

**RATES OF RETURN TO
EDUCATION IN GREECE**

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IN
GREECE.

A Discussion of Results
and Policy Implications*
by
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fascinating discussion
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of the results
(pp. 42-53)

This paper is intended to serve as a basis for discussion of the relation between rates of return to education calculations and educational planning policy.

Part I presents results and analyses of a study on rates of return to education in Greece undertaken by the author.

Part II discusses the reasons for the ambiguity of the policy implications despite the unambiguous nature of the calculated economic benefits and costs involved. The basic idea is that there is an asymmetry in the policy implications of the cases in which calculated benefits are greater than costs and those in which the reverse is true.

* The reader should bear in mind that most of this was written in 1965-66.

PART I

Returns to Education in Greece1. Education in Greece.

By comparative European standards Greek economic and educational performance gives the impression that there is little need for concern that lack of education inhibits growth. The rate of economic growth in the last decade has been one of the highest in Europe. GNP has grown by more than 7% per year. Productivity per man employed has grown by almost 6%. By any standard we can think of this as a very creditable performance. If we compare the proportions in various age groups in school in Greece with other countries at its economic level then Greece does as well or better than most. This is true not only in the primary and secondary levels but also at the university level, especially if we include Greeks studying abroad. Thus, on the basis of comparative standards the educational picture looks very good indeed. Even if we compare the proportions in each age group attending school or university in Greece with Western European countries we find that Greece does better than a great many of them, and as well as most. Table I taken from the OECD report on Greek Education summarizes some of the basic statistical data on which these conjectures are based. While it is possible that the lack of education has been an obstacle to economic growth there is no obvious evidence that this is the case.

There is some concern in Greece about maintaining the rate of growth. This concern has some basis in fact. If we compare countries

with high growth rates in the post war decades we find that, in general, they are countries which have had very much lower growth rates in the pre-war decades. Indeed, as table 2 illustrates, when we average post war and pre-war decades then the rates of growth of different countries that have grown reasonably rapidly, say about $2\frac{1}{2}\%$ in the last 40 years, are really very close to each other. Thus, it can be argued the high rate of growth in Greece in recent years is part of a process of "catching up" with a lack of growth in the pre-war period. However, the statistical evidence thus far does not suggest that any slow-down is taking place. The Greek growth rate has been rapid for about 14 years now and in the last three years it has risen several percentage points. On this score too the picture thus far appears to be highly creditable.

A remarkable fact about Greek education is that relatively large numbers, by most European standards, have been educated very inexpensively. The proportion of GNP spent on education by all groups has been less than $2\frac{1}{2}\%$ -- considerably less than most other European countries. Two alternative conjectures come to mind -- either: (1) Greece has been exceptionally efficient in allocating its resources to education, or (2) while the quantity has been ample the cost has been low because the quality of it has also been very low. We will return to these conjectures later.

Table 1

COMPARATIVE EDUCATIONAL DATA FOR GREECE AND RELATED OTHER COUNTRIES^y

Country	Number graduating from secondary education as a percentage of relevant age group	Entrants to higher education as a proportion of number graduating from secondary general education	Number graduating from higher education as a percentage of relevant age group
GREECE	17.6	45	3.6
United States	65.5	50	16.9
Canada	38.0	40	6.9
Belgium	11.0	62	3.3
Ireland	13.0	40	n.a
Great Britain	6.0	78	3.4
France	11.0	81	3.4
Netherlands	6.0	67	1.7
Norway	11.5	47	2.8
Sweden	11.0	67	4.3
U.S.S.R.	n.a	n.a	n.a
Denmark	6.0	71	2.2
Switzerland	5.5	n.a	4.7
Austria	10.0	56	1.7
Luxembourg	n.a	n.a	n.a
Italy	6.5	60	2.6
West Germany	5.0	81	2.7
Spain	5.0	50	1.4
Yugoslavia	11.5	n.a	4.3
Portugal	n.a	n.a	n.a
Turkey	2.0	n.a	n.a

All Greek data are for 1961, as furnished by the National Statistical Service of Greece and the Planning Division of the Ministry of Coordination.

Source: OECD, Education and Development Country Reports, The Mediterranean

2. Returns to Greek Education.

Another way of looking at the matter of quantity and efficiency is to see what people and the economy are getting out of their education. Is the result, given the effort, sufficiently worthwhile so that the benefits are greater than the costs? If so it may pay for additional people to be educated and to benefit accordingly. As far as I am aware, at the time of writing, there was no previous work on returns to Greek education. But returns and costs would appear to be critical considerations in answering the following questions:

What are those being educated at various levels getting out of it? Can more be educated and benefited to the same degree? What is the economic system getting out of the resources it puts into education?

To answer these questions we present in tables 3, 4, and 5 the results of calculations showing returns and costs to various levels of Greek education in different years. Before discussing the findings in detail we may indicate the general nature of the results. University education on most counts more than pays its way. The rate of return to secondary education is low, and on some bases negative. If we take these calculations seriously, and we shall consider in detail below the degree of caution with which we should treat these results, then it would appear that an expansion of Greek university education may be warranted, but this is not true for secondary education, or secondary level

Table 2

Growth of output in western countries,
1913 to 1959

Compound annual percentage rates of growth of national product at
constant prices

	Rate of change of GDP		
	1939 to 1949	1949 to 1959	1913 to 1956
Western Germany	-2.2	7.4	2.1
Austria	0.8	6.0	1.4
Greece	-2.0	5.9	2.0
Italy	0.1	5.9	1.9
France	0.2	4.5	1.3
Finland	1.6	4.2	3.1
Norway	2.4	3.4	3.0
Sweden	3.0 b	3.4	2.4
United States	4.4	3.3	3.2

Source: E.C.E., Some Factors In Economic Growth In Europe During The 1950's,
Chapter II, p. 3.

vocational training. In fact secondary education has been expanded, but little has been done about university education.

An initial difficulty that arose in attempting to calculate returns on education for Greece was the lack of appropriate data. There are no published data for Greece on income levels by years of education. Two possibilities existed: to use substitute data and make calculations based on various assumptions, and/or carry out a survey and generate the necessary data. I employed both methods. For the most part three types of data were used; (1) data from the household survey of 1957-58; (2) salary schedules for those in public employment where the occupations involved have fairly clear cut educational requirements, and (3) I directed a small sample survey¹ of those employed in commerce and industry in the Athens area and in this way obtained a sample that yielded information on each respondent's age, years of education, monthly income, and occupation. The sample included over 1,500 observations for 1964 and over 1,100 for 1960.

The general nature of the results from all types of data are for the most part in the same direction.² The rates of return to

1. While I designed the survey Greek colleagues at the Center of Planning and Economic Research did all the detail work involved. They translated my questionnaire, chose the sample, visited Greek firms, obtained the necessary data from records or from interviews, and processed the data. However, since I was in control of the situation I am responsible for any deficiencies in the results.

2. Data was also obtained of the income of engineers from their professional association. These were rough estimates of "typical" incomes by years of practice. In addition a small mail survey was made of lawyers in independent practice.

University education are relatively high while the rates of return to secondary education are low or negative. In the household survey years of education were not given but only occupational groupings. It is very difficult to know what reasonable assumptions should be made about the years of education of those who were termed professionals in the year 1957-58. From the 1960-62 census reports which give the proportions of the population with different degrees of education it was possible to infer something about the differential degrees of education for different broad occupational groupings. The results obtained on this basis were consistent with the other findings.

The sample survey presents two problems: representativeness, and the fact that the sample includes only those that are employed. That is to say, it does not include those with higher education who would like managerial or clerical posts in industry or commerce but who have been unable to obtain such posts. It is difficult to judge what the bias is in this case. The same is true of those employed in government. One interesting result of the sample survey is the finding that the rates of return in industry and commerce for higher education are not significantly different from those in government service. The present values of the income streams in the private and public sectors seem to be competitive vis-a-vis each other.

Another problem that arose in connection with the survey is the type of calculation to make. Two obvious choices are (1) the internal rate of return and (2) the per cent net gain (present value

of the income stream less cost) over the cost of education $\left(\frac{v-c}{c}\right)^1$. While I emphasized the latter approach I also made calculations of internal rates of return.

The internal rate of return does present some difficulty in that it assumes that either society or individuals have the option of investing in each period at the internal rate. That is to say, receiving income at an earlier period is worth more than the same income at a later period, in part because the person could invest the earlier period income and receive a return on it to that later period. However, there is no evidence that an individual or society could always make such investments at the internal rate of return. Indeed it seems most unlikely in some instances.

Computing $\left(\frac{v-c}{c}\right)$ involves the present value of the discounted stream which in turn involves the choice of an interest rate. I chose rates of 6 and 7%. The 7% rate, given the rates of return on bonds, and the "relatively long run" interest rate, seem to be on the high side.^{2/}

1. v is the present value of the income stream attributable to marginal years of education, and c is the cost of the same number of marginal years of education.

2. Another element involved in estimating present values are the survival rates based on the 1960-62 census figures. In developing age-income profiles for years of education, earnings were assumed to end at age 65. At a 6% rate of discount mortality risks reduced the present value of income stream by only 3/10 of 1%.

(footnote continued on page 14.)

Table 3

Benefits (Present Values) and Costs of Education in Greece
at 6% and 7% Discount Rates
(in 000's Drachmas)

		(1)**	(2)	(3)	(4)	(5)	(6)	(7)
		Primary Total Age At 14	Secondary Total Age At 14	Secondary Education Age At 19	Higher Total Age At 14	Higher Educ. Age At 19	Secondary Less pri- mary age At 14	Higher Secon Age At 19
Survey data - 1960 Males	Present Values at 6% disc.	297	318	426	420	563	21	137
	Present Values at 7% disc.	250	260	363	335	468	10	105
	Costs	8	54		132		46	78
Survey data - 1964 Males	Present Value at 6% disc.	465	414	495		665		170
	Present Value at 7% disc.	420	300	420		547	-120	125
	Costs	14	90			184	76	94
Survey data - 1960 Females	Present Value at 6% disc.	237	235				-2	
	Present Value at 7% disc.	205	192				-13	
	Costs	8	54				46	
Survey data - 1964 Females	Present Value at 6% disc.	287	330				43	
	Present Value at 7% disc.	245	269				24	
	Costs	14	90				76	
<u>Civil Service Pay Scale - 1964</u> <u>Civil Servant Administrators</u>	Present Value at 6% disc.	336	356	473		695		222
	Present Value at 7% disc.	305	287	402		577	-18	176
	Costs	14	90			199	76	115
School teachers	Present Value disc. at 6% to age 21			799*		924*		125*
	Present Value disc. at 7% to age 21			682*		786*		106*

Costs (about 2 1/2 years
higher education)

84

Self-Employed
Engineers vs. Draughtsmen

Present Value disc. @ 6% at
age 21

595*

1,218*

623*

Cost of Engineering Training

135

*At age 21.

Table 3

**
Meanings of Columns

- (1) Present value of the discounted income stream of those with a primary education, discounted to age 14.
- (2) " " " " " " " " " " " secondary " " " " "
- (3) " " " " " " " " " " " " " " 19.
- (4) " " " " " " " " " " " higher " " " " 14.
- (5) " " " " " " " " " " " " " " 19.
- (6) Column (2) minus Column (1) where appropriate.
- (7) Column (5) " Column (3) " " .

Table 4

Rates of Return ($\frac{v-c}{c}$) to Additional Education Needed for:

	at Discount Rates of	
	6%	7%
<u>1964</u>		
A. Civil Servants		
1. Secondary school teachers (against Primary teacher teachers ^(b))	49%	24%
Administrative Personnel ^(b)		
1. With Secondary Education	-113%	-124%
2. With Higher Education 15 years plus	93%	53%
B. Independent Professionals ^(a)		
1. Independent professional engineers ⁽¹⁾		
Higher education (against draughts- men with secondary education)	361%	
C. 1957-58 (Household Survey Data)		
1. Professional Earnings (against Clerical Earnings)	165%	
2. Clerical Earnings (against Laborer's Earnings)	-90%	

Data sources: (a) Based on information from Technical Chamber (Mr. Tombrogiannis) and (b) Official pay-scale for technicians - "Treasury department - tefchos 7 edicac ecdoses, 1964."

Table 5

Rates of Return $\left(\frac{v-c}{c}\right)$ to Education Based on Survey Data To

	At Discount Rates of		
	3%	6%	7%
A. Higher Education			
1. Males 1960 - Higher	-	75	34
2. Males 1964 - Higher	-	70	35
B. Secondary Education			
1. Males 1960 - Secondary	135	-53	-81
2. Females 1960 - Secondary	-	-103	-121
3. Males 1964 - Secondary	6	-167	-128
4. Females 1964 - Secondary	-	-37	-66

Table 6

Approximate Internal Rates of Return to Years of Education*

Yrs. of Education	Sex	Year	Internal rates if 0% rate of growth	Internal rate if 4% rate of growth	Internal rate if 5% rate of growth
1) 15 against 12	Males	1960	8.00	12.50	13.50
2) 15 "	12 Males	1964	8.00	12.50	13.50
3) 12 "	6 Females	1960	3.00	7.00	8.00
4) 12 "	6 Females	1964	5.00	9.50	10.50
5) 12 "	6 Males	1960	4.50	9.00	10.00
5* 15 "	6 Males	1960	6.00	10.00	11.00
6) 12 "	6 Males	1964	3.00	7.00	5.00
6* 15 "	6 Males	1964	5.00	9.50	10.50
7) 15+ "	12 Adm. Pers.	1964	8.50	13.00	14.00
8) 12 "	6 "	1964	2.50	6.50	7.50
8* 15 "	6 "	1964	5.50	9.50	10.50
9 Engineers against Draughtsmen	Males	1964	14.00	18.00	19.00
10) Secondary school teachers against primary school teachers		1964	8.00	12.00	13.00

* In each case the return is to marginal years of education. Thus "15 against 12" implies the return to the 13th, 14th, and 15th years of education combined.

3. The Choice of the Appropriate Rate of Return

Given the necessary data there are a variety of rates of return that can be calculated. We consider briefly only two of the main alternatives.

(1) The private rate of return: The private rate of return looks at the problem from the point of view of the one attending school. The household of the student has to bear certain costs for school attendance and presumably the consequence of such attendance is an increase in the potential income stream of the student. Of course, some costs are frequently born by the government, or by private or public social agencies, but these are not considered in the calculation. It is possible for the private rate of return to be positive while the "social" rate of return is negative. However, this did not turn out to be the case for Greece. It is important to note that we do include in the private costs the income foregone while attending school.

Footnote cont. from page 9.

A short-cut used in computing the rate of return is the assumption that all costs of education are incurred at a single point in time. Essentially the assumption is that all education is pre-paid. In fact, the cost of education of a given type is more or less evenly spread over the education period. The overstatement is by roughly one-half of the interest that would be earned on the cost over the period of the education if the total cost had been available at the outset. An adjustment was made to take care of this aspect of the problem. In order to avoid overstatements in the rate of return the cost of secondary education was adjusted by 10% for the six years period, and the cost of higher education by 5% for the three year period. However, the results are not very sensitive to changes in these rates by several percentage points in either direction.

(2) The full resources cost rate of return: By this term we have in mind what is frequently called the social rate of return. Here we take into account, as far as possible, the costs of all the resources per student, including the income foregone from not working while the student is attending school. Thus, in a free educational system the government's outlay for education becomes part of the cost to be considered. The income stream attributed to this education is discounted to determine its present value and compared to the full resources cost to determine the rate of return. It is this rate that has been emphasized in this study. In calculating the income foregone I have usually deducted from the income what the student would have earned, if he were not in school, some 15% because going to school does not foreclose the possibility of summer employment, and an additional 5% because of the risk of unemployment. The idea here is that approximately 5% of the students, were they in the labor force, would face the prospect of being unemployed at any given time.

For comparative purposes we include in Table 6 estimates of the internal rates of return for the various educational alternatives. For convenience we show in the same table what the internal rates are if we assume 4 or 5% rates of growth in the income streams assuming that each educational group shares proportionately in the growth.

4. Comments on the Numerical Results

One of the main ideas behind my attempts to compute rate of return on education was to suggest possibilities for further research.

hopefully with much better data. However, there was considerable value in making the crude calculations presented here in that they indicate something of the relative magnitudes involved. At the very least the numerical results suggest some preliminary hypotheses about the nature of Greek education that can be tested in the future with better data and in a more thorough manner than was possible by the writer given the time restrictions involved. It is of interest that the calculations are, in general, consistent with impressionistic observations about the nature of Greek education relayed to me by Greek informants.

The most obvious aspect of the results is the fact that the rates of return to higher education are consistently and significantly greater than the return to investment in secondary education. It is most likely, if we are to take the data seriously, that it is a paying proposition to expand university education if we take the volume and quality of secondary education as given.

It is of interest that the rates of return to a secondary education as terminal education are frequently close to zero or negative, at a zero growth rate. Strictly as an investment in terminal education, apart from the growth effect, secondary education does not appear to be a good bet. Thus, rational investment in secondary education may be seen as investment in a partial gamble to achieve university admission, which does have a considerable positive payoff. or as a cultural rather than an economic investment. To use Houthakker's phrase, for secondary education in Greece it may not

be true that "it's better to have loved and lost rather than not to have loved at all." Indeed, for 1964, without the growth effect, it does not even pay to "love and win."¹]

It is important to keep in mind a significant qualification.

[The calculations of the income streams which are presumed to be a consequence of secondary education do not include the "growth income" in the future as a consequence of the growth rate of the economy. In recent years productivity per worker in Greece has increased by about 6% per year. If this rate is assumed to continue for the next four decades, and if 6% is considered the appropriate discount rate, then this is equivalent to using the undiscounted stream to determine the present value. If we look at table 7 at the value of secondary education at a zero rate of discount we see that it is higher than primary education by about 350 thousand Drs. Since the cost of secondary education is somewhere between 46-74 thousand Drs. then it may appear that secondary education does pay-off for both 1960 and 1964.]

It is difficult to know whether, in the future, those with a secondary education will share in the productivity gains to the same degree as those with a primary or those with a higher education. In addition it does not seem reasonable to assume that a 6% rate of growth per worker will continue for four decades when the evidence suggests that if we look at the rate of growth from 1913 to 1957 it is only

1. H. S. Houthakker, "Education and Income," Review of Economics and Statistics, February 1959.

about 2% per annum. In other words, it may be argued that the current rate of growth is a short-term rate, and that based on past experience it could not be expected to persist for the 40 to 45 years of a working life-time.

But, on the other hand, a two to four per cent rate of growth in productivity for the four decades does not appear to be at all unreasonable. For example, if we assume a 3% rate of growth, then it appears that secondary education does pay for itself even at a 6% rate of discount for males for both 1960 and 1964.

The calculation that takes the growth rate of the economy into account is especially relevant if the groups under consideration gain in the growth compared to others. The question that arises

is the extent to which those with higher education and secondary education gain compared to each other, and compared to those with an elementary education or less. Table 7 sheds interesting light on this question for the years from 1960 to 1964 on which we have survey data. The increase in income for males with secondary education is approximately the same as those with a primary education undiscounted, and is considerably less than those with a primary education at the 6% discount rate. In other words, those with a secondary education not only did not share proportionately compared to those with a primary education but they could have received a greater increment in the present value of the income stream in the four year period with less education. The table indicates that approximately the same is true for those with a higher education. The only exception to the

case is for women with secondary education. For those women the income stream rose more than proportionately than women with only a primary education. Thus, if the 1960-64 experience is taken to be representative of the distribution in gains from growth, then the growth argument could not be made to justify expansion of the secondary or higher education. In other words, if we focus our attention on secondary education, then it is clear that secondary education does not pay off if we take the gains from growth into account. A similar conclusion holds for secondary and higher education taken as a single unit.

Of course, it is to be emphasized that we do not know whether the experience between 1960 and 1964 is what we can typically expect in the course of the growth process. Hence, the conclusion is far from definite but the empirical evidence available does not clearly support the conclusion that secondary education pays off. It is likely that in the period involved those who gain more than proportionately in the growth process were the previously unemployed, farmers, workers with a primary education or less, and women with a secondary education. These conjectures are based on rather fragmentary evidence and little more can be said than to suggest that the relative gains from growth needs more thorough study.

At first blush it may be thought that although secondary education does not appear to pay for itself when all costs are considered at the 6% discount rate (without the growth adjustment) that it will pay for itself if only private costs are taken into account. However,

Table 7
 Differentials in Present Values, 1960 - 1964
 (in 000's Drks.)

	Males - 6 yrs. Ed.		12 yrs. Ed.		15 yrs.		Females-6yrs.		12 yrs.	
	0% Disc.	6% Disc.	0% Disc.	6% Disc.	0% Disc.	6% Disc.	0%	6%	0%	6%
1964	1479	465	1854	414	2526	655	1086	287	1625	331
1960	1238	297	1592	318	2349	563	885	237	1116	235
Differential	241	168	262	96	177	92	201	50	509	96

additional calculations show that this is not the case. Income foregone is a significant proportion of the cost of education. The lower private cost of education (inclusive of income foregone), as compared to the social cost, does not alter significantly the overall result. (See table 8 below.)

Table 8

Rates of Return($\frac{v-c}{c}$) and Costs, Private vs. Social, for
Secondary Education at a 6% Rate of Discount

	1960		1964	
	Cost (in 000 Drs.)	Rate of Return	Cost (in 000 Drs.)	Rate of Return
Males - Survey Data				
Social	46	-53%	76	-167%
Private	37	-34%	57	-190
Females - Survey Data				
Social	63	-103	70	-37
Private	49	-104	51	-14

The low returns to secondary education may reflect the very low quality of that education as a preparation for employment. Of course our calculations omit the consumption value of secondary education, which may be considerable, at least in terms of relative status and prestige compared to those who have only a primary education. In addition the working conditions of those with a secondary education may be pleasanter.

The life style of a student is different than that of one who works. It may be argued that the utility of the experience of attending secondary school at a somewhat lower income level is not significantly less (if at all less) than the utility of a higher level income while employed. In other words, the dis-utility of work may be sufficiently greater than the dis-utility of the effort and/or psychological strains involved in attending school so that the net result would be approximately the same as if the income foregone were not included. If we excluded all income foregone (which would mean taking an extreme position) the result at a 6% rate of discount would be different for males in 1960. However, it would not make secondary education pay-off for males in 1964 since the present value of secondary education is less than that of primary education for males in 1964.

To exclude all income foregone from the cost of secondary education would certainly represent an extreme position. At least something like 40% of the income foregone can be viewed as a social cost in the sense that approximately 20% represents tax revenues lost to the government, and another 20% represents investment lost to society -- assuming that marginal tax rates and marginal saving rates are approximately equal to average rates. But even if we charge only 40% for income foregone against the cost of secondary education the qualitative results do not change markedly. This can be seen from table 9 which contrasts the rates of return $\left(\frac{v-c}{c}\right)$ for secondary education on the basis of a full charge of income foregone as against a 40% charge of income foregone.

All things considered it is very clear that the overall results are very sensitive to two elements: the rate of discount chosen, and the rate of growth in the income stream that we assume. The result that is unambiguous, and that is relatively insensitive to these two elements, is that higher education is a much better investment than secondary education.

Table 9

Rates of Return ($\frac{v-c}{c}$) to Secondary Education
Under Full Income Foregone Cost Versus
40% Income Foregone in Cost

	At Discount Rates of			
	6%		7%	
	100% Income Foregone in Cost	40% Income Foregone in Cost	100% Income Foregone in Cost	40% Income Foregone in Cost
1. Males 1960	-53%	-19%	-81%	-67%
2. Females 1960	-103	-106	-121	-139
3. Males 1964	-167	-220	-128	-150
4. Females 1964	-37	+9	-66	-41

Another important result that is unambiguous has to do with technical education at the secondary school level. In the survey the wage rates associated with such education are approximately the same as those associated with general education of equal duration. However the direct cost per student of such education is several times as large

as that for secondary education. Hence if secondary general education does not pay then technical education of the type and under the conditions given in the past certainly does not pay. Like all our results this one too is a provisional one and more research needs to be done on this matter.

Finally it is a special interest to know that if we look upon higher education as being produced by those who enter gymnasium after primary education then higher education does just pay-off at a 6% rate of discount unadjusted for growth for 1960 but it does not pay off for 1964. In other words, secondary and higher education as a combined investment that produces university graduates does not lead to a benefit greater than cost unless we reduce the discount rate below 6%, or impute a growth in productivity per man above zero, or some combination of the two. If 6% is a reasonable rate of discount, then the value of higher education for 1964 looked at as being produced by both secondary and higher education depends entirely on the increase in the productivity of the economy that we assume.¹

We have already alluded to the fact that the results are very sensitive to the discount rate employed. According to the study by Ellis, Psilos, et. al.,² the bank deposit rate fell from about 6% in

1. The above result is true even if we do not take into account the fact that it takes more than one person entering the secondary education stream to obtain a person that graduates from higher education. If we do make an adjustment for this, then higher education very clearly will not pay-off at a 6% rate of discount, and most probably will not pay-off at a 3% rate of discount.

2. Industrial Capital in Greek Development, Athens, 1964, pp. 55-56.

1958 to 5.5 in 1960. And to about 4.5% in 1964. The loan rate by banks was approximately 9% in 1956 and around 7% in 1961. The return to time deposits of one to two years duration was 6% in both 1960 and 1964. The "intermediate time" interest rate appears to be the most stable one in the economy. It is quite likely that individuals from upper income groups will have greater access to the capital market and hence their opportunity cost rate may be higher than those from lower income groups. Since to some degree it is likely that education and access to the capital market are correlated, it may be appropriate to use a 6% rate for those with higher education but only a 4 or 5% rate for those with lower education when we compute rates of return. If a single discount rate must be used then 6% seems to be the most reasonable one.

A charge that could be levelled against the numerical results is that we have overestimated the returns to education because we have attributed the entire differential income stream to different years of education.¹ However, part of this, perhaps all of it, is taken care of

1. A study by Dr. Jane Lambiri-Dimaki shows quite clearly that university students (1962-63) do come from atypical family backgrounds. Nevertheless they are not the children of the rich as this would normally be defined. Only 12% come from families whose monthly income is above 5,000 drachmas per month; 88% come from families whose income is below 5,000 drachmas per month. It is hard to imagine that those whose family income is, let us say, between 5 to 10,000 drachmas would be able to confer any considerable nepotistic advantages to their children. And this income class represents over 2/3 of those with family incomes between 5 to 20,000 drachmas per month. On the other hand, the proportion of the university population who come from relatively educated families (29% with university education) is much higher than the proportion of those in the parent age groups who are equally educated (4% with university education). This implies that it is probable that those who go to the university

by compensating errors. The results are understated because they do not include self-employed income, or "moonlighting" income. Our attempts to get some notion of self-employed income either of engineers or lawyers shows this income to be considerably above that of educated people employed in commerce and industry. The differential is probably somewhere between 30 to 70%, and it is probably sufficiently large to compensate for the presumed return to differential ability of those employed in commerce and industry.

It is difficult to adjust for ability of those employed in commerce and industry because no additional data are available at present to indicate the differential ability and related differential income of those with higher education as against those with secondary education. The author's impression is that this differential is less in Greece than it would be in the United States because the examination and elimination system is much poorer in Greece and a poorer indication of differential ability than the system for the U. S. Professor Gary Becker, who reviews the American data, found that for university education the internal rate of return should be reduced at most by about 12 to 20% whereas for secondary education it should be reduced by about 25 to 35%.¹ My general impression would be that a 20% reduction for higher

are chosen only to a small extent on the basis of native ability or nurture and hence the return to education (for those not in independent practice) calculated is for the most part really a return to education and not a return to innate capacities. Needless to say the studies available to the writer at present do not allow us to come to a definitive conclusion on this matter.

1. Gary S. Becker, Human Capital, New York 1964, pp. 82-85.

education and a 30% reduction for secondary education would be adjustments for Greece that would err on the high side. If we make such adjustments then higher education still pays at zero growth while secondary education does not. At a 5% rate of growth, assuming it is shared by the educated group in question, the internal rate of return for higher education falls to about 11% while for secondary education it falls to somewhere between 5 to 7%. The general qualitative results remain unchanged.

It must be emphasized that in part those in private practice come from the same educational cohorts as those in commerce and industry but are probably self-selected in terms of ability, less risk aversion, and superior parental connections. Thus, a good deal of the differential that we attribute to higher education has already been taken care of simply by the self-selection process which leads those with greater ability and energy to go into private practice, and the fact that most of our results exclude those in private professional practice. As a consequence, it seems to the writer that the calculated return to higher education of those employed in commerce and industry is probably reasonably close to or below their real return. It is to be noted that, for the most part, no such options exist for the bright students whose secondary education is their terminal training. All things considered, higher education appears to be a good investment while secondary education is still problematical. A clear cut economic argument cannot be made for secondary education if we exclude its consumption value.

The results of the calculations for higher education are similar

to what the Greek population seems to want. The success of Frontisteria that prepare students to take university entrance examinations, probably indicates an awareness that a university education is, indeed, a good investment, even if people are not aware of the exact rates. Of course, there are other motivations involved such as the possibilities of upward class mobility achievable through a university education.

One puzzling aspect which may have arisen in the reader's mind is that if the quality of higher education is poor, as it is frequently alleged to be, why does it pay off so well? Here we must keep in mind two facts. First, the payoffs are relative to the costs of the education. Second, the payoffs are on the basis of differentials for different years of education. This implies that if both secondary education and higher education are equally poor there could still be a considerable pay-off to higher education. This last hypothesis is contrary to the belief sometimes expressed in Greece that the quality of secondary education is high because great demands are made on the students' time. One piece of evidence of the low quality of secondary education, but hardly conclusive evidence, is the widespread prevalence of Frontisteria (private cram-schools). Students supplement for the deficiencies of the educational system in four basic ways: by attending Frontisteria, by self-study, by receiving some education in private schools, or by study abroad. The relatively high rates of return to higher education may reflect, to a considerable extent, the disequilibrium aspects of both the demand and supply sides of the picture. Given that there is a complementarity between capital accumulation and the demand for high

level manpower, it is reasonable to expect that the rapid rates of capital accumulation in Greece in recent years has lead to such demands for high level manpower that the rates of return for the higher levels of education turn out to be very high. This last is especially likely to be so in view of the relative lack of expansion of university places. On the other hand secondary education is relatively easier to expand, and has expanded, to some extent through an increase in the number of students in existing facilities.

For the most part entry into higher education has been restricted to roughly 1/3 of the graduates from secondary schools. Expansion of higher education is difficult and for the most part it has not taken place since it requires the creation of new universities which involve unusual organization, political, and manpower problems. On the other hand, secondary education has not been restricted in its expansion to the same degree, if at all. In part, the expansion of secondary education has been at the expense of quality. Namely, it probably has resulted in an increase in student/teacher ratios in the more specialized and scientific areas. Part of the explanation of the low returns from secondary education may be due to a decline in the quality of the economically valuable parts of the curriculum of secondary education.

We have not included in the calculations the consumption value of education. We may look upon the cultural value of secondary and higher education as a net bonus, but this view does not adequately suggest its importance. According to an unpublished study by Solomon Wald which inquired into the attitudes about University training held by

gymnasium students in the Athens area, over 50% of the male students indicated that they were willing to go to the University even if an appropriate job was available without additional training. This gives some indication of the consumption value of the education, at least before the fact.

Some additional minor points have to be kept in mind in evaluating the calculations. The costs of secondary education are probably biased on the low side but this is probably not the case with higher education. The reason for this is that the cost figures are the averages for Greece as a whole. However, the survey results are for incomes earned in the Athens area. It is probable that the costs of secondary education in the Athens area is above the nation wide average. This argument does not apply to higher education since the institutions at university level are entirely in Athens and Salonica. Hence the average costs at the university level are the appropriate ones to apply against income earned in the Athens area.

For the most part we have not calculated the differential returns to different types of higher education. However, the returns to engineers clearly reflect the returns to specialized university education whereas those of general administrative civil servants, and those with managerial post in industry, for the most part, reflect general university level education, even if the fact is that a high proportion of it is education received in the faculty of law. No conclusion can be drawn on the basis of this profession alone. We need more data of income in the various professions to determine whether education that

leads to the practice of a specific recognized profession earns a higher rate of return than education of a more general nature, although superficial and limited survey evidence would lead us to conjecture that this is indeed the case.

5. The Value of Education to the Economy

Do positive rates of return to individuals from education have as their counterpart productivity increases as a consequence of education. What little evidence is available for Greek education does not yield a clearly determinate answer, but the data is not inconsistent with the hypothesis that education increases productivity. Table 10 shows some interesting results based on data found in Coutsoumaris', The Morphology of Greek Industry. I have re-arranged the data from a number of tables to bring out the relation between education, value added per man, and capital per man. If we ignore capital per man then one gets the strong impression that the higher the proportion of educated people in industry the higher the value added per man. But to a considerable extent the higher the capital per man the higher the value added per man. It is probable that capital and labor skill are fairly highly correlated, and are complementary inputs. In any event, it is of interest to know that the data does not contradict the education-productivity hypothesis.¹

Another attempt was made to check whether education increased productivity on a firm basis. For the 1960 sample balance sheets were available for 14 firms.²

On the basis of this data it was possible to

1. Professor Sam Bowles estimated a production function across the sectors listed in Table 10 and found that a relationship between value added per worker on the one hand, and the net capital labor ratio and percent secondary and university graduates on the other hand was fairly strong. In fact, the null hypothesis that there is no relationship is rejected at the 90% significance level, but not at the 95% level.

2. I am indebted to Mrs. Kokkova for letting me use some of the balance sheet data that she collected for her work.

Code ISIC	Industrial Group	Graduates from University or Secondary Educ. Schools	Value added per employed person in (000 drs)	Depreciated Capital per person employed
		(1)	(2)	(3)
2-3	Total Manufacturing	13.5	56.9	-
21	Beverage Industries	27.2	159.0	133
32	Manufacture of Products of Petroleum and Coal	27.1	121.1	104
38	Manufacture of Transport Equipment	26.1	42.9	35
31	Manufacture of Chemicals and Chemical Products	22.2	74.8	79
35	Manuf. of Metal Products except Machiner. and Transport equipment	21.4	49.9	59
37	Manuf. of Electrical Machinery, Apparatus Appliances and Supplies	21.2	60.5	25.2
39	Miscellaneous Manuf. Industries	21.2	66.6	44.7
20	Food Manuf. Industries except Beverage Industries	18.3	85.9	
29	Manuf. of Leather and Leather and Fur Prod. except Footwear and other wearing apparel	16.1	71.3	43.1
27	Manuf. of Paper and Paper Products	14.1	58.1	75.1
34	Basic Metal Industries	12.9	70.0	56.6
33	Manuf. of Non-Metallic Mineral Products, except Products of Petroleum and Coal	11.4	62.5	-
30	Manuf. of Rubber Products	10.3	50.0	10
25	Manuf. of Wood and Cork, except Manuf. of Furniture	9.8	45.1	24.9
23	Manufacture of Textiles	9.1	43.0	35.4
22	Tobacco Manufactures	5.4	42.0	18.6
24	Manuf. of Footwear, other Wearing Apparel and Made-up Textile Goods	n.a	-	-
26	Manuf. of Furniture and Fixtures	n.a	-	-
28	Printing Publishing and Allied Ind.	n.a	-	-
36	Manuf. of Machinery except Elect. Mach.	n.a	50.5	30.2

Source: Col. (1) Table 2.19 - p. 76 "The Morphology of Greek Industry", by G. Coutsourakis, Athens, 1963.

" (2) Table 9.3 - p. 268 "The Morphology of Greek Industry".

" (3) Table 5.6 - p. 175 "The Morphology of Greek Industry".

compute the value added per employee, the amount of value added per employee after deducting a 10%, and (as an alternative) a 20% charge against capital (i.e., "net value added per employee"), and various indices of the average level of education per employee per firm. Using a 20% charge against capital instead of 10% did not give markedly different results.

The basic results are tabulated in table 11. Four indices of education per employee were used. For index A one unit of weight was given to the last three years of secondary education, two units for the first two years of higher education and three units for three or more years of higher education, and the result multiplied by 100, and divided by the number of employees. Index B did not distinguish between less or more higher education. Index C gives weight only to higher education while index D gives weight only to higher education but distinguishes between the first two years and the last two years. It is of interest that the best association between net value added per employee and education is with that index (index A) that discriminates most between different types of education. Index B does almost as well, while the two indices that did not give any weight to secondary education are not as well associated with value added per employee. It seems that on the average firms with a higher index of education per employee do in fact have more net value added per employee. For example, using index A, the five firms with the highest value added per employee obviously have a much higher educational index (above 70) than the lowest five firms (about 20). It is also of interest that the weights

Table 11

Adjusted Net Value Added per Employee Compared with Indices of Education

Firm Code No.	Net value added per person ¹ (in 00's drks.)	Net value added per person ² (in 00's drks.)	Educ. Index A	Educ. Index B	Educ. Index C	Educ. Index D
2	272	226	87	87	12	6
10	268	206	92	75	33	33
4	112	70	32	26	11	11
14	106	56	100	100	75	37
8	94	80	100	86	28	22
7	81	79	72	61	30	28
5	70	46	47	42	19	15
13	65	59	104	102	7	6
3	63	56	30	20	20	20
11	56	49	26	31	9	2
1	45	36	20	18	13	9
12	29	27	3	3	-	-
6	27	-36	13	17	13	4
9	20	18	26	23	8	6

¹ 10% rates of return to capital deducted.

² 20% rates of return to capital deducted.

used in index A are approximately equal to the relative costs of those types of education that are given some weight. Thus, the cost of the last three years of secondary education in 1960 is approximately 25,000 drachmas, and that of three years of higher education is approximately 78,000 drachmas, while two years higher education cost not too much more than two-thirds of that. Thus, the weights in index A approximates roughly the relative marginal costs of different amounts of education beyond age 15. Of course our sample is very small, and the limited associations that exist can only be suggestive as something worth looking into in future research efforts.

6. Investment in Education vs. Investment in Manufacturing

An obvious purpose in determining rates of return on education is to compare them with the rates in other segments of economy. The only rates of return readily available to the author are those for the manufacturing sector presented in the book by Professor Coutsoumaris and the somewhat similar rates based on the same source given in the volume by Ellis et. al.^{1 2}

Two problems arise in connection with determining rates of return for the manufacturing sector: (1) conversion of the rates given in

1. Coutsoumaris, The Morphology of Greek Industry, pp. 289-295, and Ellis, et. al., Industrial Capital in Greek Development, pp. 56-59.

2. Mrs. Kokkova has calculated some rates based on a Cobb-Douglas function for 1960 cross section data in industry. Her capital coefficient is approximated .24 for "depreciated capital." If corrections are made for the value of capital and the fact that in 1960 profits were about 20% higher than the average of 1957 to 1961 then the results are not too different from ours.

Coutsoumaris to something comparable to the rates employed in this study, and (2) the reliability of the data. Let us assume to start with that the Coutsoumaris data are correct except for depreciation charges. In other words, it may be argued that firms over-depreciate capital and as a consequence profit rates are lower than they should be if we take this element into account. It should be noted, at the outset, that there are compensating elements. For example, obsolescence is rarely if ever charged against profits, and the value of capital is lower than it should be, and as a consequence, while absolute profits are understated profit rates may be close to the truth. The remarks that follow are based on a re-calculation of the data in Coutsoumaris in accordance with the structure of capital contained in the study by Krengel and Mertens.¹ According to Coutsoumaris data depreciated capital is approximately 45% of undepreciated capital, whereas in the Krengel and Mertens model it is about 72%. This latter figure is based on a 12% rate of growth of the capital stock. The details of the re-calculation are presented in the appendix to the chapter.

If we do not take into account the growth elements both in determining the income stream for education and in determining the income stream for manufacturing then the rate of return $\left(\frac{v-c}{c}\right)$ based on a 23 year average remaining life of the capital is -14% in the manufacturing sector. The internal rate of return on the same basis is

1. Rolf Krengel and Dieter Mertens, Fixed Capital Stock and Future Investment Requirements in Greek Manufacturing, Athens 1966, p. 75.

approx. 4.5%. The average lifetime left in the capital stock are the averages determined in the Krengel and Mertens model which develops the age composition of the capital stock on a first in first out basis, assuming a 30 years lifetime for new capital, and a 12% growth rate of the capital in manufacturing. Clearly, these rates are significantly lower than the rates of return for higher education in Greece but higher than the rates of return for secondary education in most cases. It may seem strange that the manufacturing sector should expand while $\frac{v-c}{c}$ is negative, but we must keep in mind that we assume no growth in productivity. If we take growth of productivity into account this anomaly disappears.

The effect of growth of productivity on manufacturing is not symmetrical to its effect on earnings attributed to education. While labor gains by working with steadily improving inputs it does not have to pay for these inputs, but manufacturers do have to pay in order to hire improved labor. Nevertheless, manufacturing firms do gain from a portion of the "residual" elements involved in growth. Through "learning by doing" (the "Horndal effect" of about 2% per year) gross product is likely to grow by about 2% per year. Further increases are also likely to take place as a consequence of dis-embodied technological changes. Let us estimate that the sum of these elements increase gross product in manufacturing by about 3% per year. If we take this element into account then the $(\frac{v-c}{c})$ rate of return for manufacturing rises to approximately 29%. The internal rate of return on manufacturing rises to about 7.5%.

On this basis higher education is superior to manufacturing as an investment; but this is not the case for secondary education, if we do not allocate to secondary education a proportionate share in the growth of the economy.

While it may be argued that manufacturers understate profits the reliability of the results depends entirely on the means used for understatement. If profits are understated by using excessive depreciation rates then it is entirely taken into account in the recalculations made in the appendix. If however, the understatement of profits are due to understating the value of sales, or by overstating the cost of current inputs, or both, then of course the recalculations do not handle this aspect. However, it seems likely that there is a similar bias in the case of the income flows from higher education since only actual "normal" income received on the job was used. Income from multiple jobs, or "somewhat irregular" incomes are not included. Hence, one can argue that the biases in both cases are in the same direction, and that there is some value in comparing rates of return in education as against those in manufacturing.

7. Conclusions

The tentative findings of this paper give little comfort to those who believe that the expansion of education is always desirable on economic grounds. If no growth impact is attributed to education then secondary and higher education as a unit, for the most part, does not pay-off

in Greece except when it leads to specific professional practice. However, education does pay (considering only the economic aspects) if there is a continuation of recent rates of growth, and if education is deemed to be responsible for a proportionate share of the growth. We saw that for the period 1960 to 1964 males with secondary education and higher education did not gain in absolute amounts in terms of the present value of their income streams as much as those with a primary education. As a consequence the growth argument would not be valid if the share in growth continued to be biased towards males with a primary education or less, or if the growth share cannot be imputed to education. Of course, we have only one piece of evidence about the share in the growth rate towards people with different types of education and as a consequence we cannot assert that there is really reason to believe that this type of bias will continue in the future.

It is of great interest that a critical element in coming to any conclusion is the rate of growth and the sources of growth in the economy. The greater the rate of growth that is attributable to education the greater the degree to which education pays off and the greater the degree to which more types of education become economically desirable. Education works in two directions. On the one hand the rate of growth determines the economic desirability of a given type of education, and on the other hand, education can promote growth. Whether or not education (and how much education) promotes growth at the margin when the growth rate is 6% or above is difficult to determine. One is tempted to speculate that there is some point at which education stops promoting additional growth and that the return from additional growth no longer increases the return to education compared to its additional cost. But until we

know the relationship between education and its growth promoting qualities we cannot determine where that point is. Nevertheless, should the growth rate fall the return to education may fall accordingly and what may, on a previous basis, have been a sensible decision may, no longer be the case when those who have invested rationally in education have put their stakes on growth. For example, it may be argued that the return to most types of higher education at a 6% growth rate is something like 14%, which after adjusting for the non-educational differential reduces the return to higher education to approximately 11% or 12%. The return to manufacturing may, on the basis of some calculations, be at a similar level, and hence, it is possible that a 6% growth rate (per worker) may be the requisite rate even to make higher education pay off. We unfortunately do not know at present what is actually the case but we have to point to the critical nature of the growth assumptions.

Between secondary and higher education it is clear that higher education probably does pay while secondary education does not in most instances. That is to say, higher education pays if the cost of college entrants is assumed to be zero. The one clear unambiguous findings is that from an economic viewpoint there is greater reason to expand higher education rather than secondary education.

We saw that in general the value of the benefit stream was greater than the cost stream for higher education and the converse was the case for secondary education. In addition it turned out that incomes for those with technical education are approximately the same as those with a higher education but that the direct cost of technical education are

several times as high per student. As a consequence an expansion of the type of technical education which was available in the past is probably not warranted on purely economic grounds.

To all of these conclusions a number of important qualifications must be made. The consumption value of secondary education was not taken into account and it may be sufficient to change the conclusion mentioned above. In addition the quality of secondary education as well as its content has been undergoing gradual change. This element also has not been taken into account in our calculations. Even if the present type of secondary education does not pay off economically at the current supply level it does not follow that secondary education of changed content and quality would not lead to different results. This is a significant research area that should be considered in the future.

Part II

Rates of Return to Education -- The Policy Problem

1. The asymmetry between "favorable" and "unfavorable" rates.

A general presumption behind the economics of human capital is that there are some basic similarities between the treatment of investment in humans and investment in other areas. Yet it is curious that few conflicts arise when we apply the results to areas where only inanimate capital is involved as against human capital. [If calculations showed that the return to the production of ping-pong balls was considerably above the marginal product of capital while the rate of return to the production of tennis balls was considerably below, there would be little difficulty in recommending an expansion of the output of the former and decrease in the latter. Planners or governments would find it quite easy to accept such advice. The main doubts that would be expressed would be the usual ones having to do with the adequacy of the data on which the calculations were based, or some aspects of the techniques of calculation. No doubt sceptical policymakers would raise additional questions, but on the whole there can be little doubt that the degree of resistance to such advice would be very much less than in a case where the products involved are different types of education.]

If it had turned out in the study in question that the returns to education of all kinds were clearly and considerably above the marginal product of capital (and/or the interest rate), then it would be rather easy to accept the policy conclusion that all types of education should be expanded to some degree. For the most part, people have a natural bias in favor of the expansion of education. It is not only that we believe that education is a good thing, but that in addition we are likely to believe that to a considerable extent differences in output per

man after adjusting for capital per man is explained by differences in education. These remarks are not intended to exhaust the reasons for the biases in question. Whatever the reason the biases exist. This means that results consistent with such biases will not meet resistance while those that go against the bias will generate various arguments against the more obvious policy implications involved in the results. The purpose of this section is not to argue against the biases as such, or even to suggest that these biases are undesirable, but rather to point to the asymmetrical policy implications of different types of results, and to examine the possible reasons (or alibis) that would support the bias against the numerical results.

It may be useful to pinpoint our discussion with respect to the results of this paper. [Should secondary education be reduced or its rate of expansion diminished since the rate of return is below that of other types of investment including other types of education? In trying out this question before academic audiences the author found that almost invariably the response was negative. This response is not indefensible since it is easy to think of a number of arguments which, to some degree, represent counterweights to rates of return results based on cross-sectional data. [The reader should keep in mind that the normal ways of calculating rates of return to education include biases so that for the most part these rates are on the high side (assuming again that we ignore the "consumption value" of education.) For example, part of the returns to education are returns for greater skill, perserverance,

or other attributes which are useful in work situations and which at the same time are characteristics that contribute towards completing more years of education. Thus, in a sense, within the qualifications made, the returns calculated represent upper bounds.

2. Countervailing elements to low rates of return:

(1) Imperfections in the data: This element need not be considered for present purposes since most of the reactions would not change even if the data were as accurate as possible. For purposes of the present discussion we will assume that this is not the basic difficulty.

(2) Consumption (etc.) value of education: Since the results include only the direct productive value of education it is always possible to argue that if we took into account the consumption value of education to the recipient and/or the citizenship value of education to the society, that this would counterbalance whatever deficiency exists in calculating the rate of return. There can be little doubt that there is a positive consumption value of education (either private or public) obtained by some of those who receive a secondary education. The

difficulty of course is to assess its value in order to determine whether or not it counter-balances the difference between, say, the marginal product of capital and the rate of return to secondary education. This is, of course, one of the basic aspects of the asymmetry of the results. If the net economic benefits (i. e., benefits minus costs) are positive then the consumption value of education can be assumed to be positive and the policy implications are unambiguous. When the net economic benefits are negative the undetermined consumption value of education contributes to the ambiguity of the policy implication. However, it is far from being the only such element.

(3) The argument from consumers' sovereignty: In the particular study in question the argument could be made that since the choice of education was made freely the utility of the benefits was in fact greater than the disutility of the costs even if the net economic benefits in monetary terms is negative. The government subsidy aspect is unimportant in the present case since the net economic benefits for males are negative even if we exclude the subsidy. Secondary education for males did not pay even on the basis of the private costs involved. One could argue of course that the buyers of education were misled since they in fact do not know what the rates of return to education happen to be. However, while in an academic sense this is true, it is far from being obviously true in the sense in which it is relevant. The parents of children receiving an education do not have to calculate detailed present values in order to make a rational decision. It is sufficient that they know approximately the differential incomes of their friends and relatives who have had less than a secondary education as against those who have had a secondary education. It is quite likely that such knowledge is fairly widespread in urban areas. In fact, such information may be superior to average rates of return calculations since by knowing the returns to specific individuals the people involved can to some degree take into account differences

in talent or other peculiar aspects that determine the results. Of course, we do not know whether some persistent biases exist in such markets. For example, parents may consistently exaggerate the capacities of their children compared with others. But in the absence of definite information there is no reason to assume that such a bias exists.

(4) Long-run effects: Another deficiency of cross-sectional analysis is that it cannot take temporary deviations from trend into account. Thus it may be argued that the rate of return is low because of a temporary excess supply, this need not be the case if the long-run were taken into account. That is, the excess supply may be a temporary deviation from the trend which is really in the opposite direction. Since the educational gestation period is relatively long, and since adults cannot be expected to receive such an education, it may pay to overload the supply line temporarily in favor of long-term gains.

(5) Value to subsequent generation: Returns to education calculations consider only the economic returns to the present generation. It does not take into account the possibility that more educated parents pass on some of their capacities in the nurture process to future generations. While it is likely that this effect exists (the "head start" argument) and that its value is positive, the extent to which it is valuable is completely undetermined.

(6) External economies: A final argument against taking rates of return seriously is that they exclude the external economies from education. It is certainly possible that some of the growth that takes place is explained by superior educational inputs whose return is not captured to the full extent by these inputs. Thus, if the excess supply is very large, more educated individuals may receive no more than less educated ones if they have limited their own substitutibility although they are more valuable workers than would otherwise be the case.

3. Education and Growth--Distribution of the Gains:

Do private returns properly take into account the growth inducement effects of education? Let us consider some possibilities: part of the growth process is derived from the shift of workers from lower paying to higher paying occupations. Among the major shifts of this type are: (1) from unemployment, disguised unemployment or partial employment to the full employment of the individuals involved, (2) from agriculture to industry, (3) from unemployment at home to employment abroad, (4) from inefficient self-employment to employment at regular wages, (5) from smaller towns to bigger areas, etc. Education may contribute to such shifts through an increased sensitivity and widening of horizons that may occur. For the most part the people that move and gain by this process may not have secondary education. But secondary education may contribute to the link in the information chain. Higher paying blue collar jobs may become available because those with a secondary education restrict themselves to white collar jobs. Thus part of the income growth of those with a primary education may be due to the fact that more education is being received at higher levels elsewhere in the economy.

[The basic point of the previous paragraph is simply that education can contribute to growth in ways that are not fully captured financially by those being educated. The wage of those with a secondary education reflects their marginal product, but the average product may be above the marginal product and the differential may become a return to other inputs such as management or entrepreneurship.]

The basic difficulty is that at present we do not know how to measure the exact contribution of education to growth. The essence of the problem is whether or not the contribution of education is higher than that calculated by differential rates of return to differential degrees of education. We can readily imagine sequences of economic events so that this, in fact, turns out to be the case. (1) Consider the case of the education of managers and its relation to technical progress. More educated managers may result in the purchase (for replacement) of more productive machines than would have been the case of the managers were less educated. It is quite possible that this would show up not as a return to the education of managers but as a return to capital or to technical progress. (2) In a similar vein more educated managers may introduce various types of production methods improvements such as those involved in more rational flow of materials or superior inventory controls, but these differences may show up in higher profit rates and hence calculated as a return to capital or entrepreneurship or some combination of the two. (3) In addition complementarities between higher and secondary education may enable management to introduce the improvements considered under (1) and (2) more effectively. Once again the returns may show up as increased rates of return to other factors.

Finally, there are a number of elusive returns of education that are unlikely to show up in the usual calculations. The contribution of education to the practical manifestations of genius, creativity, and unusual efforts are unlikely to be fully accounted for in the cross-sectional approach. This is not to suggest that education creates genius but only that it may direct it into productive channels.

4. On Biases in Cross-sectional Results:

We consider briefly three sources of bias which may understate the rate of return to education.

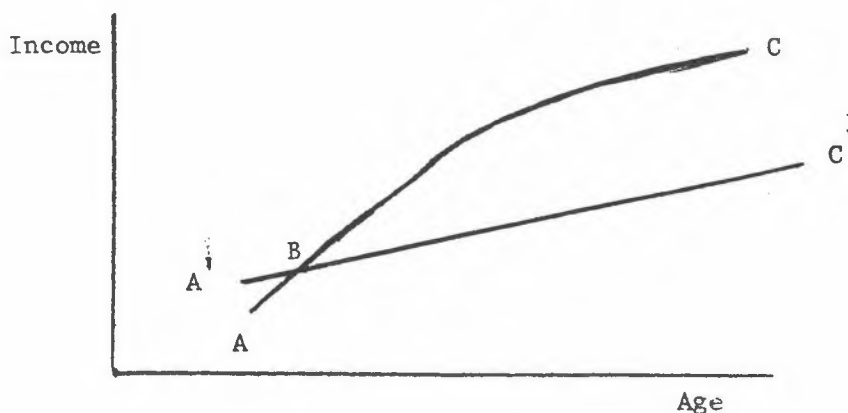
(1) It is quite likely that there is an improvement in many areas in the quality of education over time. Should this be the case then cross-sectional calculations will understate the return to this improvement. In essence this manifests itself in the younger generation being better educated for the same years of education than the older generation. This would imply that when the younger people move into the age groups now occupied by older people, the value of their experience plus education would have a greater marginal product ceteris paribus than that of those currently in the higher age groups. Empirically two problems have to be solved. One is to determine whether the quality of education has actually improved, and second is to assess the value of the improvement.

An additional difficulty that enters is that what is of value is not education by itself, but some combination of education and experience. The excess supplies of these combinations that exist at the present time may not reflect the situation that will exist when those currently being educated enter into the higher age group. Thus, peculiarities in the current demand and supply situation in different age groups may possibly bias the results against those currently being educated.

(2) A special element that applies particularly to the recipients of a secondary education has to do with the asymmetries of the degree of substitutibility on the demand and supply side that affects this group. Those who in a previous era would have received only a primary education now receive a secondary education. These people aim at white collar jobs instead of blue collar occupations. Thus, because of class-jumping aspirations and prestige reasons the occupational substitutibility falls considerably. On the demand side the degree of substitutibility works in the other direction where men are concerned. To some degree those who hire white collar workers find that they could now substitute women with a secondary education where they had previously employed men. Thus, the wage elasticity of an excess supply

of males with a secondary education may turn out to be rather high at some stages in the processes of development.

(3) A shift in the slope of the income-age profile will not necessarily show up in a cross-sectional analysis. This is not a new factor but is essentially a possible consequence of the distortions considered under (1) and (2) above. In the figure below we illustrate the nature of the distortion.



The curve A'C' represents the old age-income profile. AC is the new age-income profile. The age-income profile that will be revealed by a cross-sectional analysis is likely to be something like the curve ABC'. In other words, the data available for the shift is likely to involve either the current year or at best a few recent years but most of it will not reveal itself until the new generation takes over the occupations of the older age groups. (I.e., it is quite possible that women are substituted for men at the lower career levels but not at the higher levels.)

Thus, those receiving a secondary education currently may in fact have a steeper age-income career pattern which will not reveal itself until some years later as they proceed with their careers.

5. Some Tentative Conclusions

Given the considerations mentioned in the previous sections it is very difficult to arrive at hard and fast conclusions. Nevertheless, I shall venture some tentative conclusions, which in part are based on personal impressions, but which cannot be defended entirely on the basis of data available to me.

The easy conclusions to assert are of the "more research is needed" type. In fact, more research is needed in at least two areas: (1) The rates of return to different qualitative aspects of secondary education, and (2) the stability and direction of rates of return. On (1) it would be of interest to know whether the rates of return to alternative curricula (etc.,) for secondary education are similar or vary considerably. If they vary considerably then some types of secondary education should be expanded at the expense of others, and possibly at the expense of other educational levels, depending on the rates involved. The conclusions mentioned below are on the assumption that curricular differences make little difference in the rate of return. I have no way of knowing whether or not this is a reasonable assumption.

With respect to (2) it would be of interest to know whether or not the low returns to secondary education are temporary or of long standing. My general impression is that if we had a series of rates of return for, say, the last decade, that the returns to secondary education for men would probably be fairly stable or declining, and on the low side. If this should be true, then the conclusions that follow are somewhat more defensible.

If I were forced to make policy prescriptions on what little I know, and, looking at education solely from the point of view of the creation of human capital, my tentative recommendations would be as follows: if the allocation is to be made out of a fixed educational budget then the direction of change on narrowly economic grounds should be away

from secondary education towards higher education or primary education. Most of the factors mentioned which are responsible for the ambiguity-creating elements, such as the consumption value of education, hold for all types of education almost equally well. Furthermore it is likely that at the margin the contributions to growth are made by those types of education that contribute to skills which are bottlenecks to expansion, or those that add to the stock of entrepreneurial talent. My impression is that secondary education at the margin contributes to neither of these factors.

The most difficult conclusion to come to is whether education is a better investment than other types of capital.^{1/} It is unclear whether education of the present quality at the secondary and higher level considered as a unit can have any greater claims than at present on an overall investment budget compared with other types of investment. The exceptions to this case would be training for the well established professions, such as engineering, chemistry, medicine, etc. An argument could probably also be made in favor of managerial training at the university level since training, in the modern sense, is in a very rudimentary state at the present time.

1/ According to my estimates of the rate of return in manufacturing, higher education does pay compared to manufacturing. However, this does not imply that higher education pays compared to investments in other branches of the economy. The limited data available to me at the time did not allow me to determine how representative returns in manufacturing were compared to other sectors of the economy. If we assume that manufacturing is representative, then higher education is a desirable investment and should be expanded. This conclusion is obviously clouded by not knowing exactly how to evaluate the initial assumption.

Rates of return to secondary education and higher education considered as a unit form a borderline case. They almost pay off if we attribute a zero contribution to growth, but are quite likely to be superior to investment in manufacturing if we attribute to them something like a two percent contribution to growth. Since this is not at all unreasonable, it is then conceivable to argue for an expansion of higher education on this basis. This would lead to no expansion of secondary education initially since there is a surplus of secondary education graduates compared to entrants to higher education. However, eventually the extent to which secondary education is required to feed the university education pipeline may result in a required expansion of secondary education. Needless to say, there are many "iffy" elements in reaching this conclusion.

The above conclusions are made apart from equity considerations. If included, they would weaken our conclusions since a case for secondary education as against higher education could be made on egalitarian grounds.

Appendix I

Calculation of the Rate of Return in Manufacturing

For the most part the rate of return $\left(\frac{v - c}{c}\right)$ has been calculated on the basis of data found in Coutsoumaris' The Morphology of Greek Industry. All of the data is on the basis of rates or ratios on depreciated capital, or on rates that can be converted to this basis. Let us set depreciated capital (circa 1957) according to Coutsoumaris at 100 units. All the calculations will be rates on this basic unit.

(1) According to Coutsoumaris (p. 391), undepreciated capital is 2.2 times depreciated capital. Hence, we apply the Kregel ratio of undepreciated to depreciated capital, (72% of 220). The "true value" of depreciated capital is therefore 160 units. Inventories on the same basis are approximately 80 units, and hence total capital inclusive of inventories is 240 units. This is our denominator.

(2) A number of corrections have to be made to obtain the correct numerator. The average profit rate on Coutsoumaris' depreciated capital for the years 1957 to 1961 is approximately 9% (p.294). We note that depreciated capital happens to be approximately the same as equity and hence rates of profits on equity are equal to rates of profit on depreciated capital. We add back depreciation on cost of 5.1 units (p.420) and long term interest of 1.6 units. Thus, the numerator is equal to 9 plus 5.9 which is roughly 16 units. The ratio is approximately $\frac{16}{240}$ or roughly $\frac{7}{100}$.

(3) For the 23 year lifetime of capital we receive a net flow of 7 units for each 100 units of investment. This yields a present value of 86 at a 6% rate of discount for the 23 year period. This implies that $\frac{v - c}{c}$ is equal to -14.

(4) In computing the effects of the 3% increase in gross product every year we

must keep in mind that sales are approximately 330 units and costs 314 units according to the previous calculations. It was on this basis that we computed the rate of return assuming a 3% growth rate in gross product.

Present Value of Lifetime Annual Income (in 000's Drachmas)

	Discount Rates			
	0%	3%	6%	7%
1960 - Survey Data				
A. Males				
1. 6 years Education at age 14	1,238	554	297	250
2. 12 " " " " 14	1,592	655	318	259
3. 15 " " " " 14	2,349	-	421	333
4. 12 " " " " 19	1,592	-	426	363
5. 15 " " " " 19	2,349	-	563	468
R. Females				
1. 6 years Education at age 14	885	-	237	206
2. 12 " " " " 14	1,116	-	235	193
1964 Survey data				
A. Males				
1. 6 years Education at age 14	1,479	682	465	421
2. 12 " " " " 14	1,854	763	414	300
3. 12 " " " " 19	1,854	-	495	420
4. 15 " " " " 19	2,526	-	655	547
B. Females				
1. 6 years Education at age 14	1,086	-	287	246
2. 12 " " " " 14	1,626	-	331	270
1964 Civil Servants Paid according to the official Pay-scale				
A. Teachers				
1. Primary school teachers at age 21	2,780	-	799	682
2. Secondary school teachers at age 21	3,319	-	924	787
B. Administrative Personnel				
1. Primary Education 6 years, at age 14	1,561	-	366	306
2. Secondary Education 12 years at age 14	1,820	-	356	288
3. Secondary Education 12 years at age 19	1,817	-	473	402
4. Higher Education 15 years, at age 19	2,890	-	695	571
C. Technicians				
1. Independent Prof. Engineers Higher Education at age 21	5,115	-	1,218	-
2. Draftsmen Secondary Educ. at age 21	2,216	-	595	-

Appendix ITable 2

Educational Costs for Educational Period for the years 1960 and 1964.

(Inclusive of Income Foregone)
(in 000's Drachmas)

	1960	1964
A. Survey Data:		
1. Primary Education 6 years 6 years Educational Cost - No income foregone	7	14
2. Secondary Education 12 years - against Primary 6 years 6 years Educational Cost + 5 years income foregone	46	76
3. Higher Education 15 years - against Secondary 12 years * 3 years Educational Cost + 1 year frontisteria cost + 3 years income foregone + 2/3 of one year income foregone for frontisteria period	78	94
B. School Teachers		
1. Secondary school teachers - against Primary school teachers 2 final years of higher education Cost + 6 months frontisteria + 2 years income foregone + 1/3 of one year for frontisteria period		85
C. Civil Servants - Administrative Personnel		
1. Secondary school Education 12 years - against Primary 6 years 6 years Educational Cost + 5 years income foregone	-	76
2. Higher Education 15 years plus - against Secondary 12 years 4 years Educational Cost + 1 year frontisteria cost + 4 years income foregone + 2/3 of one year for frontisteria period	-	115
D. Engineers		
1. Independent Professional Engineers - against Draughtsmen 4 years Educational Cost + 1 year frontisteria cost + 4 years private lessons in frontisteria + 4 years income foregone + 2/3 of one year for frontisteria period	-	135

* A "frontisteria" is basically a privately operated "cram-school."

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Table 3

Present Values (Figures in 000's)

	Years of Education	Age to which discounted	Sex	Date	Income	P.V. at 0% growth when discount rate		P.V. at 4% when disc. rate 6%	P.V. at 5% when disc. rate at 6%
						6%	7%		
1) 15 against 12	12	19	M	1960	1597	427	364	973	1239
" " "	15	19	M	1960	2356	565	469	1400	1806
2) 15 " 12	12	19	M	1964	1859	497	422	1137	1449
" " "	15	19	M	1964	2634	657	549	1586	2033
3) 12 " 6	6	14	F	1960	858	238	206	522	663
" " "	12	14	F	1960	1118	236	193	631	855
4) 12 " 6	6	14	F	1964	1070	287	247	646	825
" " "	12	14	F	1964	1630	332	270	908	1209
5) 12 " 6	6	14	M	1960	1241	297	250	726	942
" " "	12	14	M	1960	1597	319	259	835	1082
" 15 " 6	15	14	M	1960	2356	422	334	1272	1723
6) 12 " 6	6	14	M	1964	1483	379	322	884	1136
" " "	12	14	M	1964	1859	371	301	1034	1378
6)* 15 " 6	15	14	M	1964	2634	491	375	1442	1939
7) 15+ " 12 Admn. Pers	12	19	M	1964	1825	478	405	1108	1413
" " " " "	15+	19	M	1964	2899	697	578	1728	2227
8) 12 " 6 " "	6	14	M	1964	1566	367	307	903	1180
" " " " "	12	14	M	1964	1826	357	289	1003	1348
8)* 15+ " 6 " "	15+	14	M	1964	2899	589	412	1574	2124
9) Engineers against draughtsmen	Draug.	21	M	1964	2222	597	506	1365	1732
" " " "	Engin.	21	M	1964	5130	1122	1006	3063	3946
10) Secondary school teachers against primary school teachers	Pr. sch.	21	M	1964	2783	801	684	1762	2203
	Se. sch.	21	M	1964	3329	929	789	2092	2623

Appendix I

Table 4

1960 Approximate - Mean Monthly Income in Drs.

Ages	Years of Education			
	Up to 6 years	7 - 12 years	13+	Total
A. Males				
up to 25	1,200	1,400	1,900	1,400
26 - 45	2,100	2,400	3,640	2,600
46 -	2,300	3,500	6,000	3,400
Total	2,000	2,400	4,300	2,600
B. Females - 1960				
up to 25	1,050	1,290		1,197
26-45	1,170	1,700		1,460
46 -	1,250	2,900		1,288
Total	1,041	1,567		1,354

Source: Survey by Kepe

Note: (1) The calculations in the previous tables used median incomes for each class rather than mean incomes.

(2) Because of vacation and Christmas payments annual income levels are somewhere between 13-14 times the monthly level.

Appendix I

Table 5

1964 Approximate Mean Monthly Income in Drs. - Data: Survey by Kepe

Ages	Years of Education		
	Up to 6 years	7 - 12	13 and over
<u>A. Males</u>			
up to 25	1,500	1,600	2,800
26 - 45	2,600	3,200	4,800
46 -	2,700	4,400	7,100
<u>B. Females</u>			
up to 25	1,270	1,680	
26 - 45	1,540	2,240	
46 -	1,650	4,010	

Source: Survey Data.

Appendix IIManpower Planning versus Rates of Return Results

The policies based on the manpower planning approach and the rate of return approach do not necessarily jibe. This is clearly so in the case of Greece. The O.E.C.D. study based on the manpower planning approach recommends the greatest rate of expansion at the secondary level. This is clearly opposed to what the present study would recommend. We consider briefly why this should be the case, and raise some questions about which of the two is the more reliable.

In the present state of the art, the manpower planning approach is largely aggregative with respect to subsectors of the economy, and it presumes (certainly as a first approximation) that different types of labor are required in fixed ratios for a given subsector. Now let us suppose that the results of the present study are correct. This means that there is an excess supply of male secondary school graduates at a wage pattern equal to the cost of secondary education -- call it "the full cost wage." Now the manpower planning approach, for the most part which takes the actual skill ratios in an industry as the appropriate number for planning purposes, will of course yield results that transform existing excess supplies into plans that maintain and exaggerate such excess supplies.

Additional deficiencies of the manpower planning approach are as follows:

- (1) The manpower planning approach determines manpower requirements of a given type based on existing average ratios of different types of manpower rather than marginal requirements. The existing averages include (a) firms operating under inefficient production functions, and (b) other firms utilizing relatively inefficient workers. The expanding (and new) firms which account for the increased manpower needs are

unlikely to include the inefficient firms in the same proportions as they exist at present. The new additions to the work force have not received the same training as the existing workers. If present training is distinctly better, (or distinctly worse) then average requirements would be different than marginal requirements.

(2) The manpower planning approach does not take into account various types of manpower substitution possibilities; e.g., such as that between: (a) different years of education, (b) different types of education, (c) different combinations of education and experience, (d) the substitution of women for men, (e) of capital for labor, and (f) even of part-time workers for full-time workers. The lack of the various substitution possibility considerations is probably the greatest weakness of the manpower planning approach.

(3) As development proceeds and the economy expands, the degree of specialization of many types of occupations is likely to increase. The training mix involved in more specialized occupations is likely to be different, and probably less time consuming in terms of months of vocational training, than the current mix.

(4) Many educational standards for jobs are conventional. It is likely that in many cases the standard is too high for the actual job involved but that the standards yield to some degree in the face of shortages at the existing standard. This is another reason why marginal requirements may turn out to be different from average requirements.

(5) As the economic structure changes in the course of development, some people have to be shifted from some jobs to others. Thus, it is likely that for many people the optimal training is for a multiplicity of jobs within a lifetime rather than for a single occupation. Flexibility of output is augmented by minimizing the degree of vocational training. This too is a factor that does not seem to be taken into account under the manpower planning approach.