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Universal Basic Education: An Overall Strategy of Investment Priorities for Economic Growth

Walter W. McMahon
Dr. Boediono

College of Commerce and Business Administration
Bureau of Economic and Business Research
University of Illinois Urbana-Champaign

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March 1989

Universal Basic Education: An Overall Strategy of Investment Priorities for Economic Growth

Walter W. McMahon, Professor
Department of Economics

Dr. Boediono
Ministry of Education and Culture, Jakarata

Abstract

Universal Basic Education: An Overall Strategy of Investment Priorities for Economic Growth

Walter W. McMahon and Dr. Boediono

This paper is a comprehensive analysis of social rates of return to investment in all levels of education in Indonesia and of the nature of underemployment in urban and rural areas. It analyzes the 1982 and 1986 nationwide SUSENAS data on individuals that covers earnings, level and type of education, and hours worked.

The analysis finds that the highest social rates of return of 19-25 percent, are to investment in expanding junior secondary general education (grades 7-9). Rates of return to senior secondary general education are nearly as high. Underemployment is highest among illiterates, but virtually all males and females now finish grade 5.

The paper suggests an investment strategy of fastest increase in junior secondary general education as contributing the most to both growth and equity goals. Indonesia has since adopted such a strategy, and will seek universal basic education through grade 9 as a central goal if its next 5-year plan.

Universal Basic Education: An Overall Strategy of Investment Priorities for Economic Growth

Walter W. McMahon and Boediono *

This paper is an economic analysis of alternative budget strategies involving human resource development for the achievement of faster per capita economic growth, emphasizing the external use of graduates. It focuses particularly on the relative costs relative to the potential returns to be realized from attaining universal basic education, relative to the alternatives. It also considers the relative rates of change in budget levels over time, with particular reference to the time frame for attainment of universal basic education (relative to the alternatives) that would appear to be most advantageous.

It is important to this analysis to stress that education expenditures are an investment that yield returns reasonably quickly after individuals leave school and also later throughout their working lines. That is, education is not merely a welfare or consumption benefit given to the families involved.

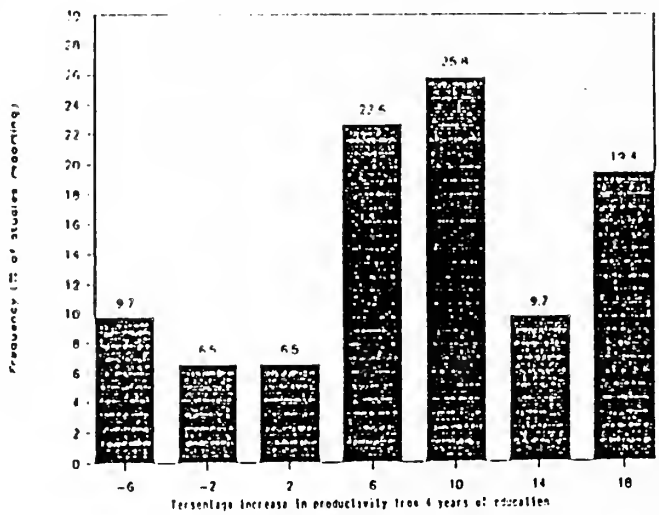
Returns to the Investment:

The productivity of education in contributing to per capita economic growth is now widely recognized in careful studies that control for the effects of other things. This contribution of education to growth is measured in part by increased earnings later in this paper. But earnings alone understate the contribution of education to growth in several of the following situations:

* The net effect of education in raising per capita physical output in agriculture.
  Each additional year of basic education raises the physical output of each farmer measured in bushels (after controlling for other effects on output) by an average of 3.05% per year. {see Jamison and Lau (1985), Lockheed (1987), Pudisani (1987), Yamada and Ruttan (1980)}. Many farmers do not receive wages and salaries, so wage and salary earnings do not include most of the contributions of education to farm output.

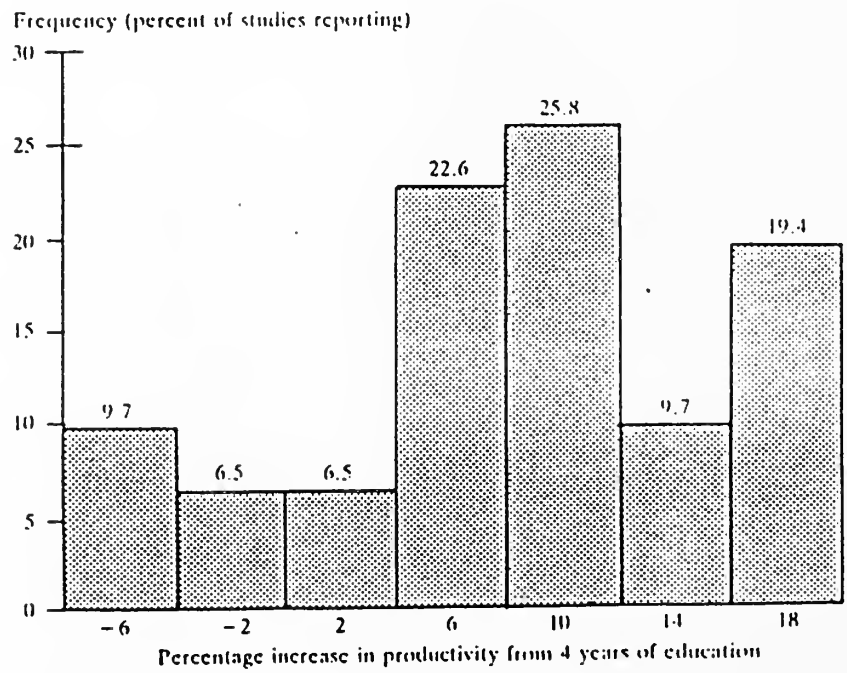
The results of thirty-one studies of the relation of schooling to agricultural output in the wet rice cultures of Malaysia, Thailand, Korea, and Nepal are shown in Figure 1 below. The medium is a 10 % increase in output of each farmer who receives from four additional years of education. This is approximately the amount of education that would be involved if Indonesia succeeds in achieving universal basic education by getting all future farmers to complete 6th grade, as well as grades 7 through 9 of Junior Secondary General education. The effects on productivity result from more intelligent use of

fertilizer (on hectares where soil tests show it is needed rather than wasting it on hectares where it is not needed), use of hybrids (e.g. shifting to disease resistant strains in the planting season following plant disease), use of animal genetics and vetinary services to improve animal health and meat production, use of guides on how to fix machinery, better marketing strategy for crops, and in many other ways that keep the farmer in touch with new agricultural technologies.



Note : Mean, 9.7 percent; standard deviation, 9.0 percent.
Source: Jamison and Lau (1982), p.9.

Results of Thirty-one Data Sets Relating Schooling to Agricultural Productivity, Unweighted

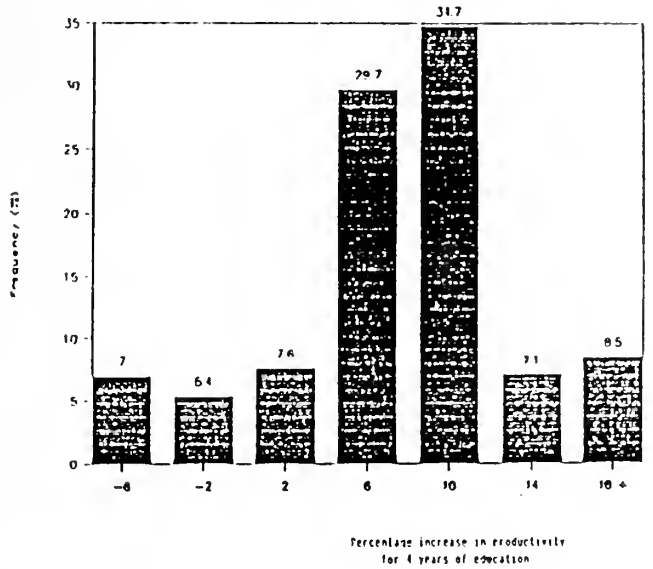


Note: Mean, 8.7 percent; standard deviation, 9.0 percent.

Source: Jamison and Lau (1982), p. 9.

When the results of these 31 studies are weighted by the reciprocal of their standard error, the results are as shown in Figure 2. The dramatic impact of education on agricultural productivity is greater in modernizing than non-modernizing agricultural environments in most cases, although recent results in Nepal (Economics of Education Review, July 1987) find the effects in non-modernizing traditional agriculture to be substantial. In Figure 2, allowing for the standard errors, the conclusion that there is a 6-10% increase in agricultural productivity from 4 more years of basic general education is especially clear.

FIGURE 2
RESULTS OF STUDIES RELATING SCHOOLING TO AGRICULTURAL PRODUCTIVITY (WEIGHTED BY RECIPROCAL OF THE STANDARD ERROR)



The social rates of return to basic education computed for these physical increments to agricultural output, assuming that the price of rice is $US 250 per metric ton is 15.2 % in Korea, 24.4 % in Malaysia, and 23.2 % in Thailand. See Psacharopaulos and Woodhall (1985, p. 49). No comparable studies have been done for Indonesia.

These rates of return to basic education in the agricultural sector are at least as high as the rates of return to basic education in industry that are reported later below for Indonesia in 1986. This is a very handsome return to this type of investment/in basic general education for those in agriculture.

Secondary general education also provides the basis for learning on the job for those that migrate from agriculture to small and medium sized enterprises in the provincial urban areas. This migration is inevitable as industrialization occurs; the question is only whether or not the labor can be assimilated. Is is the small and medium sized enterprises that ephibit the highest labor absorbtion rates. These enterprises need persons with at least a basic education who can learn on the job.

* The contribution of education to industrialization. This arises as basic education broadens the base of industrialization to permit greater learning and growth of earnings on the job (see Bowman (1974n)). It facilitates absorbtion of workers in small and medium size enterprises in the provincial cities nationwide. Moving from a narrowly based industrialization to involving as wage and salary earners a much larger percent of the population upon uses the high correlation that exists between prior formal schooling and learning on the job (e.g. Mincer, (1974) Schultz (1975, 1981). The Repelita IV growth rate of 3.8% less the 2.1% population growth rate for 1984-1989 results in a 1.7% per capita growth rate that hopefully will take off toward the per capita growth rate averaged over the last 25 years by Taiwan (4.7%), Hong Kong (6.2%), Singapore (7.8%) and South Korea (6.6%). A larger percent of the population has become involved as productive workers with wage and salary earnings in each of those countries (See McMahon (1976) and Table 3 below). It will be noticed that all of the fastest growing countries are spending a larger precent of their government budgets on education than is Indonesia (i.e. South Korea 20.5%, Hong Kong 20%, Singapore 21.6%, Japan 12%, Taiwan 18%, Indonesia 9.4%) as is shown in Table 3.)

TABLE 3

Comparative Indices of Investment in Human Resources and Physical Capital, and Per Capita Growth

	Percent of Labor Force Illiterate	Percent Not Enrolled in Primary 1965	Education Investment as of % of Govt Budget	Physical Cap. Investment as a % of GDP	Average Annual Per Capita Growth 1965-87	Distribution: Income Received By Lowest 40%
South Korea	0%	0%	20.5%	29%	6.6%	16.9%
Hong Kong	0%	0%	(20%)	24%	6.2%	16.2%
Singapore	0%	0%	21.6%	12%	7.8%	n.a.
Japan	0%	0%	12%	28%	4.7%	21.9%
Taiwan	1%	1%	18%	28%	4.7%	22.3%
Indonesia	(34,7%) *	28%	9.4%	21%	4.9%	14.4%
Pakistan	74%	60%	3.1%	17%	2.4%	
U.S.A.					4.7%	17.2%

Source: Data from The World Development Report, The World Bank, 1987, Statistical Appendix, and S. Kuo, G. Ranis, and J. Fei, The Taiwan Success Story, Westview Press, Boulder, CO, 1981, p. 40

*) See Fig. 1, col A.

* The contribution of education to technology transfer and diffusion. Technology is a major engine of growth as skills are embodied in persons through up-to-date education and as productive technologies are diffused and put into use more widely. Higher education provides a cutting edge. But the technology has little or no effect if it is not diffused and put into wider use. It also must be adapted to local conditions, since it is often developed in industrialized countries where capital is cheap, and therefore it is too capital-intensive (i.e. uses too much scarce capital and displaces too much labor). Policies that subsidize excessively physical capital intensive modes of production can be counterproductive if they drain other sectors of scarce capital, displace too much labor, and lead to falling labor absorbtion rates such as those that are now beginning to be observed in Indonesia. Countries like Indonesia where capital is expensive, relative to labor, do not have a comparative advantage in highly capital intensive labor-saving modes of production in competition with countries where capital is cheap. The odds are not good in export markets using this strategy. The industrialized contries with relatively cheaper capital and expensive labor are better adapted to labor-saving capital intensive technologies. Instead if the technology is adapted to somewhat less capital intensive approaches, and then diffused and applied through investment in human resource development (and built-in to appropriate machines) then a true comparative advantage exists in Indonesia and this strategy is very likely to be successful. {For further discussion of "embodiment" of the technology in physical capital see Solow (1957, 1959) and in human capital see McMahon (1984b, 1987a, 1988)}.

* Basic education of women through 9th grade slows population growth, and thereby raises per capita economic growth. Population growth in Indonesia has slowed from 2.3% in the 1970's to 2.1% in the 1980's. This may be compared to 3.1% in Pakistan (where 96% of the rural females are illiterate), 2.7% in Nepal (where 97% of all females are illiterate), and 3.2% in Malawi (where 94% of the population has no junior secondary education). A very favorable stage is being approached in Indonesia however, since most females are literate and almost all are now finishing at least 5th or 6th grade. To the extent that the results of extensive international research applies here, the education of women up through 6th grade results in children that are heathier. But 6 years of education alone does not lower fertility rates, and better health has the effect of increasing population growth rates. However education through 8th or 9th grades as is now being contemplated in Indonesia will give women alternative economic options. It should result in them marrying 2.2 years later, having children that are healthier, and in spite of more of their children surviving, the total number of children women choose to have throughout their child bearing years falls sharply. The result is slower population growth. The education of males appears to be

essentially irrelevant to this process. The reason that women make these choices (see T.W. Schultz (1974, pp 3-22) is that with more basic education they then have economic options available to them in the villages other than just having more children. The economic significance to education of this effect from expanding the education of women from 6 to 9 years is that slower population growth puts less pressure on public budgets to build more schools just to keep up with the population growth, a pressure that is limiting improvements in school quality. But even more important, rising per capita growth rates (i.e. living standards) which is a key goal of Repelita V, are calculated by subtracting the population growth rate from the economic growth rate. Per capita growth thereby is increased directly as population growth slows. The negative correlation of -.31 between female school enrollment and population growth rates across 94 countries shown in Table 4 below, as well as the positive +.49 correlation between female school enrollment and per capita growth, are consistent with this effect of education in slowing population growth and thereby raising per capita growth.

TABLE 4

Correlation Between Basic Education

and Population Growth

94 Countries

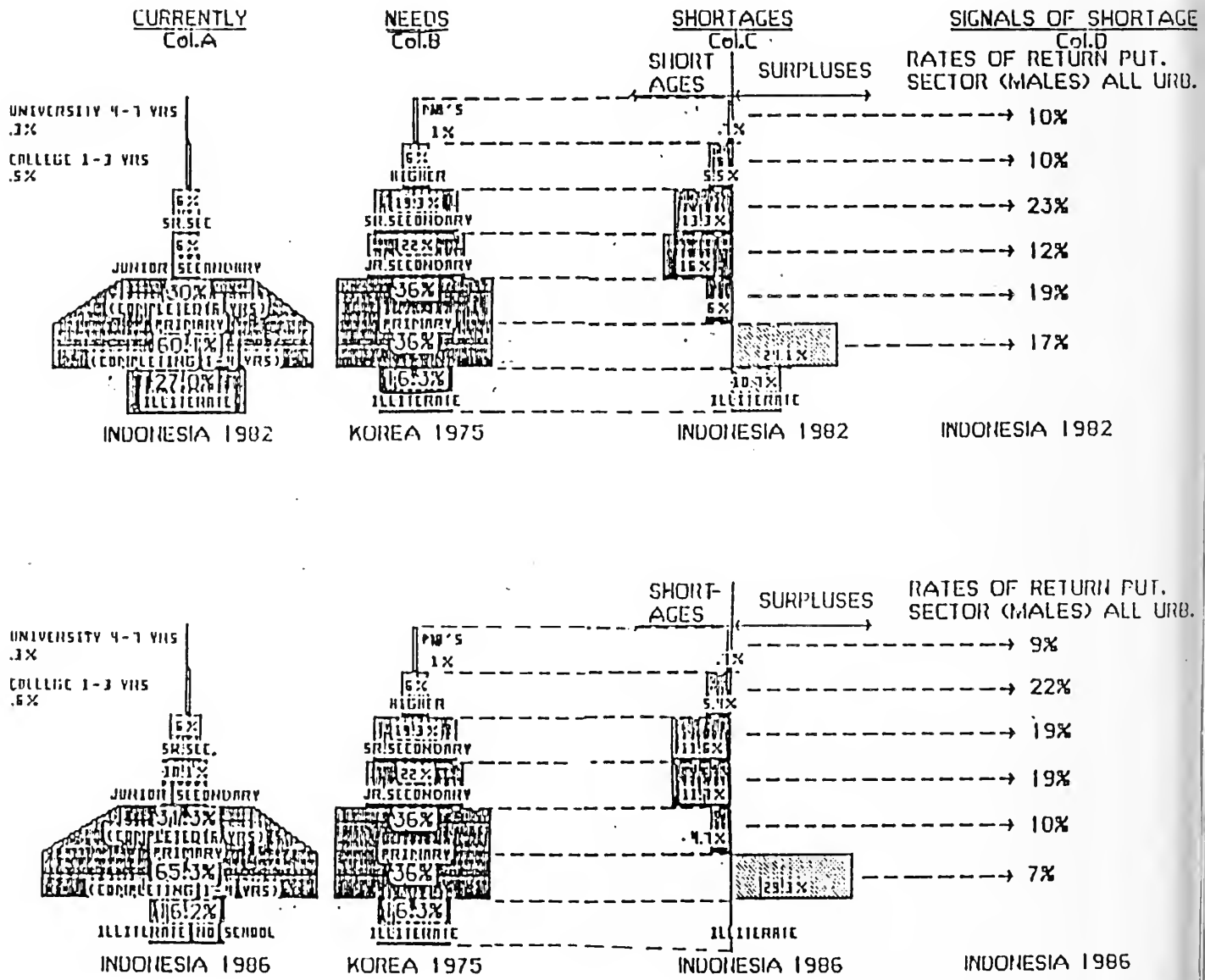
	Population Growth 1970-80	Per Capita GNP Growth
Female School Enrollment Rates, Ages 10-14	-.31	+.49
Literacy Rate	-.47	.54

Source: Rosenzweig (1987, Table 1)

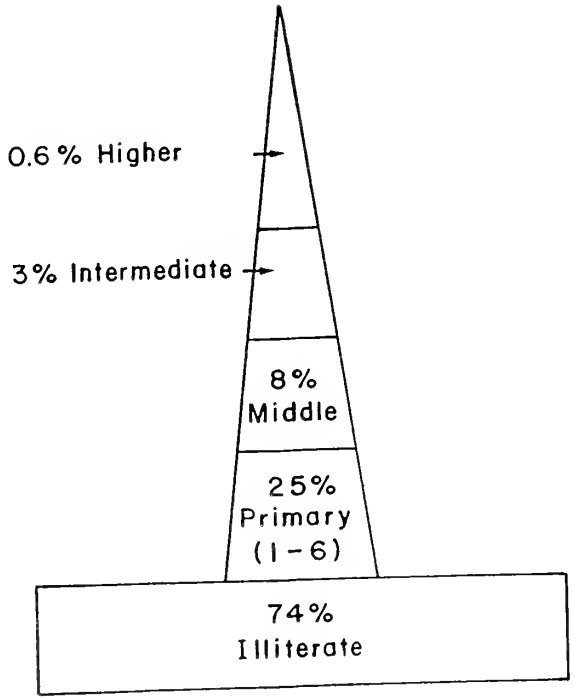
* Finally, basic education spreads the capacity to earn more widely in the population and thereby reduces the degree of inequality in the income distribution. Economic analysis reveals that basic education contributes to the growth of a middle class, reducing the polarization in the income distribution characteristic of the poorest of the developing countries (e.g. Haiti, Malawi, Nepal, and Pakistan). The evidence is that more education for those already getting the most education does not have the effect of increasing the degree of equality in the income distribution, except perhaps in the very long run where it causes wage and salary income to become more important relative to property income, given that property income is distributed more unequally. But the evidence is that who gets the education does have an important effect on the income distribution because it is a very important determinant of who receives the earnings later, see Psacharopoulos and Woodhall (1985 pp. 264-7). Therefore a larger percent increase in investment in basic education that expands the percent completing 6-9 years (since primary education is already nearly universal) could be expected to broaden the access to earnings at this level considerably and bring a larger percentage of the poor into the earning stream. This inclusion of the poor is a frequently articulated National goal. It is important to stress that this policy that fosters greater equality is fully compatible with achieving faster per capita growth. Evidence consistent with this includes the fact that a greater degree of equity in the income distribution is characteristic of the six fastest growing nations in Asia as shown in the last two columns in Table 3. It is also apparent that great inequality such as that found in many of the poorest countries such as Panama, Malawi, Haiti, and Kenya is frequently associated with low and even negative per capita growth.

Demands and Supplies of Manpower. Since it is now widely recognized that there are returns from the investment in education over the working lives of the individuals involved, the most appropiate theoretical framework in economics to use is investment theory that considers these returns over time, discounts them back to their present value, and relates then to the investment costs. This does not ignore manpower demands and supplies in the short term, but is instead another way of considering them. When demands for a given type or level of manpower are high, investment demands are also high, and given the costs, the rate of return to producing more of that type of manpower will be high. Consequently, if demand is low for workers with a particular level of education there will be unemployment or underemployment of this type, the returns in the form of earnings will be low, and with given investment costs, rates of return to further investment of this type will be low or even negative. Apart from more adaquately considering the cost of the various alternatives, the advantage to using investment demands and their associated rates of return as a central criterion for guiding relative rates of increase in the various education budget lines is that they can also be compared directly to the

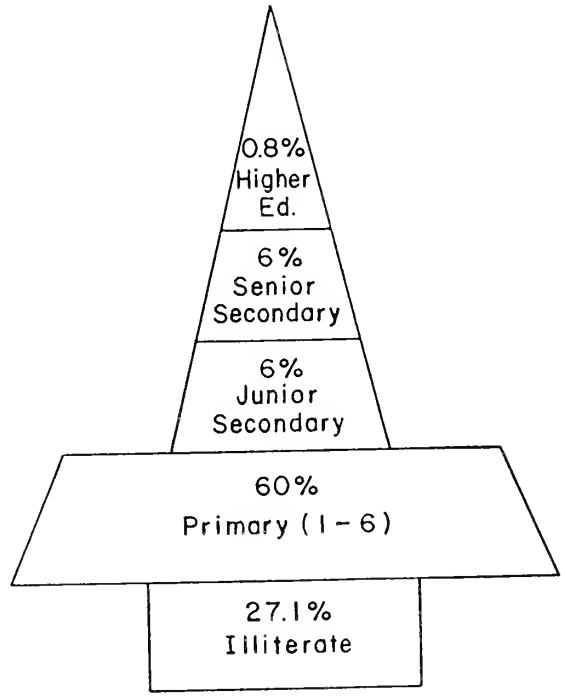
FIGURE 3.
EDUCATIONAL ATTAINMENT OF THE LABOR FORCE
IN INDONESIA
CURRENT ATTAINMNET AND NEEDS FOR RAPID GROWTH



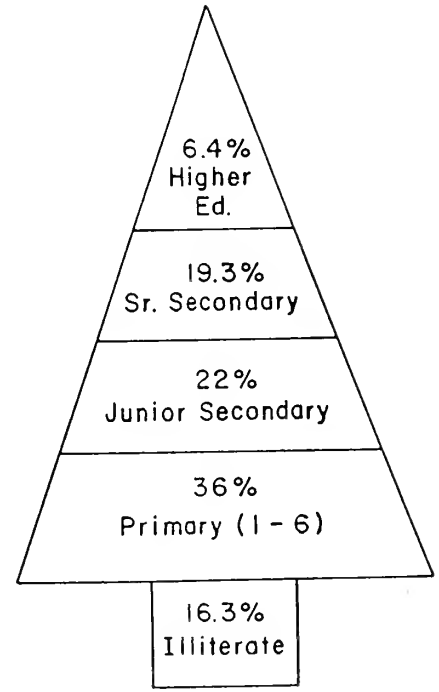
(1) ESR,Chr,p.115
(2) SKIM, C.YUN,MANPOWER PROJECTIONS STRATEGIES, KOREA (EDUCATIONAL DEVELOPMENT INSTITUTE, SOUL,1984,p.24
(3) ESR,Ch,p.306
(4) Mc Mahan, "ECONOMIC ANALISIS OF IEP PROJECT, FEB 1988, AVERAGE OF Col. 2-4, TABLE 2.122, P.30



PAKISTAN 1985-8



INDONESIA 1982



SOUTH KOREA 1975

rates of return available from investment in physical capital or other alternative uses of the scarce budget resources.

In summary, there are several very important types of returns from investment in education that arise over the working lives of individuals, all of which are important to getting faster per capita economic growth and widely shared development. They include the increment to earnings attributable to education to be presented below for those employed in industry and in private sector small and medium sized enterprises. Investment of public funds furthermore induces further saving by households as they forgo consumption to support the child longer in school, thereby increasing their household investment in human resource development in partnership with the state. The earnings that result capture the contribution of education to industrialization and to the diffusion of technology. But there are three additional contributions not picked up by earnings to consider and to use in adjusting upward the measured rates of return based on earnings. They are the contribution to the increased physical output of farmers (many of whom have limited wage and salary earnings), and the contribution to growth of per capita output as the education of women through 8th grade helps to slow population growth rates. Finally, the expansion of basic education helps to extend earnings more widely to the poor. This is a growth strategy that is available to policy makers, and is compatable with faster per capita growth at a take-off stage at which point a larger percent of the population must become involved in the industrialization and growth process.

Current Manpower Supply and The Investment-Demand for Educated Manpower

The educational structure of the labor force in Indonesia in 1982 and in 1986 that show the supplies of educated manpower in use are illustrated in Column A of Figure 3. The current supply can be compared to the amounts of educated manpower at each level employed in Korea just after it reached the fast-growth take off stage in 1975 as shown in Column B. The net difference between current supplies of educated manpower and the structure that appears to be needed for fast growth is the residual of relative shortages and surpluses shown in Column C. Since excess supplies tend to hold earnings down, and excess demands (or shortages) to pull earnings up, it is consistent and further important evidence of the effect being discussed that the social rates of return (which reflect the full cost of the investment to the society) are highest at the levels where the shortages in the private sector labor force are greatest. They suggest lack of a sufficiently large "middle class". There are clearly an insufficiently large number available to agri-business and industry that have finished 6th grade, as well as junior and senior general secondary levels. The social rates of return at these levels are very high. They were, respectively, 19 % to investment that increases the number that finish 6th grade in 1982, and a 10% return in 1986, a 12 % return to investment in

junior secondary general education in 1982 and a 19% return to junior secondary general in 1986, and 23 % and 19 % respectively in 1982 and 1986 for expansion of senior secondary general education. This represents a very handsome growth pay off to increasing rates of investment more rapidly percentagewise at 6th through 12th grade levels than at other levels. Many secondary general graduates choose to end their education at 12th grade. But if some go on, especially if more pay their own way, the returns (at 22% for finishing a three year degree) are relatively high.

Rates of return to investment in physical capital in Indonesia are not this high on the average. The rates of interest in the private market currently average about 11 %, and returns to investment in physical capital are likely to be close to that.

Any overall budget strategy that focuses on the relative rates of increase in different parts of the education budget therefore is inherently an investment strategy. The key relevant criteria therefore from the point of view of economic analysis are investment criteria, which are the social rates of return just cited. These consider the returns to different forms of investment, relative to the costs, and are relevant to the growth of individual earnings as well as to the growth of National Income in the aggregate.

III New Results on Social Rates of Return

The newly available 1986 SAKERNAS data collected by B.P.S. and covering 360,000 individuals nation-wide provides an excellent source for developing new refined investment criteria relevant to rates of expansion of the major levels and types of education. The high quality of this data base is analyzed in a recent paper by Alex Korns (1987).

Explanation of the Method of Computation

The total investment costs of education for 1986 on a per-student basis are shown in Columns 1-3 of Table 5 , and the wage and salary earnings for persons other than farmers at each education level are shown in Columns 4-9. These are the investment costs of education, and the benefits that enter into the benefit cost analysis for which the results are reported in the form of social rates of return.

Farmers are excluded because the 1986 SAKERNAS data does not contain an adequate measure of farm output. The returns to education in agricultural employments are better measured by the estimated 3,05 % added each year to rice and other farm output by each additional year of basic education as mentioned above.

The Investment Costs of education are composed of foregone earnings costs (Col 1) and Direct Costs (Col 2). Foregone earnings costs are assumed to be zero up through 5th grade. But at the 6 th grade level a child can either earn an amount

Table 5

EARNINGS OF ALL URBAN WORKERS, 1986 — TOTAL SOCIAL COSTS AND GROSS AND NET RETURNS TO EDUCATION

All Provinces — All Urban Workers — FOR COMPUTATION OF RATES OF RETURN

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	COST OF EDUCATION			MEAN ANNUAL EARNINGS AT DIFFERENT AGES					
				AGE GROUPS					
	Foregone Earnings	Direct Cost	TOTAL	15-20	21-30	31-40	41-50	51-60	61-65
	C	D	E	F	G	H	I	J	K
				380	482	735	601	674	557
NO SCHOOL(M)	0.00		0.00	~~197.00~~	~~447.00~~	~~715.00~~	~~611.00~~	~~557.00~~	427.00
NO SCHOOL(F)			0.00	246.00	251.00	276.00	275.00	291.00	257.00
SOME PRIMARY(M)									
COST & EARNINGS		-343.58	-343.58	~~518.00~~	~~626.00~~	~~707.00~~	779.00	685.00	~~736.00~~
NET EARNINGS DIF.FROM THE LAST LEV.				41.00	-17.00	-28.00	136.00	128.00	243.00
SOME PRIMARY(F)									
COST & EARNINGS		-343.58	-343.58	~~329.00~~	~~334.00~~	~~360.00~~	385.00	291.00	300.00
NET EARNINGS DIF.FROM THE LAST LEV.				83.00	83.00	84.00	110.00	100.00	43.00
PRIMARY(M)									
COST & EARNINGS	-372.75	-689.69	-1062.44	508.00	773.00	829.00	1048.00	1015.00	739.00
NET EARNINGS DIF.FROM THE LAST LEV.				11.00	130.00	94.00	405.00	458.00	302.00
PRIMARY(F)									
COST & EARNINGS	-184.50	-689.69	-874.19	343.00	359.00	513.00	727.00	879.00	437.00
NET EARNINGS DIF.FROM THE LAST LEV.				97.00	108.00	237.00	452.00	588.00	180.00
JUN. HIGH SCHOOL GEN.(M)									
COST & EARNINGS	-338.44	-384.31	-722.75	549.00	866.00	1108.00	1329.00	1373.00	1300.00
NET EARNINGS DIF.FROM THE LAST LEV.				141.00	93.00	279.00	281.00	358.00	511.00
JUN. HIGH SCHOOL GEN.(F)									
COST & EARNINGS	-228.52	-384.31	-612.83	477.00	573.00	609.00	870.00	932.00	609.00
NET EARNINGS DIF.FROM THE LAST LEV.				134.00	214.00	96.00	143.00	53.00	163.00
JUN.HIGH VOCATIONAL(M)									
COST & EARNINGS	-367.25	-417.14	-784.39	445.00	709.00	940.00	1287.00	1540.00	1287.00
NET EARNINGS DIF.FROM THE LAST LEV.				-63.00	-73.00	111.00	239.00	525.00	138.00
JUN.HIGH VOCATIONAL(F)									
COST & EARNINGS	-247.96	-417.14	-665.10	492.00	544.00	655.00	904.00	1301.00	800.00
NET EARNINGS DIF.FROM THE LAST LEV.				149.00	125.00	142.00	177.00	422.00	361.00
SEN.HIGH SCHOOL GEN.(M)									
COST & EARNINGS	-469.18	-494.99	-964.17	638.00	1084.00	1374.00	1703.00	1899.00	2005.00
NET EARNINGS DIF.FROM THE LAST LEV.				49.00	218.00	266.00	380.00	526.00	705.00
SEN.HIGH SCHOOL GEN.(F)									
COST & EARNINGS	-333.24	-494.99	-828.23	625.00	736.00	1021.00	1303.00	1351.00	900.00
NET EARNINGS DIF.FROM THE LAST LEV.				148.00	183.00	412.00	439.00	419.00	305.00
SEN. HIGH VOCATIONAL(M)									
COST & EARNINGS	-1203.83	-875.00	-2078.83	914.00	1189.00	1567.00	1915.00	1995.00	1900.00
NET EARNINGS DIF.FROM THE LAST LEV.				295.00	323.00	459.00	556.00	622.00	300.00

57 SEN. HIGH VOCATIONAL(F)									
58 COST & EARNINGS	-884.79	-875.00	-1759.79	598.00	801.00	1055.00	1445.00	1797.00	1100.00
59 NET EARNINGS DIF.FROM THE LAST LEV.				121.00	228.00	446.00	575.00	865.00	500.00
60									
61 TEACHERS SCHOOL (M)									
62 COST & EARNINGS	-1601.41	-536.94	-2138.35	0.00	1495.00	1906.00	2135.00	2580.00	1872.00
63 NET EARNINGS DIF.FROM THE LAST LEV.				-649.00	629.00	798.00	806.00	1207.00	572.00
64									
65 TEACHERS SCHOOL(F)									
66 COST & EARNINGS	-1177.00	-536.94	-1713.94	300.00	428.72	453.88	600.00	699.96	650.04
67 NET EARNINGS DIF.FROM THE LAST LEV.				-177.00	-144.28	-155.12	-270.00	116.28	116.28
68									
69 COMMERCIAL(M)									
70 COST & EARNINGS	-1620.88	-492.18	-2113.06	458.16	711.58	794.17	1036.74	869.45	800.01
71 NET EARNINGS DIF.FROM THE LAST LEV.				-190.84	-154.42	-313.83	-292.26	-503.55	-439.99
72									
73 COMMERCIAL(F)									
74 COST & EARNINGS	-1191.31	-492.18	-1683.49	300.00	428.72	453.88	600.00	699.96	650.04
75 NET EARNINGS DIF.FROM THE LAST LEV.				-177.00	-144.28	-155.12	116.28	116.28	116.28
76									
77 ACADEMY(M)									
78 COST & EARNINGS	-989.42	-951.40	-1940.82		1495.00	1906.00	2285.00	2230.00	2072.00
79 NET EARNINGS DIF.FROM THE LAST LEV.					411.00	532.00	576.00	331.00	67.00
80									
81 ACADEMY(F)									
82 COST & EARNINGS	-885.94	-951.40	-1837.34		1164.00	1144.00	1390.00	1301.00	800.00
83 NET EARNINGS DIF.FROM THE LAST LEV.					428.00	123.00	81.00	-50.00	-100.00
84									
85 UNIVERSITY(M)									
86 COST & EARNINGS	-1837.49	-4143.28	-5980.77		1472.00	2063.00	2533.00	2474.00	2000.00
87 NET EARNINGS DIF.FROM THE LAST LEV.					388.00	689.00	824.00	575.00	-5.00
89									
89 UNIVERSITY(F)									
90 COST & EARNINGS	-1645.31	-4143.28	-5788.59		1270.00	1643.00	1889.00	2000.00	1800.00
91 NET EARNINGS DIF.FROM THE LAST LEV.					534.00	622.00	580.00	649.00	900.00

approximately equal to an older person with no school (For males, Row 10, Col 4, adjusted downward to reflect 75% of a year in school, and for underemployment) or can tend smaller children and the smaller animals on the farm. This rise in "forgone earnings costs" to the parents is the primary explanation for the higher drop out rate at the 6th grade level. More detail on the source of the data on investment costs is given below in table 6, and is discussed further together with a detailed explanation of the methods of computation in Appendix A.

approximately equal to an older person with "some primary education" (For males, Row 14, Col 4) or can tend smaller children and the smaller animals on the farm. This rise in "forgone earnings costs" to the parents is the primary explanation for the higher drop out rate at the 6 th grade level.

TABLE 6

DIRECT COSTS OF EDUCATION

PUBLIC INSTITUTIONAL COSTS PLUS PRIVATE FEES, IN THOU. OF RUPIAHS

	1982 Annual	Yrs *	Cycle Costs	Direct Costs 1986 (Col.2 in 1986 prices)
Some Primary	64.1	4.0	256.40	343.58
Primary	64.1	8.0	514.70	689.69
Jr.Sec.General	87.2	3.29	286.80	384.31
Jr.Sec.Vocational	87.2	3.57	311.30	417.14
Sr.Sec.General	107.2	3.45	369.40	444.99
Sr.Sec.Vocational	143.7	4.58	657.70	875.00
Sr.Sec.Teachers	121.8	3.29	400.70	536.94
Sr.Sec.Commercial	110.3	3.33	367.30	492.18
Academy (College 1-3)	203.0	3.50	710.00	951.40
Univ.(College 4-7)	475.7	6.50	3,092.00	4,143.28
Manpower Dept's BLK's **	438,8	1.00	438.00	588.80

Source: McMahon, Millot, and Eng, EDUCATION SECTOR REVIEW, (Ch.2 p.300 for Costs and Cycle Costs), 1982, p. 300

*Yrs. = Average of Years in School

Inflation Rate 1982-3=8.40%; 1983-4=12.63%; 1984-5=3.64%; 1985-6=5.66%; 1986-7= 8.83%; 1987-8=8.23%

Inflation Adjustment Factor =(100)(1.084)(1.1263)(1.0364))(1.0566)
=1.336 = 1.34

Source of Data on Inflation Rate: Data obtained by Abas Gozali of Pusat Informatik from the Bureau of Planning. See also Indonesian Financial Statistics, Vol XXVI No. 3 1988 to which these inflation rates correspond.

** Ministry of Labor and Manpower runs 3 month courses in craft skills at a cost of 147,000 Rp. in 1985/86. This excludes equipment and building costs, and routine expenditures on maintenance, electricity, telephone, water, and overhead staff. Nevertheless, on this basis, the annualized cost per student is 588,00 Rps, which in 1982 prices would have been the 438,800 Rps. shown above. The source of this data is Martin Godfrey (1987, p. 37).

Rates of Return By Education Level and Type of Curriculum

The investment strategy most conducive to reaching the take-off stage of fast per capita growth in Indonesia is a strategy that increases investment in education by the largest percentage each year where the social rates of return are the highest, and increases expenditure but by smaller percentage amounts where the rates of return are smaller. High rates of return reflect high earnings relative to the costs, and high earnings reflect where the demands for manpower are relatively the highest, i.e. where the shortages or growth bottlenecks, lie. These economic signals are very useful for fine-tuning human resource development plans to get the largest possible growth payoff -and hence reach the take off stage of fast per capita growth more quickly. To these economic returns must be added the non-monetary returns 1) in agriculture, 2) via reduced fertility, and 3) from increased involment of the poor, most of which are to be realized in Indonesia at the 6th, 7th, 8th, 9th and 10th grade levels.

Relative Rates of Increase in Investment

The pure economic returns repeated in Table 7 are based on the 1986 SAKERNAS sample of 225,000 individual nation wide. Column 1 shows the growth pay offs to investment in education for all urban workers. Column 2 reports results for a sub-set of the 27 Provinces. It indicates that there is some variation among provinces in the returns. But the basic pattern is consistent.

The results show that the highest growth payoffs are to be obtained by increasing investment by the largest percentage amounts in:

* Junior Secondary General, and
* Senior Secondary General Education

(Rates of return to the three year college degree programs should be discounted somewhat because this degree program has now been changed. However a two year community college type degree program would definately appear to be economocally productive).

Rates of return to Junior Secondary General average 22% and to senior secondary general average 20.5%. The 1982 SUSENAS data reflected the same pattern of high rates of return to these two levels although smaller allowance was made for under employment in calculating foregone earnings, so most of the rates of return were a bit lower. (See McMahon, Millot, and Eng (1986 b, Table 2.122, on p. 306 in the first edition).

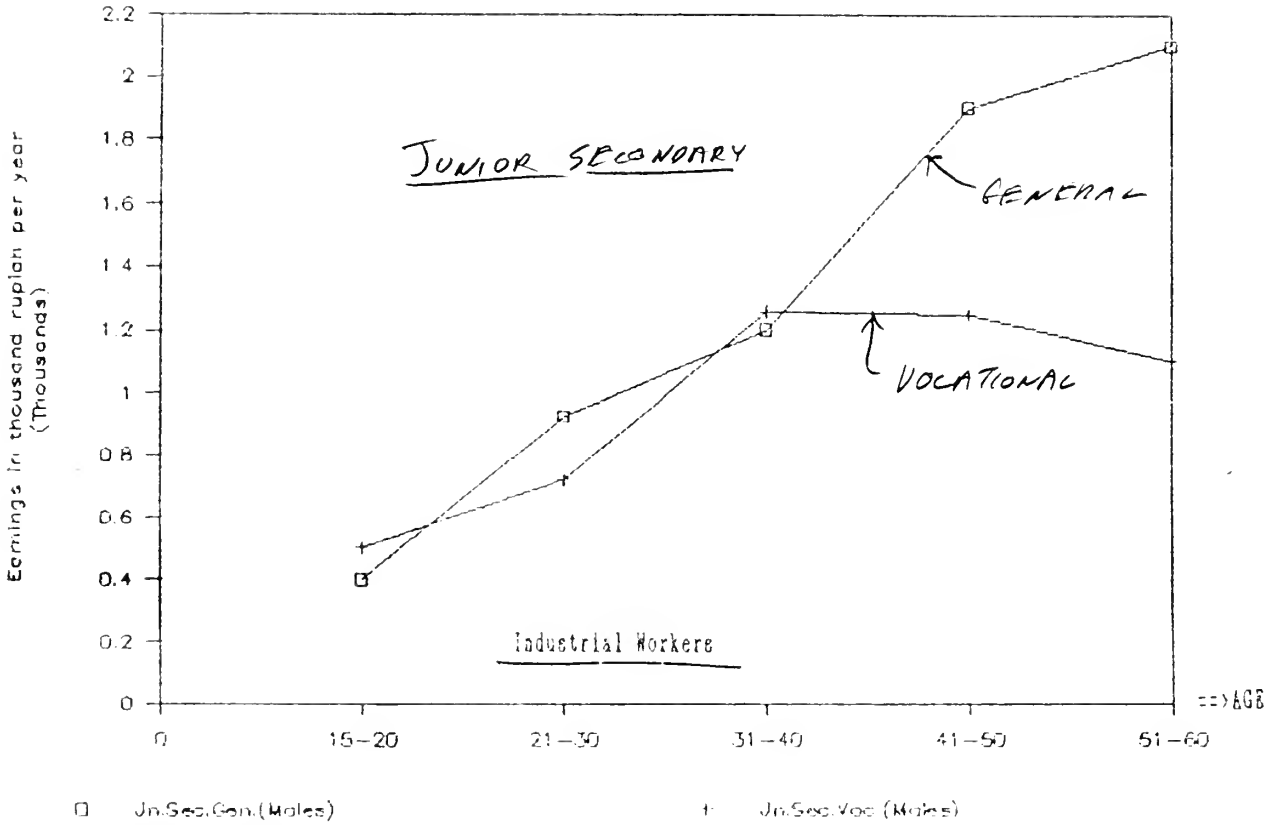
There are high investment returns to getting students to finish 6th grade (especially in the rural provinces shown in Column 2) as well as to moving toward universal junior secondary education quickly. To these economic returns must be added the effect education of women through grade 9 will have in lowering fertility rates (and thereby rising per capita growth), as well as the benefit to be gained by involving a much larger percent of the poor in the industrialization process. In general the 1986 SAKERNAS data, and the nature of the non-monetary returns to be obtained provide clear support for achieving the goal of universal junior secondary education rapidly as an intelligent growth strategy.

Table 7

SOCIAL RATE OF RETURN
BY LEVEL OF EDUCATION AND TYPE EMPLOYMENT
TYPE OF EMPLOYMENT

LEVEL OF EDUCATION	ALL URBAN WORKERS All Provinces in Indonesia	ALL URBAN WORKERS Provinces 11,12,31-35 Only
SOME PRIMARY(M)	0.07	0.06
SOME PRIMARY(F)	0.24	0.02
PRIMARY(M)	0.10	0.27
PRIMARY(F)	0.14	0.16
JUNIOR SEC. GENERAL(M)	0.19	0.12
JUNIOR SEC. GENERAL(F)	0.25	0.29
JUNIOR SEC. VOCATIONAL(M)	0.06	0.04
JUNIOR SEC. VOCATIONAL(F)	0.24	ERR
SENIOR SEC. GENERAL(M)	0.19	0.14
SENIOR SEC. GENERAL(F)	0.22	0.16
SENIOR SEC. VOCATIONAL(M)	0.16	0.08
SENIOR SEC. VOCATIONAL(F)	0.14	0.15
TEACHERS TRNG HS (NO DATA 86, 82 only)		
TEACHERS TRNG HS (NO DATA 86, 82 only)		
COMMERCIAL HS (No data 86, 82 only)		
COMMERCIAL HS (No data 86, 82 only)		
ACADEMY(M)	0.22	0.13
ACADEMY(F)	0.20	0.11
UNIVERSITY(M)	0.09	0.13
UNIVERSITY(F)	0.10	0.09

FIGURE 4 - 1982
EARNINGS OVER LIFE-CYCLE ARE FLATTER FOR VOTEC
THAN FOR GENERAL EDUCATION, GRADE 7--9



Source: BSR, p.309

FIGURE 4 - 1982
EARNINGS OVER LIFE-CYCLE ARE FLATTER FOR VOTEC
THAN FOR GENERAL EDUCATION, GRADE 7--9

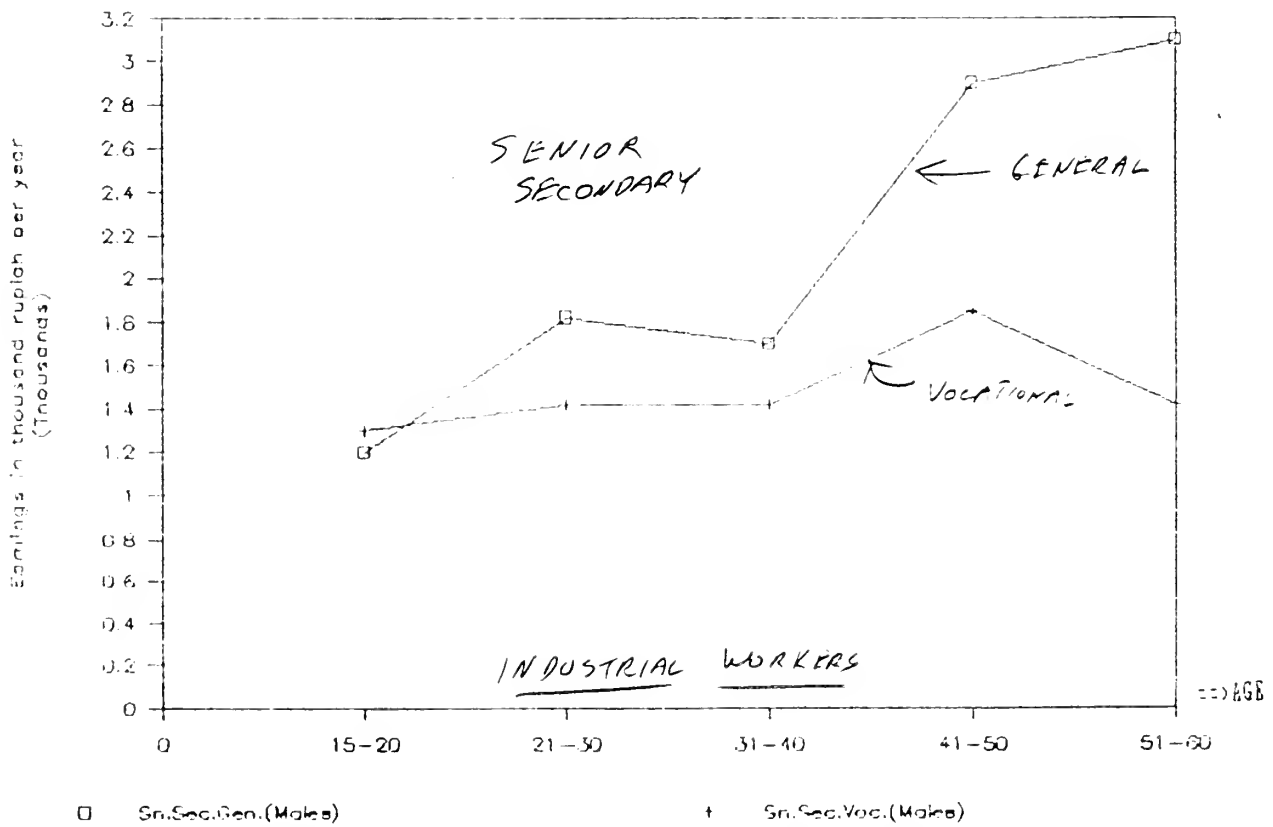
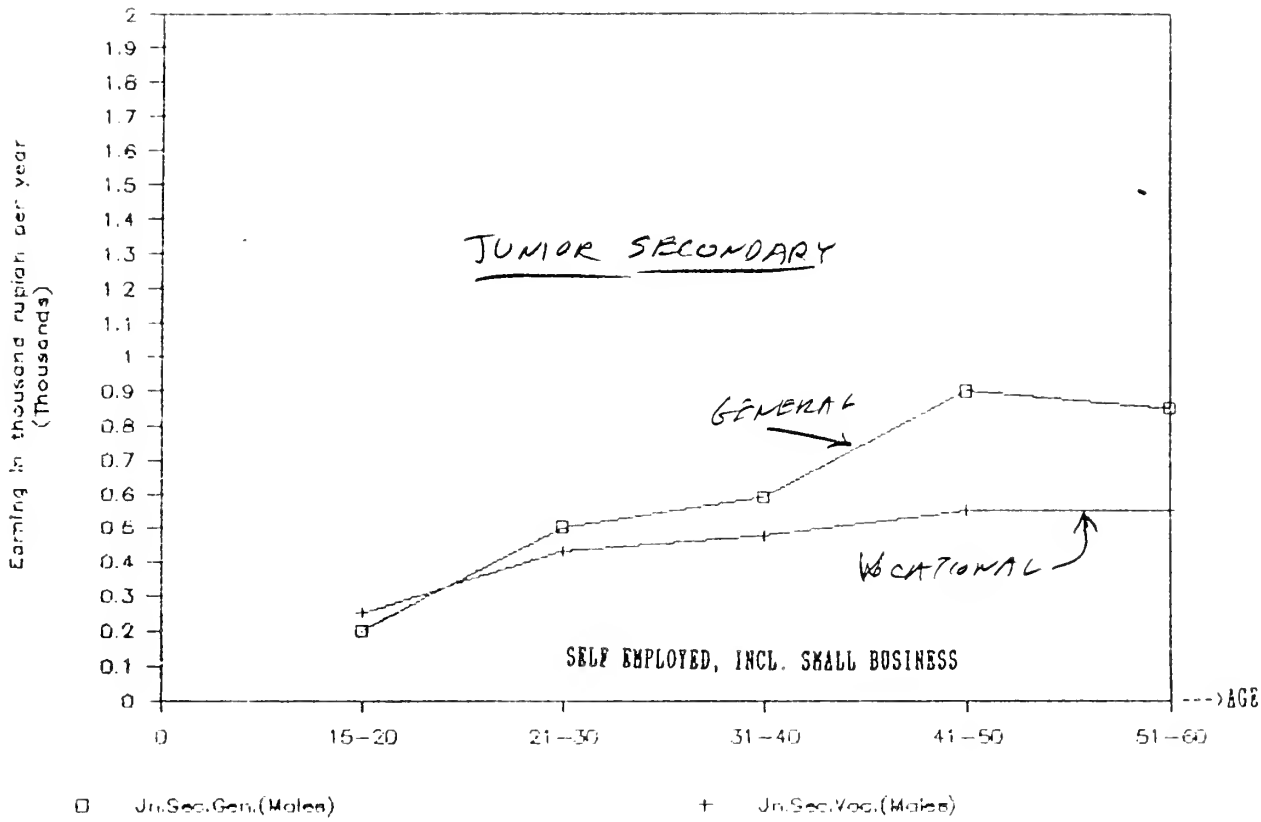
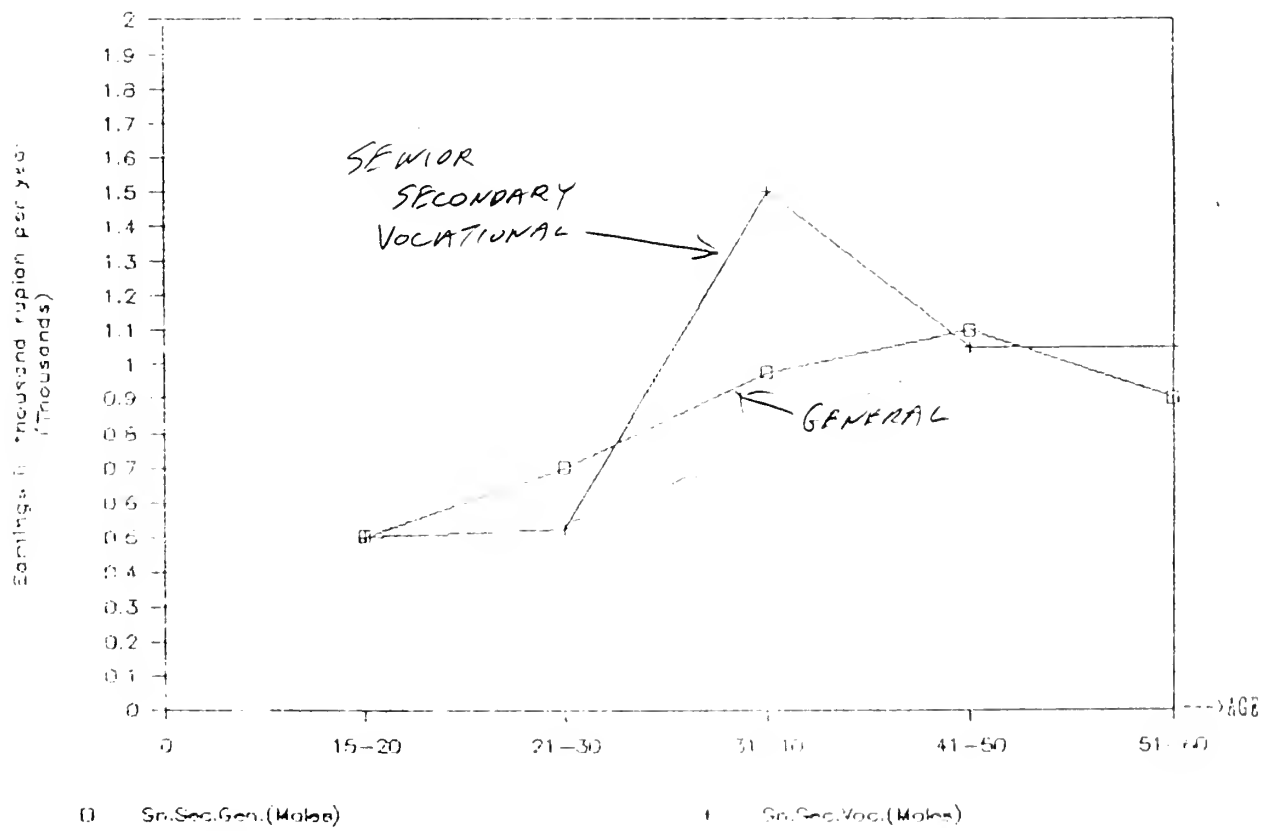


FIGURE 5 - 1982
AGE EARNINGS PROFILES; SMALL BUSINESS



RETURNS ONLY. (NO REFERENCE TO THE COSTS)



Source: 1982 Susenas Data, BPS, as Reported in W. McMahon, En and Millot, Ed. Sector Review, IEES, April 1986, p. 308-9.

FIGURE 6 - 1986 AGE EARNINGS PROFILES
(Provinces of DI Aceh, N. Sumatera, DKI Jaya, W. Java, Central Java, DI Yogyakarta, East Java)
ALL URBAN WORKERS

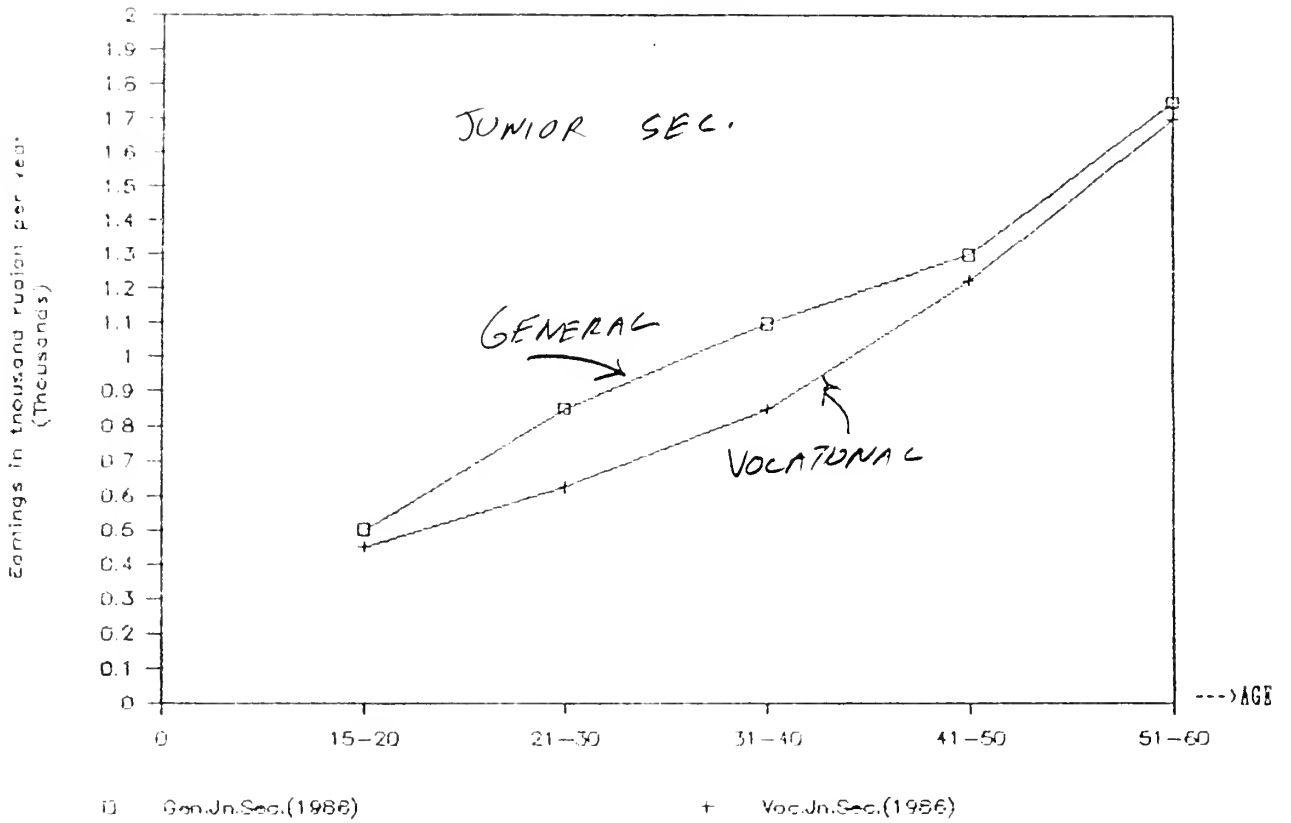


FIGURE 6 - 1986 AGE EARNINGS PROFILES
(Provinces of DI Aceh, N. Sumatera, DKI Jaya, W. Java, Central Java, DI Yogyakarta, East Java)
ALL URBAN WORKERS

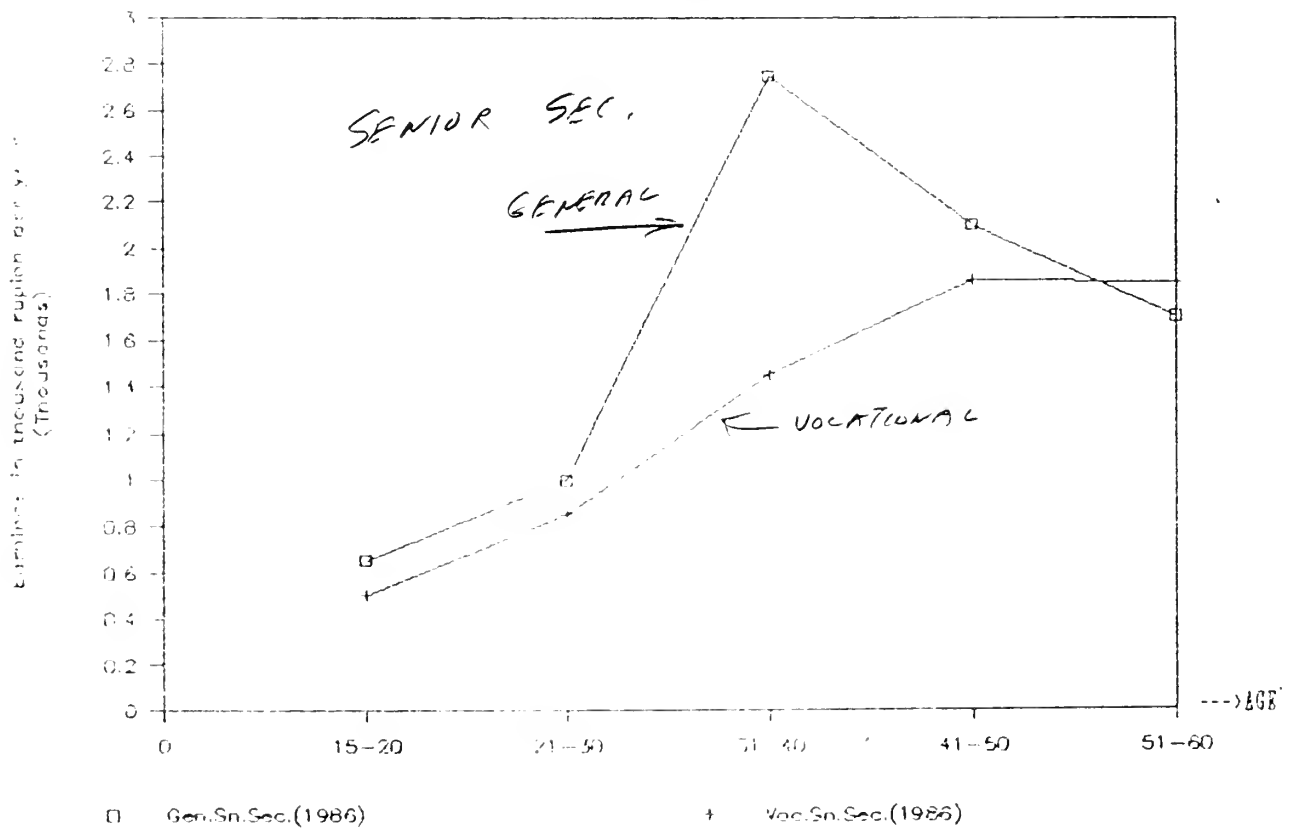


TABLE 8

Unemployment and Underemployment
By Education Level and Type

	URBAN Unemployed or Under employed (Works 0-35 hrs/wk)	RURAL Unempoyed or Underemployed (Works 0-35 hrs/wk)
No. School	47%	61%
Some Primary	37%	52%
Primary	26%	47%
Jr.High General	22%	48%
Jr.High Vocational	23%	43%
Sr.High General	16%	32%
Sr.High Vocational	28%	45%
College 1-2 Yrs	42%	57%
College 3 Yrs	28%	29%
University 4-5 Yrs	19,6%	37%

Provinces 13, 14, 15, 16, 17, 18, 31, 32, 51, 52, 53, 61, 62, 63, 64, 71, 72, 73, 74, 82

Types of Curricula

Within junior secondary, the returns to expanding the vocational schools is quite low --- only 6% nationwide. See Table 7. (The return to the education of females in these schools is higher. But this in undoubtably due to the fact that they females are thereby induced to work outside of the home rather than remaining as homemakers without wage and salary earnings). To expand these junior secondary vocational schools is not a wise growth strategy, and they should probably be phased out as economic development occurs. The U.S. did so long ago, and expanded vocational education at the community college level, and Japan has just phased out its secondary vocational schools. As economic development occurs, the vocational-technical education tends to move to higher levels (Senior Secondary, Community college, and advanced collegiate technical programs). Students with junior secondary general education can read and write (whereas those in lower level wood carving, weaving, and other craft schools often cannot). This kind of junior (and senior) secondary general education is highly correlated with the amount of learning that occurs on the job, as mentioned earlier (e.g. Bowman (1974), Mincer (1974)).

The learning on-the-job effect can be seen with Indonesian data for industrial workers. In Fig. 4 the 1982 data shows a pattern of continuing to learn, and gaining earnings over the life cycle for both junior and senior secondary general education graduates. The age-earnings profiles for the VOTEC graduates are much flatter. This is the main reason parents resist having their children placed in separately tracked vocational schools. They are quite rational.

The same pattern emerges for those going into small business occupations, as shown in Figure 5. The senior secondary vocational training however has somewhat higher returns in some years. Little or no significance should be attached to a one year "blip" upward or downward in these graphs. Instead it is wiser to average out these "blips" either by increasing the number of cases drawn from the data base, or by averaging then with the earnings in adjacent age levels, or both.

A similar pattern can be seen in the 1986 data shown in Figure 6.

Unemployment and Underemployment

Table 8 shows that the unemployment plus under-employment rates, (defined in our analysis here as working less than 35 hours a week) are highest for those with no schooling, --- 47% in Urban areas and 61% in rural areas! These unemployment and underemployment rates are next highest for those with only some Primary Schooling" --- 37% in urban areas and 52% in rural areas. The sample has been sorted to include only the main wage eamer in each family over age 15. But table 9 is sorted further by sex, and reveals the same general pattern. (Note: This table has not

yet been inserted in the MS, but is available in the cross tabulations of the 1986 data).

Unemployment is largely a demand-side phenomenon. At currently is low in Indonesia, but if it should rise, the remedy is to raise aggregate demand by either easier monetory policies for which the Central Bank is responsible, or more stimulate fiscal policies for which the Ministry of Finance is primarily responsible, or both. But it is very difficult to reduce underemployment as demand rises (without inflation) unless the potential entrants to the labor force have sufficient education.

For those with primary schooling and above the underemployment is lowest in urban areas all the way up to and including university graduates (with the one exception of college drop outs), as shown Table 8.

In the rural areas, underemployment remains high, even at secondary education levels, which is a major reason that they migrate to provincial urban areas. It is the small and medium sized enterprises in these provincial urban areas that have the highest labor absorbtion rates, and are a vital part of the economic growth process.

The employment growth is highest among those with at least a junior High School or Senior High School education, as shown in Table 10. Employment has grown at a 3.05 % to 3.26 % rate per year among these groups, as compared to only 1.99 % to 2.4% among those with less than primary school.

TABLE 10

EMPLOYMENT GROWTH BY EDUCATION LEVEL

Educational Level	Annual Growth 1980-83
Less than Primary	1.99 %
Primary School	2.4 %
Junior High School	3.05 %
Senior High School	3.26 %
University	3.38 %
Total Employment Growth	2.21 %
Rate of Growth in the Working Age Population	2.91 %

* Source: Martin Godfrey, p. A-7 2) Ibid p. A-9

III. Conclusions

This economic analysis finds that increasing investment in junior secondary general education at the largest percentage rate while seeking universal basic education is the most economically efficient and equitable growth strategy. The returns in agricultural output can be estimated to raise by 10% per year for each farmer that completes 9 instead of 5 years of basic education, a rate of return of 23,3 to 24% (computed from studies in nearby rice-growing economies). The returns in all urban employments at the junior secondary level averages 22% in Indonesia in 1986 in what is probably, the best and most recent rate of return analysis (of data covering 225,000 individuals nationwide) that has been done. These returns understate the returns to per capita growth because as females finish basic education, the population growth rates can be expected to fall below the 2,1% current rate.

This needs to be accompanied by an expansion of senior secondary general at almost as high a percentage rate. The rates of return in urban areas in Indonesia average 20,5%. At both levels the under employment rates are much lower than for illiterates or for those with some primary education only. Both contribute to learning on the job, and the higher labor absorbtion rates found in small and medium size enterprises.

Junior secondary vocational has flatter age earnings profiles, lower rates of return, and should probably be phased out as the country develops further. Senior Secondary Vocational does contribute to growth, but the age earning profiles are somewhat flatter than for secondary general, and the rates of return are lower. A slower rate of expansion, and some consolidation and inprovement in quality, would be economically justified.

Finally, the overall rate of investment in education in Indonesia is relatively low. Indonesia invests only 9,4% of its government budget in education, in spite of the fact that rates of return are higher than to investment in physical capital as shown in this paper. It therefore would be economically justified to increase this percentage steadily over the next several years. Korea invests 20,54% its government budget in education, and all countries that have reached the take-off stage in Asia are investing in the range of 18 to 22% of their budgets in education both before and in the early stages of rapid per capita growth. An economically efficient and equitable way to start moving in this direction would be to establish a clear goal of universal junior secondary general education (with some emphasis on improving the quality of primary, and on expending and improving senior secondary), and to more in this direction with all deliberate speed.

APPENDIX A
Methods of Computation

Foregone earnings costs at each education level shown in Table in the text consist of the earnings of school leavers at the next lower level, multiplied by .75 (since 3/4 of a year only is spent in school), multiplied by the average number of years it takes to complete the education level in question in Indonesia, multiplied by the percent of school leavers at that level that are employed. This probability of being employed and not unemployed or underemployed is .27 at the primary school leaver level, and .54 at the secondary school level, based on David Clark's (1983, p.40) tracer study that reports the proportion working in each age group. Forgone earnings costs can be reduced for the parents if the government assists with transportation costs, the costs of books, school uniforms, (and fees).

Direct Costs are calculated as shown in Table in the text . They are composed of the total government expenditure in schools at each level. These consist of Routine Budget Expenditure, Development Budget Expenditure, Inpress (Special from the President) Expenditure, plus the additional Susidies over and above the routine budget that goes largely to primary schools. Direct costs (except for fees) therefore correspond to the total budget lines in the government budget for education. They are multiplied by the number of years it takes to complete each level, just as are foregone earnings costs. They then are adjusted to 1986 prices by use of the Indonesian Consumer Price Index as shown in Table footnotes. These costs are explained in greater detail in McMahon, Millot, and Eng ([illegible] Ch. 2, p. 300) and the cost appendices to that Chapter.

The LOTUS program for Table in the text then calculates the pure internal rate of return for each level and type of education as shown in Table A-1 below by means of formulas underlying each cell. For example, total costs in Column 3 are merely the sum of forgone earnings costs and direct costs of Table in columns 1 and 2, and are repeated on the first "Total Cost" line for each level of education in Table A-1. Similarly, the "net earnings differential" (or returns) attributable to each additional year of education are automatically calculated by LOTUS in Table The net earnings differential for Senior High School, General, Males (i.e. 49, 218, 266, 380, 526, 705) is obtained by substracting earnings of school leavers at the next lower level, (i.e. 649, 866, etc. in this case) from earnings of those who finished the next higher level. These annual net earnings differentials for 10 year age groups are then spread out over all inter-veening ages automatically by the LOTUS program, as shown on Table A-1 where for Senior Secondary General Male, S.S G (M), following the investment costs at that level 964.17 the net earnings increments are shown for each age (i.e., 49 up to age 20, 218 up to age 30, 266 from 30 to 40 etc.) After an initial guess is inserted, the LOTUS program solves the non-linear

equation to compute the pure internal rate of return (IRR) by using the standard formula (See Mc Mahon (1988). The 18 % rate which was the initial guess for senior secondary general education, after the numerical analysis iterations calculate a social rate of return for this level of education of 19 %, which causes the net present value of the costs (-964.17) and the discounted present value of the stream of returns (49, 218, 266 etc.) to equal zero as shown on the last line. Sometimes the program will not solve for the rate of return, and proceduces ERR as shown in Table for Jr.Sec. Vocational in selected provinces. The remedies are to insert another "initial guess", and recompute. If this does not work look at the net earnings differentials, and if they contain a dip, or saddle point, insert an average of the two adjacent cells. Then normally the solution will not hang up on a local maxima, but will find the global solution that satisfies the equations.

There are of course issues in the use of net earnings differentials as a measure of the benefits of education. They are extensively discussed in the literature, but it should be noted that a number of these have been addressed by the research design. Farmers for example, have been excluded since earnings do not measure their output. Income other than earnings has been excluded. All analyses control for sex, and for age, and hence age earnings profiles in Indonesia reflect learning on the job, over time, as they should. Indonesia has a relatively large private sector so that government pay scales do not dominate to the extent that they do in some countries. This is also an effect that has been minimized by sorting the data to exclude government employees (For breakdowns by this dimension see McMahon, Millot, and Eng (1982, p.308-314) and for 1986 data see the tables later in this paper).

The issue of "self-selection" is a complex issue that cannot be addressed in all of its ramifications here. Let it only be said that if individuals, or families, self-select a larger investment in more years of education, then any returns to that level or type of education selected is a return to the additional education, whether it was self-selected or not. These returns should not be excluded from the benefit/cost calculation. Furthermore, if the fathers income is higher, and this causes the family to keep the child in school for more years, then again, larger earnings later are a return to the investment in education that has been made (irrespective of who makes the investment, the state, the child, or the father). These earnings should not be excluded as a return on the grounds that the father has higher education, or higher status. Similarly, if there is more imvestment in education in the home due to the fact that the mother has more education, and this helps the child to stay in school longer, then again the higher earnings that result are a return to the investment in educatfon of the mother that has been made, and should not be excluded. It is only factors <u>other</u> <u>than</u> <u>education</u> that lead to higher earnings that should be excluded. Some differences in earnings are due to pure chance. But these are somewhat random, and over larger numbers of individuals will

average out as white noise with a mean of zero and a sum of zero over the relatively large number of individuals within each cell in this very large 360,000 person sample. When they do not average out an "outlier" is often observed with either a very large or very small mean. To prevent these chance related outlie from distorting the results the persons processing the data (HEROE and PRAYITNO) have systematically replaced these outliers with the mean of the earnings data from the two adjacent age groups.

Ability differences are the one remaining significant factor that can lead to differences in earnings. For example, it is true that students with lower ability tend to be placed in vocational secondary school curricula, rather than in secondary general schools, (see McMahon, 1988, p. 29). The problem is that "ability" which is usually measured by test scores tends to be very highly correlated with the parents education and income, and reflects the amount of prior investment in education that has been made by attending better quality schools in higher income districts and by some learning at home. So the earnings that result are again a return to the prior investment in education in these higher income urban schools in large part. The more recent research on the increments attributable to education (the so called "alpha coefcicient") has moved toward placing it at .9 or 1.0, (See Psacharopoulos and Woodhall (1985)) has been done here. A survey of this large amount of research on the alpha coefficient also appears in McMahon and Geske (1982, in the Appendix to Chapter 3 by McMahon and Wagner).

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Footnote

*Walter W. McMahon is Professor of Economics, and of Education, at the University of Illinois at Urbana-Champaign. Dr. Boediono is Head of the Center for Informatics in the Ministry of Education and Culture in Jakarta. Both would like to express appreciation to Dr. Moegiadi, Associate Director of the Office of Educational Research and Development, MOEC, and to the IEES/USAID project both for support of this work and for willingness to allow publication of the results. Responsibility for any conclusions reached and all errors however remain exclusively with the authors.