EDUCATION AND LABOR FORCE COMPOSITION IN SOUTHEAST AND EAST ASIAN DEVELOPMENT

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INTRODUCTION

SINCE the conception of the "manpower" and the "human resources" theories in the early 1960s, education has been advocated as one of the critical factors for development.[1] In fact, the last two decades saw unprecedented expansions of education in the developing countries, which, coupled with the large sizes of the young-age cohorts, created massive influxes of educated work forces into the labor markets [5]. Despite the early optimism, however, the shift in the supply of educated workers was often not met with the corresponding shift in demand. Now there is growing concern about the "excess supply" of educated labor or the "overexpansion" of education in the developing countries.[2] Evidently, the relation between education and development is far more complex than was once theorized.

An advantage the current students of manpower and development have over those two decades ago is that the data on the educational composition of population and labor force are available not only for a greater number of developing countries but also more frequently in combination with distribution of other attributes, such as age, industrial sector of employment, or occupation.[3] Moreover, since those data have been accumulated over the past years, it is now possible to identify different patterns of development rather than a single "typical" path of growth and the corresponding differences in the role of education by comparing the experiences of development across countries.[4] An analysis of manpower is thus allowed to incorporate structural and flexible viewpoints.

This paper is a partial summary of my study which is reported in more detail in a monograph published in Japanese [8]. I thank Professor Ikuo Arai, Professor Yukio Watanabe, and Mr. Akio Yonemura for their generous advice.

1 Harbison and Myers [4] and Schultz [14] were most influential among others.

2 Recent studies by sociologists tend to emphasize the mechanism of self-reinforcement of the demands for educational opportunities and, by implication, cast doubt on the actual contribution of education to development [3] [11].

3 A study by OECD [12] heralded the structural analysis of manpower by examining the composition of labor force by education, industry, and occupation. It has been criticized, however, for its rigid framework of analysis built upon the assumption that every country follows a similar path of the change in labor-force composition in the course of development.

4 Differentiation among the developing countries in terms of the pace and pattern of development is one of the significant phenomena in the development scene in past decades.

Specifically, the following three questions emerge as the keys for further theoretical development. First, how did the educational composition of adult population and that of labor force change over time in past decades, and what were the points in common and differences among countries in this aspect? Second, how were the educated labor absorbed in the labor markets, and how was this absorption reflected in the educational compositions of labor force by industrial sector or by occupation? And third, how did the differences in the manpower structure correspond to the patterns of development, and what can be speculated about the causal relation of education to development from this standpoint?

In the present study, I intend to seek preliminary answers to these questions, while limiting the focus of empirical examination to selected developing countries in Southeast and East Asia. The choice of this particular region is primarily due to the accessibility of the relevant data and their background information, which are essential in undertaking a meaningful cross-national comparison. Few would doubt, however, the significance of the region in the world development scene, in view of either the size of population or the dynamism of development. Moreover, the differentiation of development patterns has been dramatically demonstrated in the region. In East Asia, the Republic of Korea and Taiwan achieved tremendous economic growths and general improvement in their employment situation through a development pattern called "export-led growth" or "export-substitution." On the other hand, Southeast Asian countries are considered to have led "import-substitution" growths, which lack strong expansion of exports of manufactured goods [13] [15]. Although not necessarily lower than those of the other developing countries elsewhere in the world, the growth rates of Southeast Asian countries were modest and the employment problems showed limited improvement in the course of development. Relating these differences to the patterns of educational endowment would provide fresh insights into the functions of education under different patterns of development and their consequence on employment.

To facilitate a sensible cross-national and over time comparison, a data base of the educational compositions of population and of labor force by age, industry, and occupation was developed from the censuses and labor force surveys of selected countries in the region, through a standard classification system of education, industry, and occupation.[5] For a rough description of the data base, readers are referred to Appendix A. It should be noted, however, that the numbers of observations that the data base comprises are limited and uneven among the countries due to the scarcity of relevant original data. Furthermore, there are intrinsic problems in comparing employment statistics across countries or over time because of the differences in the definition of employed and other

The systematic analysis by Chenery and Syrquin [2] about past development of the developing countries based on a large data employs the pattern of development as the principal analytical concept. Myer et al. [10] tried to relate education to growth using similar data but their analysis did not incorporate this viewpoint.

[5] The data base is the product of cooperation between Mr. Akio Yonemura and myself.

technical factors of survey.[6] The empirical analyses in this study are therefore subject to potential biases, and the discussions developed therefrom should be taken as tentative ones.

The present report is organized in the following order. In Section I, the educational composition of the adult population and that of the labor force will be statistically analyzed in relation to the level of economic development and the structural difference between Southeast and East Asia. In Section II, the same statistical analysis will be applied to the educational compositions of labor force by industry and by occupation. And finally, some decomposition analyses of the growth rates of national income and employed labor force will be undertaken in Section III, which, together with the findings from the previous sections, will lead to a discussion about the relation between the endowment of education in labor force and the pattern of economic development.

I. EDUCATIONAL COMPOSITION OF ADULT POPULATION AND LABOR FORCE

The data for educational composition of adult population (age fifteen or over) by age is available for Indonesia (1961, 1971, and 1976), Korea (1960, 1966, 1970, and 1975), Philippines (1960, 1970, and 1975), Thailand (1960 and 1970), and Taiwan (1956, 1966, 1970, and 1975). Two observations for Japan (1960 and 1970) were also added to the data base for reference. Since the educational classifications vary considerably from one country to another, the data were first matched to a detailed standard classification, and then transformed either (1) through a set of dichotomous aggregations, or (2) through a simple aggregation, of the detailed classification.[7] For the analysis of educational composition of the adult population, I used the data set obtained through dichotomous aggregations, for it represents the degree of diffusion with each level of education.[8] The proportion of adult population who completed at least the eth level of education is called the completion rate at the eth level. It was computed with the following criteria: some experience of primary education (0+), completion of six or seven years of primary education (1+), completion of lower secondary education (2L+), completion of upper secondary education (2U+), and some experience in higher education (3+). Note that the completion rate at 0+ is necessarily greater than that at 1+, which, in turn, is necessarily greater than that at 2L+, and so forth.

Although the limited number of observations and the data problems afore-

[6] For discussions about the problems involved in comparing employment data of the Asian countries, see [7].

[7] For a further description of the standard classification, see Appendix B.

[8] A technical reason also in favor of the use of the set of dichotomous aggregation is that the adult population includes a large number of students currently enrolled in schools. Dividing the population into subgroups according to the highest education completed is therefore misleading. It is, naturally, not the case when one analyzes the educational composition of the labor force.

TABLE

REGRESSION ANALYSIS OF THE EDUCATIONAL COMPLETION

$100(P_{a,e}/P_a)$

	Total Population Age 15 and Over				Age 15–19			
	b_0	b_1	b_2	R^2	b_0	b_1	b_2	R^2
0+	−131.4	20.5***	−10.2***	0.80***	−58.5	9.2***	−0.3	0.45***
		(2.6)	(4.3)			(2.8)	(4.6)	
1+	−147.4	16.0***	26.9***	0.79***	−102.0	9.3***	40.6***	0.74***
		(4.1)	(7.0)			(5.0)	(8.5)	
2L+	−98.0	23.3***	1.5	0.77***	−93.8	23.0***	9.2*	0.66***
		(3.7)	(6.3)			(5.8)	(6.4)	
2U+	−44.8	11.0***	−0.0	0.80***				
		(1.5)	(2.6)					
3+	−7.3	1.7***	0.7	0.39***				
		(0.5)	(0.8)					

Source: See Appendix A.

Notes: 1. The number of observations is thirteen for 2L+ and eighteen for otherwise.

2. Standard deviation of estimation in parentheses.

mentioned erode the validity of statistical methods in a strict sense, here I resorted to a crude regression analysis as a means to obtain preliminary summaries from the observations in the data set. For the regression analysis, it was hypothesized that the completion rate at a level of education, the dependent variable, is positively related to the level of economic development, but there are systematic differences between Southeast and East Asia in the absolute level of the completion rates.

In symbols, the regression model is

$$100(P_{a,e}/P_a)=b_0+b_1\cdot\ln y+b_2\cdot D+u\,,$$

where $100\,(P_{a,e}/P_a)$ is the completion rate at the eth educational level of the population in the ath age bracket, $\ln y$ is the index of log-transformed per capita GDP in real terms,[9] D is the dummy variable that assumes value 1 for the East Asian countries and value 0 for Southeast Asian countries, and u is the error term. Since the regression analysis is applied to the data set where the observations in different time-periods and in different countries are pooled, the estimated value of regression coefficient b_1 would stand for the average effect of the increase in $\ln y$ over countries and over time-periods, while that of b_2 would measure the systematic difference between the two regions after the effect of the difference in $\ln y$ is controlled for.

It should be noted, however, that the estimates obtained from the above regression scheme are potentially biased due to two technical problems. The first is that, since the dependent variable ranges only between 0 to 100 per cent,

[9] The values of y were derived from [1] in terms of market price in 1967–69 U.S. dollars.

I

RATES OF ADULT POPULATION BY AGE GROUP

$= b_0 + b_1 \cdot \ln y + b_2 \cdot D + u$

Age 20–24				Age 25–29			
b_0	b_1	b_2	R^2	b_0	b_1	b_2	R^2
−76.9	11.9***	−1.0	0.48***				
	(3.3)	(5.5)					
−109.0	10.4***	39.4***	0.72***	−126.8	12.3***	41.3***	0.77***
	(5.3)	(9.0)			(5.2)	(8.8)	
−95.8	24.3***	8.9	0.72***	−94.7	23.0***	7.9	0.71***
	(4.9)	(8.3)			(4.7)	(7.9)	
−71.2	17.6***	1.8	0.79***	−60.9	14.8***	2.6	0.73***
	(2.7)	(4.5)			(2.7)	(4.6)	
				−12.8	3.4***	−1.3	0.50***
					(0.8)	(1.4)	

3. R^2 is adjusted for degree of freedom.
*** Significant at 1 per cent level.
** Significant at 5 per cent level.
* Significant at 10 per cent level.

the error term u is bound to take positive or negative value as the estimated value of regression approaches the value boundaries, thus causing heteroscedasticity. The potential bias will be negligible, however, as long as the dependent variable stays well within the value boundaries.[10] The second problem is the potential dependence among the error terms for the same country in the different time-periods or for the same time-period of different countries, which would create auto-correlation.[11] The limited number of observations does not allow a check through covariance matrices, and further examination about this point is left for more systematic studies in the future.

The regression analysis was undertaken with the data set including the two observations for Japan as one of the East Asian countries and with that excluding Japan. The regression results were essentially similar to each other, and the former is reported in Table I. Three points should be observed.

First, the coefficients of determination (R^2, adjusted for the degree of freedom) are generally high, with the exceptions of those for the completion rate at tertiary education in all the age brackets and those at lower primary education in the young age brackets. The lack of explanatory power of the regression model

[10] The standard measure to avoid this problem is the probit or logit transformation of the dependent variable. However, by these transformations the unit of the resulting regression coefficients will no longer be percentage points, which makes the direct interpretation of the regression results difficult. Furthermore, the theoretical justification of using any particular specification of transformation is not necessarily trivial in this case.

[11] For an extensive discussion about the problems caused by the pooling of time-series and cross-sectional data, see [2, pp. 141–77].

when the completion rate at tertiary education becomes the dependent variable reflects the large institutional differences across the countries. On the other hand, the division of the young population with the criterion of any experience in primary education brings about poor results of regression mainly because the absolute values of the proportion are approaching 100 per cent, making the imposition of linear relation improper.

Second, the highest regression coefficients on log-transformed per capita GDP are found when the completion rate at lower secondary education is taken as the dependent variable and then the next highest appears with the completion rate of upper secondary education. The strongest link between the growth of enrollment and economic growth thus appears to lie in secondary education. It should be remembered here that in their influential work [4], which heralded the "manpower approach," Harbison and Myers obtained strong correlation between the diffusion of secondary education and the levels of economic development from a cross-sectional analysis and they considered it as an evidence of the strategic importance of the "middle-level manpower." Much more systematic investigation of the cross-sectional data by OECD [11] also found the strongest correlation between the proportion of the workers with secondary education and the levels of economic development. My empirical finding from the data of Southeast and East Asia is congruous with these preceding studies. We should remain more cautious in its interpretation, however, for a strong correlation or a regression coefficient may reflect opposite directions of causality. In fact, the rapid expansion of enrollment at the secondary levels of education appears to be rather evidence of the effect of growth on educational expansion, reflecting a high income elasticity of demand for educational opportunities at the secondary level. It does not, however, preclude potential contributions of secondary school graduates in the course of development.

Third and the most striking finding comes from the regression analysis of the completion rate of upper primary education or the proportion of the adult population that completed at least six or seven years of primary education. The East Asia dummy assumes large and significantly positive coefficients at this level in all the age brackets. As these results indicate, the proportion of the persons who completed at least upper primary education among the adult population is on the average 27 percentage points greater in the East Asian countries than in the Southeast Asian countries after the levels of economic development are statistically controlled. Moreover, the difference has not been diminishing in last two decades, for the coefficient of the dummy becomes even greater when only younger age brackets are taken up for regression. Among the younger generations, the completion rate of upper primary education averages around 40 percentage points higher in the East Asian countries than in the Southeast Asian countries. This does not imply that enrollment rates are generally low at the primary level in the Southeast Asian countries. In fact, if any experience in primary school is taken as the criterion, the completion rate is slightly higher in the Southeast Asian countries. But, presumably the dropout rates in higher grades of primary schools were significantly higher in Southeast Asia and the

TABLE II

REGRESSION ANALYSIS OF THE EDUCATIONAL COMPOSITION OF LABOR FORCE

$100(L_g/L)=b_0+b_1\cdot\ln y+b_2\cdot D+u$

	b_0	b_1	b_2	R^2
E0	200.8	−28.2**	−9.1	0.41**
		(11.5)	(15.4)	
E1	7.5	3.6	3.3	−0.19
		(12.4)	(16.7)	
E2	−89.1	19.8**	9.5	0.24**
		(7.2)	(9.6)	
E3	−19.2	4.9**	−3.7	0.33**
		(1.8)	(2.4)	

Source: See Appendix A.

Notes: 1. The number of observations is fourteen.
2. Standard deviation of estimation in parentheses.
3. R^2 is adjusted for degree of freedom.

** Significant at 5 per cent level.

difference did not change dramatically in last two decades. Also, some Southeast Asian countries have two-tier systems of primary education, which tend to depress the completion rate at the upper level of primary education. Thailand is a typical example of this phenomenon. In any case, if there was any structural difference between the East and Southeast Asian countries in terms of the endowment of education among their population that can not be accounted for by the simple relation between educational expansion and the level of per capita income, it was the remarkably high completion rates of at least six years of primary education but not those at secondary or tertiary education.

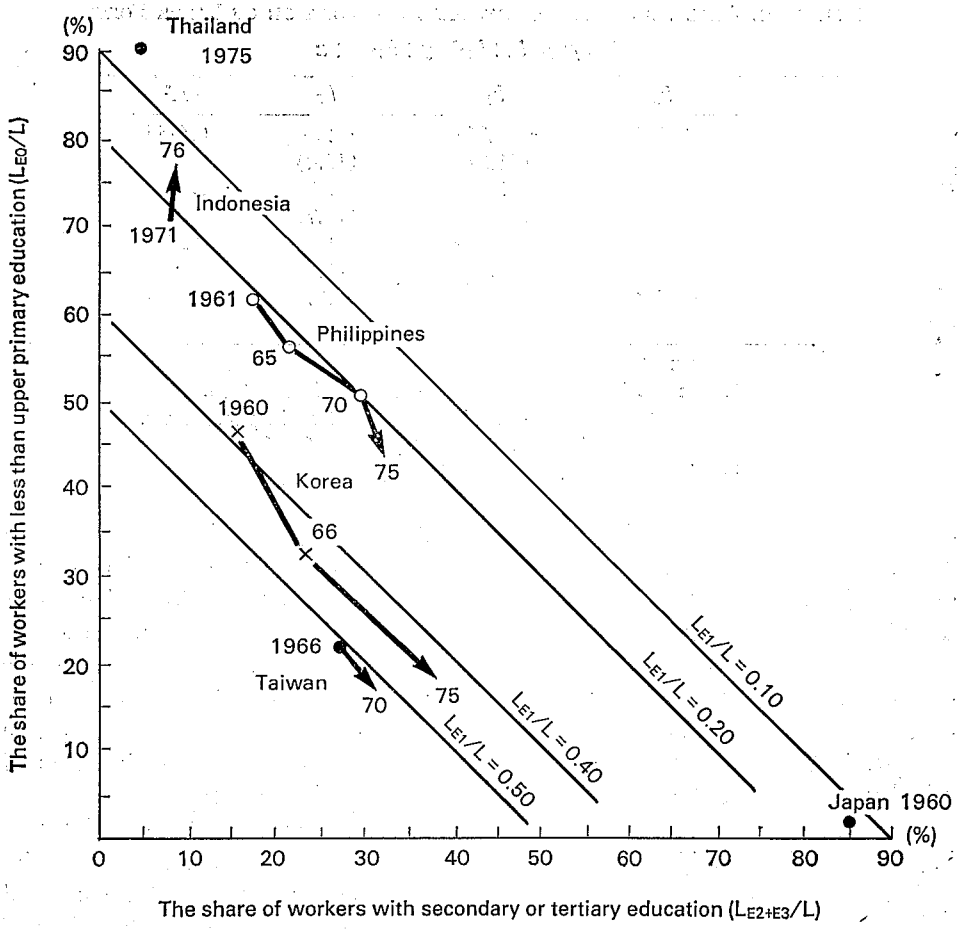
How do these patterns of the relation of the completion rates of education in adult population with the levels of economic development reflect on the educational attainments of the labor force? A regression analysis of the shares of the workers by different educational qualifications (L_g/L) on log-transformed per capita GDP (ln y) and the East Asia dummy (D) was undertaken, and its results are reported in Table II.[12] Note that the educational classification used in this analysis is the simple aggregation of the detailed standard classification, instead of the dichotomous aggregation, so that the ratio L_g/L should be understood as the share of the workers whose highest educational qualifications belong to the educational level g.[13]

On the whole, the performance of the regression analysis is inferior to the previous analysis of the completion rates in adult population. One reason is that the wide variance of the education-specific labor force participation rate among countries, which is partly due to the differences in the definition of employed, creates additional disturbance. Another is that for some educational levels, L_g/L

[12] The data include Indonesia in 1971 and 1976; Korea in 1960, 1966, and 1975; Philippines in 1961, 1965, 1970, and 1975; Thailand in 1975; Taiwan in 1966 and 1970; and Japan in 1960 and 1970.

[13] For the description of the simple aggregation of educational classification, see Appendix B.

Fig. 1. The Pattern of Changes in the Educational Compositions of the Labor Force



Source: See Appendix A.

would draw a curve-linear relation with ln y, for it grows with ln y at first, and then levels off or decrease as it is substituted by the shares of the higher levels of education. This is particularly evident with the share of primary school graduates. Nonetheless, one can observe from the table that the findings with the total adult population do not run in counter to those with the labor force: the strongest regression coefficient on ln y appears with the proportion of secondary school graduates (E2) and the East Asia dummy assumes a negative value with the share of the workers with less than upper primary education (E0).

The contrast between the Southeast and East Asian countries in terms of the pattern of the change in educational composition of the labor force is better illustrated by presenting them in graphical form. The vertical axis of Figure 1 measures the share of the workers with less than upper primary education (E0), while the horizontal axis measures the share of the workers with secondary or

tertiary education (E2+E3). Notice that the oblique lines stand for isoquants of the share of the workers with only upper primary education (E1). A typical economy would shift from the upper-left corner to the lower-right corner as higher educational qualifications prevail among the labor force. We observe in this figure that Taiwan and Korea are following deeper or more concave paths than those followed by the Southeast Asian countries, especially the Philippines. This suggests that in the East Asian countries the reduction of the share of E0 was accompanied by an increase in the share of E1 at first, and then by the increase in the share of E2+E3; while in the Southeast Asian countries it was directly replaced by the increase in the share of E2+E3. Again, the major difference in the pattern of the change in the educational composition appears to be in the swift diffusion of primary—but not secondary or tertiary—education in the East Asian countries.

II. EDUCATIONAL COMPOSITION OF THE LABOR FORCE BY INDUSTRY AND BY OCCUPATION

How were the growing numbers of educated labor absorbed in the economies, and how did the educational composition of the labor force in each industrial sector or in each occupational group change under the growing supply of educated labor? Table III summarizes the results of regression analyses of the shares ($L_{i,g}/L_i$) of the workers with the educational qualification g in the labor force of the industrial sector i on ln y and the regional dummy.[14] The following points deserve particular attention.

First, the shares of the workers with no experience of education (NOS) decrease rapidly with the increase in per capita GDP in all the industrial sectors, as indicated by the negative and significant values of the coefficients on ln y. But when the shares of all the workers with less than upper primary education are taken together, the effect of the increase in per capita GDP becomes less prominent and the East Asia dummy assumes negative and significant values, indicating significantly less proportions of the workers with less than upper primary education in the region. Most notably, this tendency is more salient in the agriculture (A) sector and in the manufacturing (M) sector. The share of workers with less than upper primary education in the labor force in the A sector is on the average 40 percentage points less and that of the M sector is 35 percentage points less in East Asia. The higher completion rates of upper primary education among the adult population in East Asia clearly reflected in these results.

Second, the shares of the workers with only upper primary education generally do not show strong relation with ln y, for the increase in the completion rate of primary education is compensated for by the increase in entrants into

[14] For the description of the industrial classification, see Appendix C. The samples include Indonesia in 1971 and 1976, Korea in 1966 and 1975, Philippines in 1961 and 1965, Thailand in 1970 and 1975, Taiwan in 1966 and 1970, and Japan in 1960 and 1970. The exclusion of Japan from the sample did not change the estimated values of regression coefficients in any substantial degree, but the levels of significance of some coefficients slightly lessened.

TABLE

REGRESSION ANALYSIS ON THE EDUCATIONAL $100(L_{i,g}/L_i)$

	A Sector				M Sector			
	b_0	b_1	b_2	R^2	b_0	b_1	b_2	R^2
NOS[a]	146.2	−24.0***	16.5***	0.92***	96.0	−15.5***	0.4	0.87***
		(2.4)	(3.4)			(2.7)	(3.8)	
E0	143.7	−13.1**	−39.7***	0.84***	129.7	−14.7	−34.9***	0.55**
		(8.0)	(11.4)			(12.3)	(16.9)	
E1	45.9	−6.4	36.4***	0.72**	55.8	−5.6	19.5	−0.15
		(7.0)	(10.0)			(16.0)	(22.0)	
E2	−88.4	19.0**	3.6	0.48**	−77.3	18.0***	15.4	0.52**
		(11.0)	(15.7)			(9.4)	(13.0)	
E3	−1.3	0.3	−0.3	0.28	−8.3	2.2*	0.0	0.12
		(0.2)	(0.3)			(1.5)	(2.1)	

Source: See Appendix A.

Notes: 1. The number of observations is twelve.
2. Standard deviation of estimation in parentheses.
3. R^2 is adjusted for degree of freedom.

secondary or tertiary education, leaving the share of the primary school graduates stable over time. A striking finding here, however, is the high and positive coefficient attached to the East Asia dummy, when the regression is applied to the labor force in the A sector. The proportion of the workers with no less and no more than upper primary education in the total labor force in the A sector is about 36 points higher in East Asia than in Southeast Asia after the levels of economic development are controlled for. Thus, the high completion rate of upper primary education in the East Asian countries created large reserves of primary school graduates accumulated in their agriculture sectors, which should have formed potential supplies of primary school graduates for the modern sectors.

Third, secondary school graduates expand their shares in all the sectors with the rise of per capita GDP, as is indicated by the highest coefficients on ln y than any other educational categories. This is a finding expected from the preceding analyses on the educational compositions of the adult population and the total labor force. What deserves attention here, however, is that the coefficients of ln y assume similar values except in the services (S) sector, where obviously the large value of the coefficient for college graduates is depressing that for secondary school graduates. This implies that the growing supply of secondary school educated labor is absorbed into the economy not through a growth of demand from a particular industrial sector but through generally high absorption capacities across the industrial sectors. In this sense, it is misleading to lay emphasis only on the link between the expansion of secondary school graduates and the growth of the manufacturing sector.

III

COMPOSITION OF LABOR FORCE BY INDUSTRY

$=b_0+b_1 \cdot \ln y+b_2 \cdot D$

F Sector				S Sector			
b_0	b_1	b_2	R^2	b_0	b_1	b_2	R^2
56.6	−9.4**	5.2**	0.89**	82.3	−13.4**	1.7	−0.92**
	(1.1)	(1.5)			(1.5)	(2.1)	
96.2	−10.3	−26.3	0.42	106.0	−12.5	−24.5	0.58*
	(11.1)	(15.3)			(8.7)	(12.0)	
76.5	−8.9	14.2	−0.17	62.0	−7.3	11.1	−0.18
	(13.4)	(18.5)			(10.9)	(15.0)	
−66.9	17.3	11.6	0.50*	−40.1	11.9	18.7	0.64*
	(8.5)	(11.7)			(6.6)	(9.0)	
−5.7	1.9	0.5	0.05	−27.9	7.9	−5.4	0.22
	(1.6)	(2.3)			(3.7)	(3.7)	

*** Significant at 1 per cent level.
** Significant at 5 per cent level.
* Significant at 10 per cent level.
[a] A subset of E0.

Fourth, in a sharp contrast to secondary school graduates, the labor force with tertiary education tend to concentrate on a particular industrial sector, i.e., the S sector. Although the coefficients of determination are generally low, reflecting the wide variance of the levels of the supply of college educated labor by country, the difference from other sectors in the regression coefficients of ln y is evident: the percentage gain with a unit increase in ln y of the share of college graduates in the S sector is about twice as much as the total of those in the other sectors. Another point to be noted is that there is no significant difference between Southeast and East Asia in terms of the shares of college graduates by industry once per capita GDP is controlled for, and there is even an indication that the S sector in the East Asian countries tends to have a lower percentage of college graduates. At least, the labor force disposition of the East Asian countries can not be characterized by higher proportions of college graduates or their concentrated use in any particular industrial sector.

The implication of the last point becomes clearer with inspection of the results of a regression analysis of the share of the workers by educational qualification in each occupational category ($L_{f,g}/L_f$).[15] Table IV is a summary of this analysis. We notice in this table that among the white-collar workers the share of upper primary school graduates and that of secondary school graduates are higher in East Asia than in Southeast Asia, although they are declining with the growth

[15] For the description of the occupational classification, see Appendix C. The samples include Indonesia in 1971 and 1976; Korea in 1960, 1966, and 1975; Philippines in 1961, 1965, 1970, and 1975; Thailand in 1970 and 1975; Taiwan in 1966 and 1970; and Japan in 1960 and 1970.

TABLE

REGRESSION ANALYSIS ON EDUCATIONAL

$100(L_{f,g}/L_f)$

	White-collar Workers				Professional Workers[a]			
	b_0	b_1	b_2	R^2	b_0	b_1	b_2	R^2
NOS[b]	16.6	−2.6***	0.1	0.59***	17.1	−2.9***	0.7	0.75***
		(0.7)	(1.0)			(0.5)	(0.7)	
E0	53.9	−8.3**	0.2	0.25	39.6	−6.8*	3.0	0.72***
		(0.2)	(5.2)			(1.3)	(1.8)	
E1	69.2	−11.3***	8.5***	0.57***	41.9	−7.1***	8.6***	0.48***
		(2.8)	(3.7)			(2.3)	(3.2)	
E2	66.4	−6.5	25.3**	0.20	152.7	−24.3**	32.6**	0.45**
		(8.6)	(11.6)			(8.8)	(12.0)	
E3	−89.4	26.1**	−34.0**	0.43**	−143.3	38.1***	−44.2***	0.60***
		(9.4)	(12.5)			(9.9)	(13.5)	

Source: See Appendix A.

Notes: 1. The number of observations is fifteen.
2. Standard deviation of estimation in parentheses.
3. R^2 is adjusted for degree of freedom.

of per capita GDP. The share of college graduates, in contrast, expanded rapidly with economic development, but it is still much smaller in East Asia. The difference is about 34 percentage points. This contrast becomes more salient when only the professional workers are singled out from the white-collar workers. While there is a clear tendency in all the countries for the secondary school graduates to be replaced by college graduates with the growth of per capita GDP (see the large negative coefficient on ln y for E2 and the large positive coefficient on ln y for E3), the East Asian countries have by far the smaller proportions of college graduates in the professional occupations, once per capita GDP is controlled, the average difference from the Southeast Asian countries being as much as 44 percentage points. Again it is affirmed that the advantage of the East Asian countries in terms of the supply of educated labor did not lie in unproportionately large supplies of "high-level manpower." The empirical investigation reveals rather the opposite.

III. PATTERNS OF ECONOMIC GROWTH AND THE SUPPLY OF EDUCATED LABOR

How did the differences in the educational composition of the adult population and hence in the supply of educated labor affect the magnitudes and patterns of economic growth in Southeast and East Asia? This question calls for a systematic analysis of the supply and demand of educated labor in the course of economic development, which is far beyond the scope of the present study.

IV

COMPOSITION OF LABOR FORCE BY OCCUPATION

$= b_0 + b_1 \cdot \ln y + b_2 \cdot D$

Services Workers				Blue-collar Workers			
b_0	b_1	b_2	R^2	b_0	b_1	b_2	R^2
122.2	−20.7***	7.2***	0.94***	95.5	−16.1***	8.4***	0.95***
	(1.6)	(2.1)			(1.1)	(1.5)	
202.5	−29.9***	−7.0	0.50**	194.1	−28.7**	−3.4	0.35
	(10.2)	(13.6)			(11.9)	(16.0)	
15.2	2.6	−0.3	−0.21	22.0	1.6	6.8	−0.19
	(10.6)	(14.2)			(13.5)	(18.1)	
−102.8	23.5***	9.0	0.66***	−107.7	24.8***	−0.2	0.43**
	(6.3)	(8.5)			(8.6)	(11.6)	
−14.9	3.8**	−1.8	0.19	−8.5	2.2	−3.1	0.19
	(1.8)	(2.4)			(1.2)	(1.6)	

*** Significant at 1 per cent level.
** Significant at 5 per cent level.
* Significant at 10 per cent level.
[a] A subset of white-collar workers.
[b] A subset of E0.

Nonetheless, a careful scrutiny of the available date about the growths of the countries in the region, together with the findings in the foregoing analyses, may allow preliminary accountings on the nature of the issue, which would render a basis for future studies

Table V presents the results of a decomposition exercise of the economic growth rates ($\Delta Y/Y$) of Indonesia, Korea, Philippines, and Taiwan into the contributions by industrial sectors, and further into the effects of the changes in (1) the number of employed, (2) productivity, and (3) their interaction, in each industrial sector based on the following identity:

$$\frac{\Delta Y}{Y} = \sum_i \Delta Y_i \cdot \frac{1}{Y}$$

$$= \sum_i \left(\frac{1}{Y} \cdot \frac{Y_i}{L_i} \cdot \Delta L_i + \frac{1}{Y} \cdot L_i \cdot \Delta \frac{Y_i}{L_i} + \frac{1}{Y} \cdot \Delta L_i \cdot \Delta \frac{Y_i}{L_i} \right),$$

(1) (2) (3)

where Y stands for GDP in real term, L for the number of employed, subscript i for industry, and Δ for net increases.[16]

First, we shall examine the breakdown of the total growths into sectoral con-

[16] The output of the M sector in this exercise does not include that from the mining sector, which assumes a substantial part in Indonesia. Also note that the exercise analyses the changes in GDP over the fifteen-year period from circa 1960 to circa 1975 for all the countries but Taiwan, for which an analysis of a nine-year period (1965–74) was extended to obtain a comparable fifteen-year equivalent.

TABLE V

ANALYSIS OF ECONOMIC GROWTH RATES OVER FIFTEEN YEARS

			Distribution by Industrial Sector			
			A	M	F	S
Indonesia, 1961–76:	Total growth rate	0.737	0.163	0.128	0.117	0.329
	of which due to the change in:					
	(1) No. of employed	0.710	0.268	0.077	0.040	0.325
	(2) Productivity	0.001	−0.072	0.026	0.046	0.001
	(3) Interaction	0.026	−0.033	0.025	0.031	0.003
Korea, 1960–75:	Total growth rate	2.304	0.501	0.649	0.343	0.811
	of which due to the change in:					
	(1) No. of employed	1.210	0.132	0.438	0.238	0.402
	(2) Productivity	0.544	0.276	0.046	0.028	0.194
	(3) Interaction	0.550	0.093	0.165	0.077	0.215
Philippines, 1960–75:	Total growth rate	0.881	0.380	0.223	0.038	0.240
	of which due to the change in:					
	(1) No. of employed	0.516	0.086	0.046	0.064	0.321
	(2) Productivity	0.315	0.231	0.142	−0.015	−0.043
	(3) Interaction	0.050	0.064	0.035	−0.011	−0.038
Taiwan, 1965–74:	Total growth rate	1.930	0.122	0.653	0.328	0.827
	of which due to the change in:					
	(1) No. of employed	1.040	0.023	0.408	0.178	0.428
	(2) Productivity	0.525	0.093	0.115	0.076	0.239
	(3) Interaction	0.363	0.005	0.130	0.073	0.154

Source: See Appendix A.

Note: For Taiwan, the growth rate over the nine-year period from 1965 to 1974 was converted into a fifteen-year rate by simply multiplying by 15/9.

tributions. A quick glance at the table suffices to confirm that the robust expansion of the outputs from the M sectors of Korea and Taiwan created substantial direct contributions to the total growth rates. In Korea, 65 percentage points of the total growth rate of 230 per cent over the fifteen-year period came directly from the growth in the M sector. In Taiwan, 65 points of the 193 per cent growth were the direct contribution of the M sector. The corresponding figures for Indonesia and the Philippines are 13 and 22 percentage points, respectively. The M sectors in Korea and Taiwan were indeed the very core of development. The literature on the remarkable growths in Korea and in Taiwan attributed their success in achieving the multifold growths of the M sector in such a short period to the promotion of the export of manufactured goods. This pattern of growth is called "export-led" industrialization, and the policy package designated to promote this type of growth is called a "export-substitution" growth strategy. It may as well have been the truth that the direct leverage for the growth was the trade pattern as claimed, but what made such a pattern of expansion possible,

especially in view of the supply of labor, has not been thoroughly clarified.

A further examination of Table V reveals a striking fact. By far the major proportion of the growth of the M sector in Korea or in Taiwan over the fifteen-year period is attributed to the expansion of the number of employed, while a very small proportion is attributed to the direct contribution of the growth of productivity per worker. In Korea, 44 percentage points of the total 65 percentage points of the growth of the M sector were due to the increase in the number of employed and only 5 percentage points were due to the productivity growth. In other words, 67 per cent of the growth of the M sector (0.438/0.649) or one-fifth of the growth rate of the whole economy (0.438/2.304) was the direct consequence of the increase in the number of employed in the M sector. A very similar picture can be drawn in the case of Taiwan, where the contribution of the increase in the number of employed amounted to 41 percentage points or 62 per cent (0.408/0.653) of the total growth of the M sector. This pattern of the growth analysis of the M sector presents a clear contrast to that of Indonesia or of the Philippines. Especially in the Philippines, the contribution of the increase in the number of employed in the M sector was only 5 percentage points in the fifteen-year period, or only 21 per cent (0.046/0.223) of the total growth of the M sector. The increase in productivity in the Philippines, on the other hand, contributed 14 percentage points or 64 per cent (0.142/0.223) of the growth of the M sector. Thus, the thrust of the growth of the M sector in Korea or in Taiwan was the enormous expansion of the size of employment rather than an improvement in productivity, and here lied the major difference from the Southeast Asian countries.

How, then, was this enormous horizontal expansion of the M sector possible? A standard answer from development economics would be that there was a large potential supply of labor force accumulated in the traditional sector, which can be employed at a near subsistence wage level, and Taiwan and Korea tapped this resource effectively until they finally reached the turningpoint [8]. This seems to be a sound conjecture, but I think that it was not the whole story, particularly from the viewpoint of comparison with the growth of the Southeast Asian countries.

It is important here to recall the finding in the previous section that the proportion of the workers with less than six years of primary education in the labor force in the M sector was very low in the East Asian countries relative to the Southeast Asian countries and that it was declining with economic development. This observation implies that the educational attainment level in the M sector did not deteriorate despite the massive influx of new workers and that by far the majority of these new workers in the M sector had at least primary education, if not much more. Hence, it was not only the large quantity of the labor available at low wage levels but also the quality of that labor which, by making them eligible for the kind of work demanded under export promotion, must have given an impetus to the growth of the M sector of Korea or Taiwan. Also, the especially high proportion of primary school graduates in the A sector can be seen as an evidence of the existence of vast reserve of surplus labor with primary

TABLE VI

NET INCREASE IN EMPLOYMENT IN KOREA BY INDUSTRY AND BY EDUCATION, 1966–75

(1,000 persons)

Sector	Total No. of Employed (1966)	Net Increase				
		Total	E0	E1	E2	E3
All sectors	7,960	4,721	−335	2,228	2,464	500
		(100.0)	(−7.1)	(47.2)	(52.2)	(10.6)
A	4,552	1,657	−181	1,287	538	13
		(100.0)	(−10.9)	(77.7)	(32.5)	(0.8)
M+F	1,430	1,821	−120	634	1,133	175
		(100.0)	(−6.6)	(34.8)	(62.2)	(9.6)
S	1,978	1,237	−171	306	790	311
		(100.0)	(−13.8)	(24.7)	(63.9)	(25.1)

Source: See Appendix A.

Notes: 1. Per cent distribution in parentheses.
2. The breakdowns may not add up to the total due to rounding.

education accumulated in the A sector. There was almost a saturation of primary education. One could then argue that the reservation wage for the primary school graduates should not have been much higher than the subsistence wage level in the A sector. Under these circumstances human capital in the form of primary education may not have had much labor market value for a typical individual, but its potential value would have been fully exploited by the expansion of the manufacturing industries that cater to the export demands.

It should be noted, however, that the major source in terms of number of the supply of labor to the M sector was not primary school graduates. As Table VI indicates, of the net increase of employed in the M and facilities (F) sectors of Korea over the period 1966 through 1975, 62 per cent was the net increase in the number of secondary school graduates. The increase of the enrollment rates at the secondary levels accompanied by the increase in household incomes provided the supply of labor force to the M and F sectors. In this sense, a positive cycle between educational expansion and economic growth was functioning through secondary education. Still, we observe that the contribution of the net increase of primary school graduates amounts to a substantial 35 per cent. Moreover, the large potential supply of primary school graduates should have prevented the wage level of secondary graduates from soaring beyond the degree that makes the products lose competitiveness in the international market. Hence, I argue that the large potential supply of primary school graduates was a complementary factor to the major driving force of the supply of secondary school graduates, and this complement was critical to the type of growth achieved in Korea and Taiwan. It was this complementary factor that differentiated the supply structures of the labor force in Korea and Taiwan from those in the Southeast Asian countries.

The discussion so far in this section emphasized the strategic importance of

TABLE VII

ANALYSIS OF THE INCREASE OF EMPLOYED COLLEGE EDUCATED LABOR INTO OCCUPATIONS AND DEMAND FACTORS

(1,000 persons)

	Korea 1966–75					Philippines 1965–75				
	All Occupation	FR	WC	SS	BC	All Occupation	FR	WC	SS	BC
No. in the base year	329					820				
Net increase	478	15	325	84	53	737	73	415	125	124
of which due to the change in:										
(1) Occupational composition	369	9	295	37	28	103	8	40	28	27
(2) Educational composition	57	4	13	27	13	555	57	351	77	70
(3) Interaction	51	2	17	20	12	79	8	24	20	27

Source: See Appendix A.

Notes: 1. The breakdowns may not add up to the total due to rounding.
2. FR stands for farmers.

the growths of the M sectors in the development of Korea and Taiwan and the roles of the supply of secondary school graduates and primary school graduates in them. A brief comment as to the role of the supply of college educated labor is in order.

As the analysis in the preceding section revealed, the increasing supply of college graduates accompanied by economic growth tends to concentrate into the S sector, raising the proportion of the college graduates in the S sector much more than in the other industrial sectors. In fact, as Table VI suggests, even in Korea where the growth of the M sector was tremendous, 62 per cent (331,000/500,000) of the net increase in the number of employed college graduates over the period 1966 through 1975 were absorbed by the S sector, followed by 35 per cent (175,000/500,000) by the M and F sectors. The major contribution of the supply of college graduates in the growth of the Southeast and East Asian developing countries appears to have lain in fulfilling the growing demand for wide societal infrastructures. What, then, was the consequence of a very large supply of college educated labor?

The Philippines and Korea again draw an interesting contrast. Table VII shows the results of an analysis of the growths of employed college graduates over the period 1965 through 1975 in the two countries, following the formula:

$$\Delta L_c = \sum_f \Delta L_f \cdot \frac{L_{f,c}}{L_f} + \sum_f \Delta \frac{L_{f,c}}{L_f} \cdot L_f + \sum_f \Delta L_f \cdot \Delta \frac{L_{f,c}}{L_f},$$

(1) (2) (3)

where subscript f stands for occupational categories. Notice that the net change in employed college graduates (ΔL_c) is analyzed into the effects of (1) the change in occupational structure in total employment, (2) the change in the educational

composition within occupations, and (3) their interactions. It is seen in the table that the major part of the increase in employed college graduates concentrates in the white-collar (WC) occupations in both countries, although the absolute number of net increase is much greater in the Philippines. A striking contrast emerges when one compares the analyses into the demand factors: In Korea 77 per cent (369,000/478,000) of the net increase in employed college graduates was directly induced by the change in occupational structure, particularly by the expansion of the WC occupations. In the Philippines, on the other hand, only 14 per cent (103,000/737,000) came from the change in occupational structure and as much as 75 per cent (555,000/737,000) was the direct consequence of the change in educational composition, especially in the WC occupations. Indeed, about one-half of the net total increase of college graduates in the labor market was absorbed by replacing the lower educated labor in the WC occupations. A rapid increase of college educated labor without a rapid economic growth or transformation of occupational structure thus resulted in the replacement of lower educated labor in particular occupational categories.

SUMMARY AND CONCLUSION

In terms of statistical correlation, the heaviest link between educational expansion and economic development in Southeast and East Asia was found at the secondary level of education, which is congruous with the results of preceding studies based on cross-national data. But this strong relation of the diffusion of secondary education with the levels of economic development should not be taken directly as the evidence of the contribution of the secondary education to economic growth, for it may be also reflecting a high income elasticity of households' demand for the educational opportunities at secondary levels.

The unique finding of this paper lies in the primary level of education. There was a wide difference in the diffusion of upper primary education (six or seven years in school system) among the adult population between the East Asian countries and the Southeast Asian countries—the completion rates of upper primary education among the adult population of the East Asian countries were on the average 27 percentage points greater than those of the Southeast Asian countries after the levels of economic development were controlled for. The difference was even growing among the young adult population. Examinations of the educational composition of labor force by industry and by occupation revealed further that widespread attainment of upper primary education is a unique characteristic of the labor force in East Asia relative to the Southeast Asia. The proportions of secondary school graduates and of college graduates in the East Asian countries do not differ significantly from those in the Southeast Asian countries once per capita GDP is controlled for. These findings, together with the analyses of the growth structures in last two decades, lead me to argue that the existence of the massive reserve of the workers with upper primary education, combined with the growing supply of secondary school graduates, rendered one of the critical bases for the rapid horizontal expansion of the

manufacturing sector in such a short period, and hence the growth of the whole economy, in Taiwan or in Korea. Given the problems of data and the methods of analysis, however, these points should be substantiated by more systematic analyses in future.

Although excessive generalizations should be avoided given the limited scope of the present study, one could argue that the above discussion points to the strategic significance of the diffusion of primary education in the early stages of economic development. A very high completion rate of primary education among the surplus labor accumulated in the traditional sectors may appear to be redundant in a short-run, but it would create one of the critical driving forces for growth once the economy enters the path of rapid development. On the other hand, if higher levels of education are expanded disproportionately to the level of economic development, the genuine effect would be the replacement of less educated workers, especially in the services sector.

It should be noted that the above argument does not imply that primary education in the Southeast Asian countries has been stagnant. In fact, Thailand has recently moved to achieve a six-year compulsory primary education and the 1970s witnessed significant gain in completion rates of primary education in the other Southeast Asian countries. Nevertheless, a universal completion at the primary level is yet to be achieved. Further policy efforts to enhance the trend toward increasing of completion rate at the primary level are as necessary as ever, since the children who miss primary education now will have to survive for many decades under rapid economic change, and their weight in the total labor force will be substantial for a long time given the large size of the young-age cohorts.

Also, it should be pointed out that Korea and Taiwan are now facing a new problem in balancing educational expansion and economic development and it will continue to be a difficult problem in the 1980s. Since both countries appear to be approaching the point of exhaustion of the abundant supply of cheap yet educated labor as the very consequence of past development, they have to seek the source of growth in the improved productivity of labor with introduction of relatively high technologies. This creates a demand for educated labor, but the number of highly educated labor demanded is still limited. On the other hand, the increasing household income levels make it very difficult to maintain a restrictive policy on higher education. Educational investment in Korea or in Taiwan has been very productive so far in supporting economic growth by concentrating on the lower tiers of education, but this direct effectives of educational expansion on growth will subside as the focus of educational expansion moves into the higher levels of education. The challenge to Korea and Taiwan lies in the fact that they have to go through this transitional period with still limited resources and in an increasingly precarious international economic environment to which their growth structures are particularly vulnerable.

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APPENDIX A

DATA

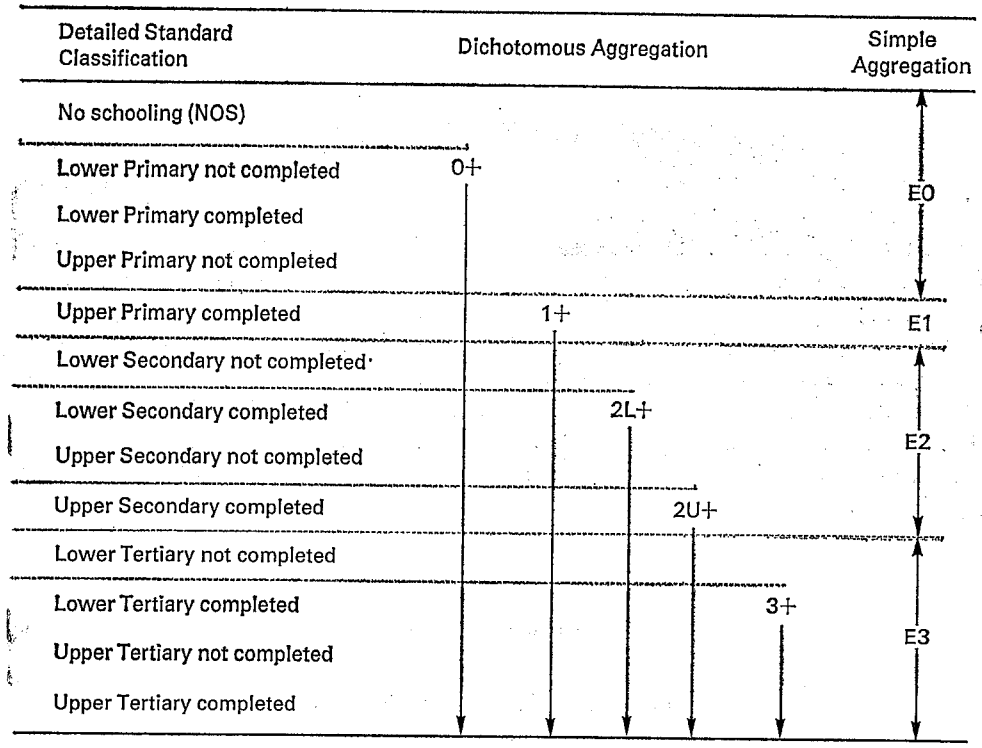
The data on the educational composition of adult population (education by age) and most of the data on the educational composition of the labor force (education by age, industry by education, and occupation by education) are taken from the censuses of the following countries and years: Indonesia, 1961, 1971, and 1976; Japan, 1960 and 1970; Korea, 1960, 1966, 1970, and 1975; Philippines, 1960, 1970, and 1975; Taiwan, 1956, 1966, 1970, and 1975; and Thailand, 1960 and 1970. Additional data were collected from labor force surveys for the following countries and years; Philippines, 1961 and 1965; Taiwan, 1965, 1970, and 1974; and Thailand, 1970 and 1975. The data on national product accounts are taken from ADB, *Key Indicators of Developing Member Countries of ADB* [1].

APPENDIX B

EDUCATIONAL CLASSIFICATION

The model educational system is conceived of as consisting of three basic levels (primary, secondary, and tertiary), each of which is divided into lower and upper tiers. Since an individual may or may not complete a level of education, there are twelve levels of experience in the educational system, and adding a category corresponding to no experience in school, the model system bears thirteen levels of educational attainment. This is the detailed standard classification of educational attainment. The Philippines had a two-tier primary education but in practice changed into a six-year one-tier system. Thailand had a two-tier (4+3 years) primary education system which was still effective in the period that this study covers, although it had moved into a six-year primary system recently. Most of the countries have two-tier secondary education with the exception of the Philippines which has a four-year one-tier system. The educational classifications used in the original data are matched to the standard classification primarily based on the structure of the educational system and then considering the number of years required for completion.

Then, two aggregate classification systems are developed: One is a dichotomous classification system to construct indices of rates of completion at a particular level of schooling. Another is a simple aggregation of the basic categories to indicate the shares of the workers by their highest education obtained. The following table describes the two systems.



APPENDIX C

INDUSTRIAL AND OCCUPATIONAL CLASSIFICATIONS

The standard industrial classification is based on the International Standard Industrial Classification, which is integrated into a four-sector classification: The agriculture (A) sector comprising agriculture, fishery, and forestry; the manufacturing (M) sector comprising manufacturing and mining; the facilities (F) sector comprising construction, public utilities, transport, and storage; and the services (S) sector comprising commerce and personal, business, and public services. The standard occupational classification is based on the International Standard Classification of Occupations [6], and the aggregated classification includes: Farmers (FR) including farmers and fishermen; the white-collar (WC) workers including professional, administrative, and clerical workers; the services (SS) workers including sales and services workers; and the blue-collar (BC) workers including quarry men, production process workers, and transport equipment operatives.