of the sample with training:

	Years of school				
All	0	1–6	7–9	10–13	14+
22.2	7.1	16.9	24.8	43.5	69.6

27. The following is the cumulative proportion with training by cohort:

Year of First Labor Market Experience	Years of Labor Market Experience						
	1–5	*6–10*	*11–15*	*16–20*	*21–25*	*26–30*	*31–35*
1971–1975	.22						
1966–1970	.16	.18					
1961–1965	.19	.26	.28				
1956–1960	.14	.21	.22	.22			
1951–1955	.14	.19	.21	.24	.26		
1946–1950	.14	.18	.21	.21	.22	.23	
1941–1945	.04	.12	.14	.15	.17	.18	.19

28. In addition to high-yielding varieties, two important changes have been the substitution of polybags in place of cups (which increases the intervals of collection from 2 days to 4 or 5 days) and the use of stimulants such as ethrel. Tapping of trees usually begins 6 or 7 years after planting and the productive life of trees is around 35 years. Thus, there is a substantial lag before the benefits of introducing new varieties begin to accrue.

29. The diversification after 1962 was more a reaction to significant changes in price structure, particularly for palm oil and petroleum, rather than a decision to diversify for its own sake.

REFERENCES

Ben-Porath, Y. (1976) "The Production of Human Capital and the Life Cycle of Earnings." *Journal of Political Economy,* Vol. 75, No. 3, (June).

Butz, W. P., and J. DaVanzo. (1978) *The Malaysian Family Life Survey: Summary Report,* The Rand Corporation, R-2351-AID, (March).

Griliches, Z. (1979) "Sibling Models and Data in Economics: Beginnings of a Survey," *Journal of Political Economy,* Vol. 87, No. 5, (October).

Welch, F. (1970) "Education in Production," *Journal of Political Economy,* Vol. 78, (February).

Weiss, Y. and L. A. Lillard. (1978) "Experience, Vintage, and The Effects in the Growth of Earnings: American Scientists, 1960–1970." *Journal of Political Economy,* Vol. 86, No. 31.