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MANPOWER AND EDUCATIONAL PLANNING FOR HIGHER EDUCATION IN THAILAND

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Draft

MANPOWER AND EDUCATIONAL PLANNING FOR HIGHER EDUCATION IN THAILAND

Apichai Puntasen*

Part I
INTRODUCTION

The government of Thailand officially recognized the need of incorporating manpower planning into its National Economic and Social[1] Development Plan during the second phase of the first planning period (1964-1966). The National Economic Development Plan 1961-1966, Second Phase: 1964-1966 reads as follows:

"The successful execution of social and economic development projects depends greatly upon the availability of efficient and capable personnel. The proper training and utilization of manpower is therefore vital to the whole development effort in every aspect. The shortage of trained manpower constitutes a more serious impediment than the shortage of finance or natural resources. This is particularly true of those countries which are accelerating their rate of growth in order to increase rapidly the standard of living of their population."[2]

In spite of those clear objectives, the actual planning process has not been very successful.[3] The failure is due largely to both the

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1. The word "Social" was added in the title of the second plan.

2. Thailand, The National Economic Development Board, Office of the Prime Minister, The National Economic Development Plan 1961-1966, Second Phase: 1964-1966 (Bangkok, Thailand: Government House Printing Office, 1964), p. 44.

3. Thailand, The National Economic Development Board Office of the Prime Minister, National Economic and Social Development Plan, 1967-1971 (Bangkok, Thailand: Government House Printing Office, 1967), pp. 77-88.

unsettled theoretical approaches to be used for planning and insufficient information to implement then.

This study will not attempt to analyze manpower and educational planning for the whole economy of Thailand. Rather, it will seek to unravel some issues regarding alternative approaches which might be used for manpower and educational planning in Thailand. Our pilot study will be focused on university educational planning in Thailand with specific emphasis on how to allocate limited university resources to educate students in different fields so that resources will be utilized as efficiently as possible.

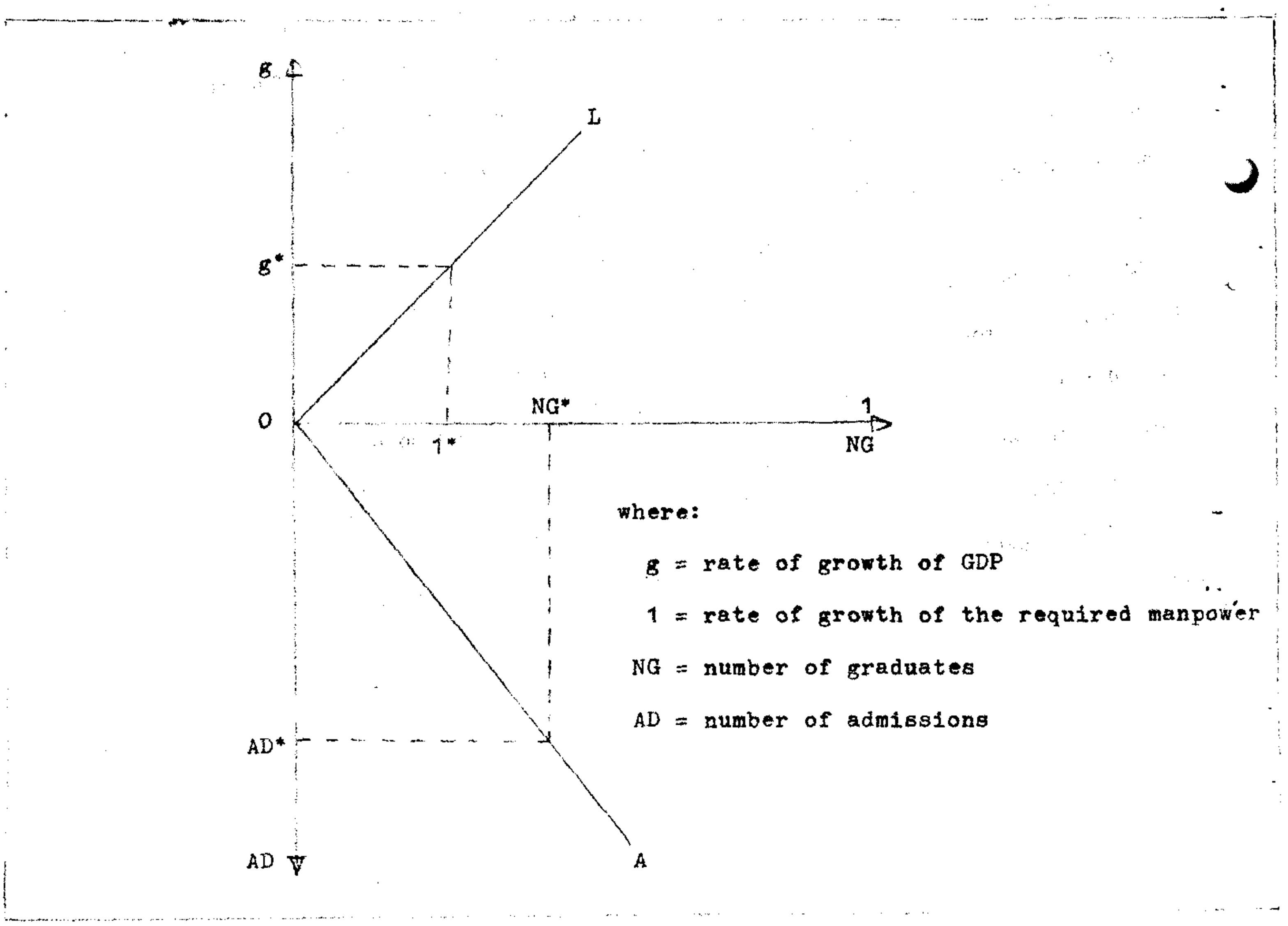
In Part II we will survey the two main approaches currently used for manpower and educational planning in most countries: the manpower-requirement approach and cost-benefit analysis. Part III will investigate further whether there is any way to combine the two approaches into one model so that the unique advantages of each approach can be retained and their weaknesses reduced. In Part Vi, we will report the results of a test of the wage-employment relationship in the market for new college graduates in Thailand. This step of the analysis is essential in our study because the validity of the cost-benefit analysis rests heavily on the results of this test. The next step is to calculate the proxy of the social rate of return for the group of new graduates whose test show positive results. Part V will demonstrate the utility of the integrated model, which combines features of the cost-benefit analysis and the manpower-requirement approach, in obtaining a solution to the problem of precisely how many students should be admitted in each academic field for a specified "social" rate of return and target rate of growth.

PART II
THE MANPOWER REQUIREMENT APPROACH AND THE COST-BENEFIT ANALYSIS.

The Manpower Requirement Approach (M-R)

The M-R is the translation of projected manpower demands into required supplies of educational output. The empirical study of the M-R, therefore, consists of two vectors: The demand and the supply of labor. The typical study of the M-R assumes that the supply of labor (with different educational backgrounds) is a function of some fixed coefficient production function in the educational system. The demand vector is determined by the gross domestic product (for the closed economy model) adjusted by some related indices. Figure 1 below is the simplified version of the manpower requirement approach.

FIGURE 1
THE TYPICAL MANPOWER-REQUIREMENT APPROACH



In the upper sector of this figure, OL indicates a positive relationship between the rate of growth of the gross domestic product and the rate of growth of required manpower. The linear relationship of OL shows the proportional changes in the two rates. The typical supply relationship is shown in the lower portion of the diagram, where OA represents the fixed coefficient input-output relationship between the number of admissions and the number of graduates. If AD and NG have the same scale, OA will lie at the angle greater than 45^{o} from the NG axis because the number of admissions is usually higher than the number of graduates.

After the target rate of growth of GDP, g*, has been specified, the required rate of growth of trained manpower, 1*, is determined. This enables us to compute the absolute number of trained manpower (NG*) required to achieve the target rate of growth and AD*, the required number of admissions, is correspondingly determined. Figure 1 refers to the aggregate number of the two variables, while corresponding lower case letters will be used to represent homogeneous subsets of graduates from the aggregate model in the following figures.

The typical M-R has often been criticized for failing to include the wage variable in its analysis.[4] According to this approach, variations in wages are irrelevant to the analysis, for they have been predetermined by the choice of the target rate of growth (g*) and the fixed relationship of the required manpower (1*) to the rate of growth.

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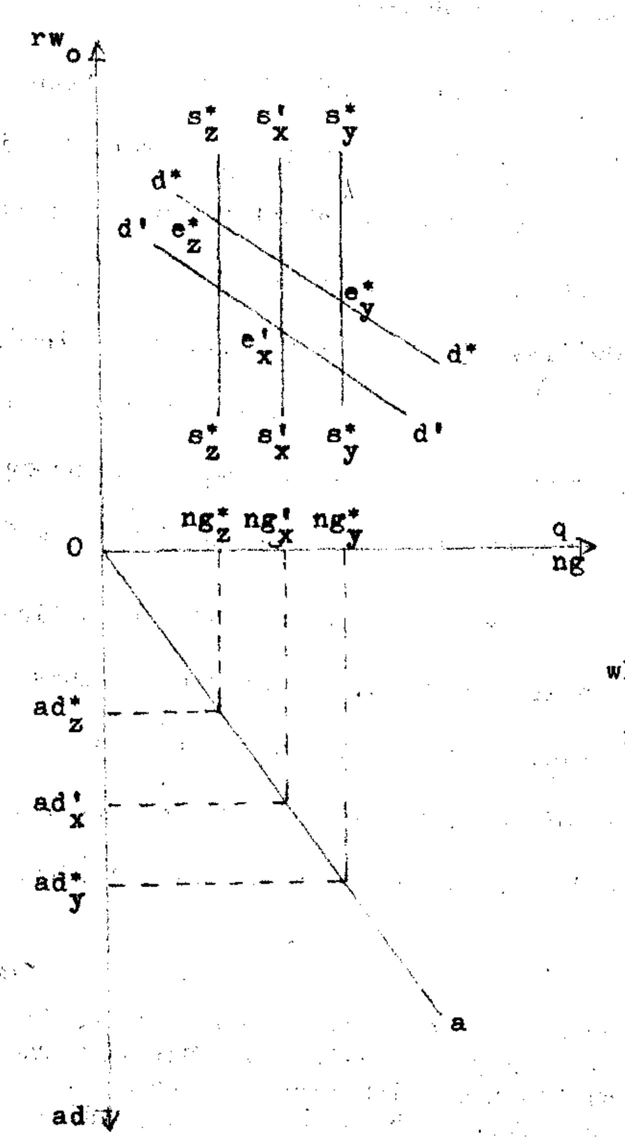
4 The first attempt to include a wage variable in manpower planning was made in the study by Carnoy and Thais. See Martin Carnoy and Hans Thais, "Educational Planning with Flexible Wages: A Kenya, Example." Economic Development and Cultural Change, XX (April, 1972), pp.438-73.

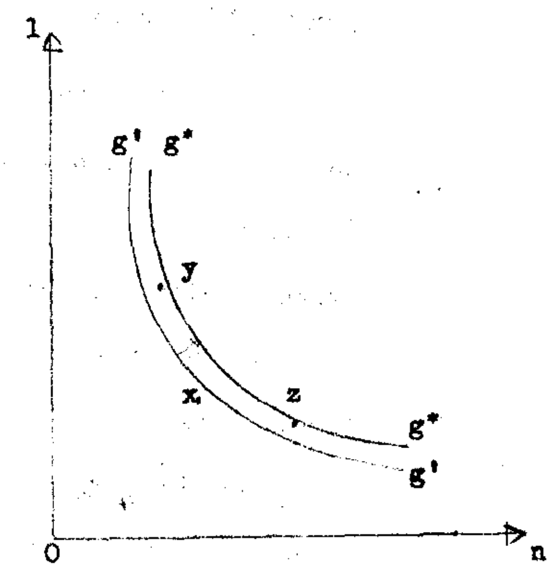
In order to include the wage variable in a meaningful way, substitution between the use of manpower and other factors of production must be permissible. With this modification and the division of the labor market into smaller homogeneous units, we should be able to discuss the effect of changes in wages. This model will be called the "modified" manpower requirement approach.

FIGURE 2

THE MODIFIED MANPOWER-REQUIREMENT APPROACH



2(a)



2(b)

where:

rw_o = real wage of new graduates

d = demand for new graduates

s = supply of new graduates

n = rate of growth of other resources

In 2(a) of figure 2, we replace the upper portion of figure 1 by the demand and supply relationship of a homogenous group of new graduates. Having disaggregated our previous model by different types of training, we now label all the variables in the diagram by lower case letters. The demand schedule has the conventional negative slope. To simplify the analysis, the supply schedule within the relevant range of real wages in our analysis is assumed to be perfectly inelastic and is limited by the number of new graduates being produced in the period. Part (b) of this figure is a modified version of the upper diagram of figure 1 which shows the iso-growth rate of GDP for all possible combinations of l and n.

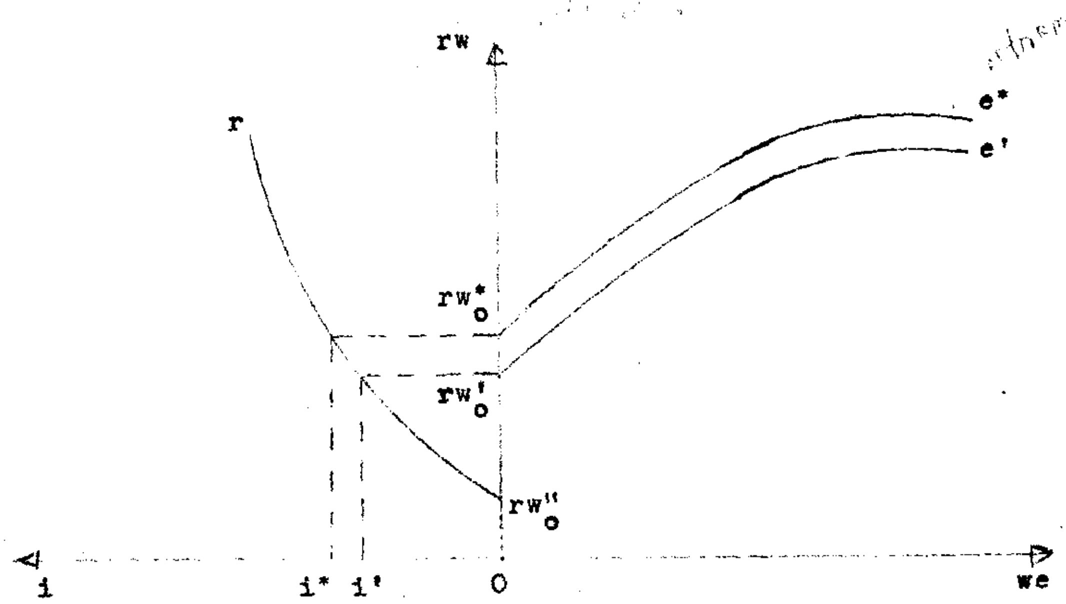
In the upper sector of figure 2 (a), d'd' is the demand schedule corresponding to the iso-growth rate curve g'g' with the choice of the technical coefficient defined at the point x. The equilibrium real wage is represented by e'_x and the number of admission is represented by ad'_x. Given an exogenously determined target growth rate (g*) the demand schedule will shift from d'd' to d*d*. If the planner chooses y to be the point of technical coefficient, $s^*_y s^*_y$ will be the corresponding supply schedule of new graduates. If he chooses z instead, $s^*_z s^*_z$ will be the corresponding supply schedule. With this modified version of the manpower requirement approach, the planner can tell not only the number of graduates required but also the equilibrium real wage that corresponds to the technical coefficient selected. This procedure will be less arbitrary than the conventional approach. Although we have modified the traditional form, we can still claim that this approach is strictly the M-R. After specifying the target rate of growth and selecting the technical coefficient, it follows that a set number of trained workers should be supplied regardless of how the internal rate of return from investment in their training compares with the rates of return from alternative uses of all others resources. It is possible that the technical coefficient may be selected at a point inconsistent with the optimal use of all other resources.

The Cost-Benefit Analysis (C-B)

The C-B on the other hand is an equilibrium approach which is designed conceptually to handle the problem of efficiency of resource allocation. The essence of this approach is to set priorities for investment projects by establishing certain criteria for the comparison of the benefits and costs of each investment project. If all investment projects can be ranked by some acceptable value criterion, given the target rate of growth, it is conceivable that we can determine the optimal use of resources. One popular rule used in setting priorities among projects is the internal rate of return rule.

In computing the internal rate of return from education, future streams of earnings plus all other net external benefits are considered to be benefits from investment in education. After the costs of education are established, the internal rate of return can then be computed. The simplified relationship is shown in figure 3.

Figure 3
THE TYPICAL COST-BENEFIT ANALYSIS



where:

we = years of work-experience

i = internal rate of return

e = earnings-profile

The typical C-B begins from the relationship in the right hand diagram of Figure 3, where earnings are shown to rise at a decreasing rate with years of work-experience. In the typical profile, earnings increase at a relatively rapid rate during the early years of work-age with the rate of increase falling thereafter. Earnings may decrease absolutely near retirement age. This earnings-profile represents the monetary benefits from education, which are assumed to be equivalent to the marginal productivities of trained people. After all other benefits have been taken into account and all costs have been calculated, the internal rate of return i can be computed. Normally a cost-benefit analyst must assume also implicitly or explicitly that the shape of the earnings-profile will not change over time. In other words, any shift in initial earnings entails a corresponding shift in the whole profile with the slope of each ordinate unchanged. If this relationship holds he will be able to show the relationship between rw_o and i in the left hand diagram of figure 3. For each change in rw_o, given that all factors remain unchanged, he can find the corresponding value of i. This relationship is such that i increases monotonically with the value of rw_o. With this i-rw_o relationship, the cost-benefit analyst can now indicate the direction of change when the target value of i is specified. Suppose i* is the target internal rate of return, rw_o^* will be the target value of starting earnings. Since rw_o^* is higher than rw_o', to bring rw_o' up to rw_o^*, fewer graduates should be supplied. An exact answer to the question of how many new graduates should be produced cannot be expected from the cost-benefit analyst because he does not have the demand-supply model in his framework.

Since the cost-benefit analyst has also been attacked for failing to test his assumption of the competitive nature of the labor market, he should construct a demand-supply model to test his assumptions and if necessary modify his analysis further.[5]

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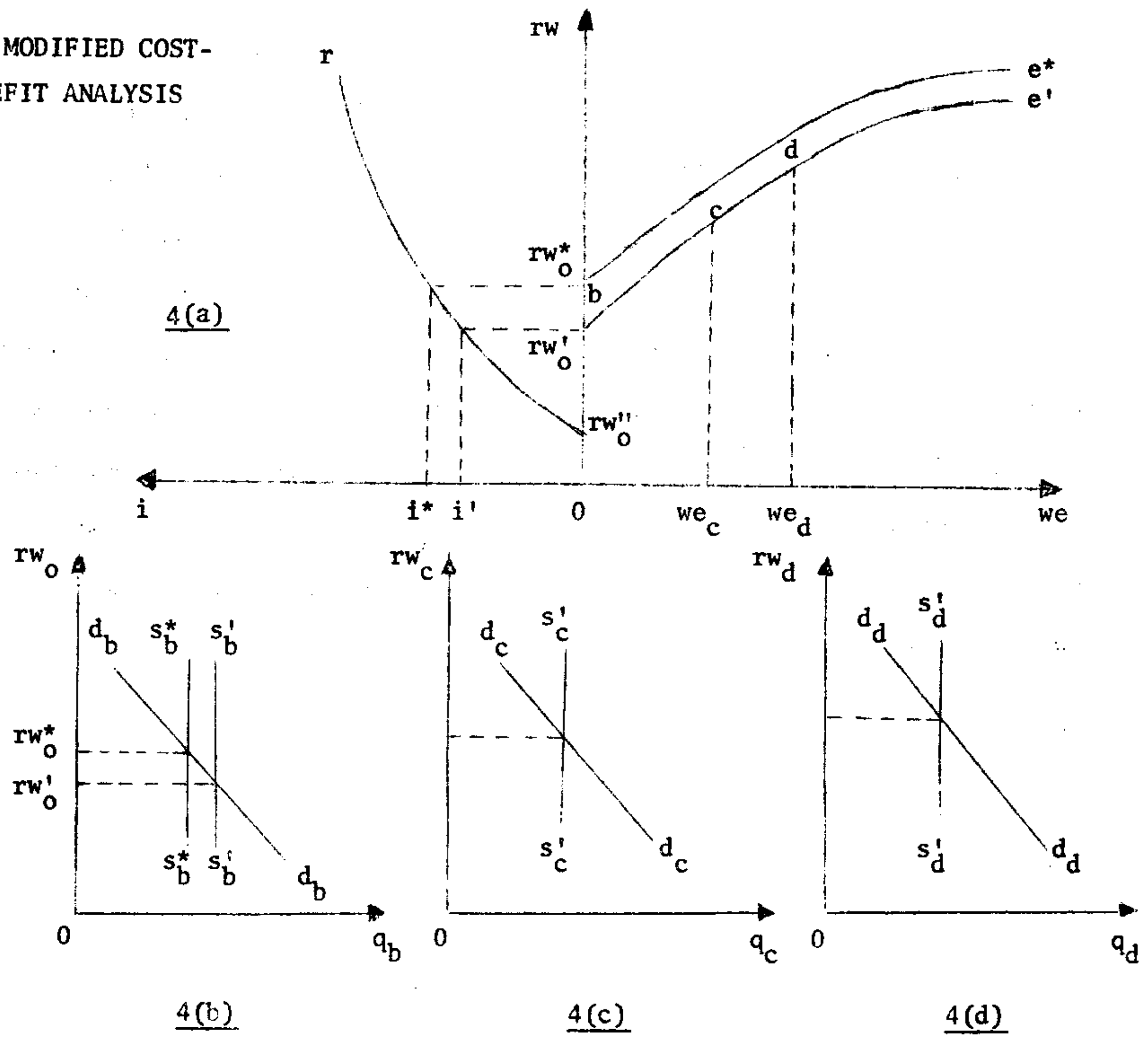
[5] A similar analysis can be seen in M. Blaug, An Introduction to the Economics of Education, (London: Allen Lane, The Penguin Press, 1970), pp. 178-179. However, Blaug has also included the "educational" market in his model and he has established the relationship between present value and the ratio of the market rate of interest and the private rate of return instead of the rw_o-i relationship in the second quadrant of figure 4(a).

FIGURE 4

THE MODIFIED COST-BENEFIT ANALYSIS

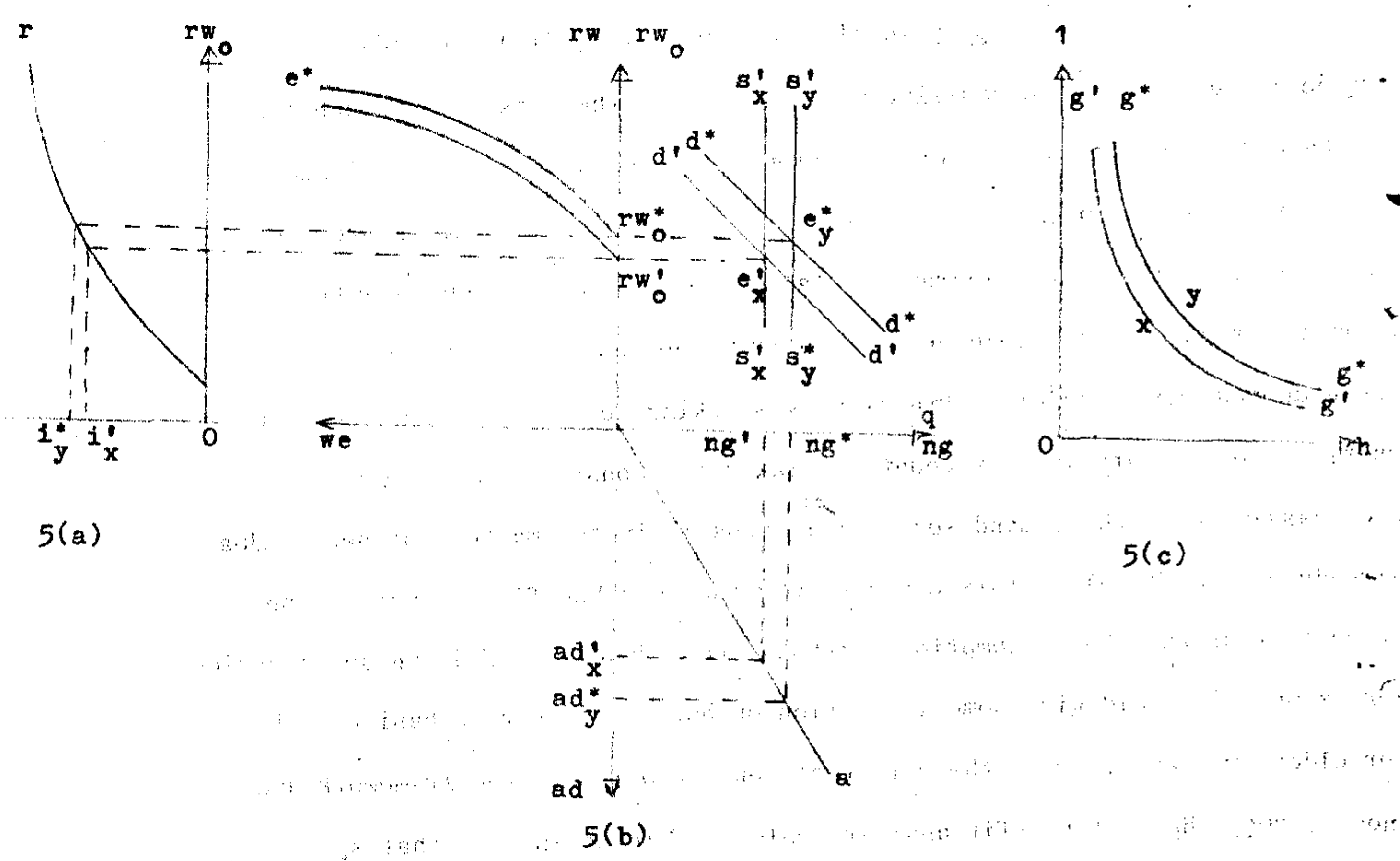


The demand-supply models in Figure 4(b), 4(c) and 4(d) are designed to show the equilibrium solutions in the markets of graduates who have different years of work-experience. These points of equilibria indicate how the corresponding points, b, c and d on the earnings-profile rw_o'e' in the right hand diagram of 4(a) are established. Conceptually, every point on rw_o'e' should be derived from the equilibria of the set of these demand-supply models. Practically speaking however, the limitations on times series data in most countries makes the construction of a model encompassing only the demand-supply relationship in the market for new graduates already very difficult. This explains why the cost-benefit analyst has never tried to test this key assumption, although the advantage of doing so is obvious. For example it would give some indication on how the market mechanism works for older graduates. With the market of new graduates in the framework and knowing rw_o^*, the cost-benefit analyst would be able to specify that $s_b^* s_b^*$ new graduates should be supplied

PART III
THE INTEGRATED MODEL

After examining both the M-R and the C-B, we see clearly that the missing part in both analyses is the conventional demand and supply relationship in the market of new graduates. In order to integrate the two approaches, we simply insert this relationship into the first quadrant of Figure 5(b). The i-rw_o relationship of the C-B and the technical relationship of the iso-growth rate of the M-R are reproduced in Figure 5(a) and Figure 5(c), respectively. Considering the three parts of Figure 5 as a unit, we have a graphic presentation of the integrated model to be employed in this study.

FIGURE 5
THE INTEGRATED MODEL



In this figure 5, we begin with the technical coefficient at the point x on the iso-growth rate curve g'g': ng_x' and ad_x' in the fourth quadrant of figure 5(b) are the required numbers of graduates and admissions, respectively. Also rw_o' and i'_x are the equilibrium real wage and the corresponding value of the internal rate of return. Suppose again that if g* has been determined outside of this system, the demand schedule will shift from d'd' to d*d*. If the planner picks y to be his choice of technical coefficient, the supply schedule will shift from $s_x's_x'$ to s_y*s_y*; rw_o* and $i*_y$ will be the new equilibrium real wage and the corresponding value of the internal rate of return, respectively. Observe that $i*_y$ has not been fixed by g* but by the choice of the technical coefficient y on g*g*. Given the target rate of growth at g*, the planner is now free to select the point on g*g* such that the target internal rate of return i* is also satisfied. If i* is the rate at which all resources are used optimally, with this scheme of analysis, this specified target rate of growth will be reached at the point of efficient resource assocation.

PART IV

RESULTS FROM THE TEST OF THE MARKET MECHANISM IN MARKETS OF NEW GRADUATES

In our empirical study data limitations prevent is fr m formulating the demand function in the labor market according to the concept of the marginal revenue product. Therefore the demand for new graduates must be formulated on the basis of actual market phenomena. It is quite possible that this empirical demand function may not reflect the marginal productivities of labor and if this is the case, the cost-benefit analysis will be invalidated. The proper procedure in this case is to test the responsiveness of the wage variable in the demand function. A significant wage-employment relationship in the demand function will imply the existence of competition in the labor market. Under the conditions of perfect competition, the real earnings of a person can be considered equivalent to his marginal productivity.

In this study, we classify university graduates into two general fields, social and natural sciences. Under the broad field of social sciences, we classified them again into five major fields, namely, commerce and accountancy (CAA), economics (ECO), law (LAW), sub-field of social science such as political science, sociology, social administration, public relation and mass communication, (SSS), and arts and humanities (AAH). Sixs major fields are classified under the general field of natural sciences. They are engineering (ENN), pharmacy (PHA), architecture (ARC), science such as physics, mathematics, and chemistry (SCI), medicine (MED), and agriculture (AGR). The test is confined to the group of graduates working in the Bangkok Greater Area[6] where 78% of them are employed. We will limit the scope of the test to cover the market of graduates in the "private sector" which includes commercial and quasi-commercial operations of the government. The reason for the exclusion of the public sector from the test even though it is relatively larger is that the government pay scale is commonly recognized as irrelevant to the competitive market model in Thailand.

Since the supply of new graduates is largely regulated by policy variables, the wage-employment relationships need be tested only from demand equations. After the demand functions are formulated,

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6 Bangkok-Thonburi, Nonthburi, Pratumthani, and Smutprakarn.

the target "social rate" of return can be realized by regulating the supply of new graduates so as to reach the appropriate wage levels. We define our demand function as follows:

D = f (RW, RY)

D = the demand for new graduates from the private sector in the Bangkok - Thonburi Greater Area

RW = real wage (annual earnings) of new graduates

RY = the real gross sectoral domestic product (the income variable in the demand function). The sector which employs the highest proportion of the reference group of graduates has been selected to be the income (demand) variable of that group.[7]

In our empirical study, we have observed similar patterns of change in the wages of the two groups of graduates, social sciences and natural sciences. In order to generalize and to strengthen the results, observations are classified into these two groups and then pooled together. To recognize possible differences in values of the intercept and the slope of RY for each sub-group within the main group, dummy variables for the intercepts and slopes have been inserted in the regression equations.

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7 According to this definition, the sector which employs the highest proportion of graduates in CAA, ECO and SSS is banking, insurance and real estate (BIR); the highest proportion of LAW, AAH, and ARC are employed in the transportation and communication sector (TAC); the manufacturing sector (MAN) employs the highest proportion of SCI, PHA, and AGR; electricity and water supply (EWS) and services (SES) employ the highest proportion of ENN and MED, respectively.

The results reveal significant wage-employment relationships for the SS group in CAA, SSS and AAH and for the NS group in ENN, PHA, ARC and SCI.[8]

SS

$$\ln D = \underset{(1.7445)}{3.1662} - \underset{(-2.1168)}{0.6221} \ln RW + \underset{(5.7875)}{0.7552} \ln RY$$

$$+\underset{(3.0770)}{0.5683} \ln RY_{SSS} + \underset{(6.5510)}{1.8299} \ln RY_{AAH}$$

$$-\underset{(-4.6714)}{6.1983} X_{SSS} - \underset{(-8.0776)}{18.2565} X_{AAH}$$

Adjusted R^2 = 0.9002

Standard error of estimation = 0.4645

F - value = 85.2324

Number of observations = 57

Numbers in parentheses are the t - values.

RY and X with the subscripts are dummy variables of the slope and the intercept

CAA is the reference group of this equation.

NS

$$\ln D = \underset{(2.4155)}{3.4125} - \underset{(-1.9115)}{0.6073} \ln RW + \underset{(4.9158)}{0.7962} \ln RY + \underset{(2.6265)}{1.0512}$$

$$\ln RY_{PHA} + \underset{(5.6494)}{1.8037} \ln RY_{ARC} + \underset{(5.1317)}{1.7441} \ln RY_{SCI}$$

$$-\underset{(-3.7514)}{13.8370} X_{PHA} - \underset{(-7.4606)}{20.0333} X_{ARC} - \underset{(-6.8255)}{21.1505} X_{SCI}$$

Adjusted R^2 = 0.8330

Standard error of estimation = 0.5472

F - value = 47.7751

Number of observations = 76

ENN is the reference group of this equation.

8 For detailed analysis see Apichai Puntasen, "Manpower and Educational Planning: An Application of A Simple Integrated Model to Selected Groups of Thai University Graduates." Unpublished Ph.D. dissertation, Vanderbilt University, 1973 pp. 60-66.

Beside confirming a significant wage-employment relationship in the demand functions the results also show that the values of the wage-elasticity in these two demand functions are almost identical, about - 0.6. This low elasticity does not support the common belief that the wage elasticity of the demand for labor in general is almost infinite.[9] The above test results permit the calculation of the proxy for the social rate of return for these groups of graduates. After calculating the "social costs" of university education for each group and their earnings-profile, the social rate of return can be computed as soon as the equilibrium solutions of the real wages in the markets of new graduates are known. Unfortunately, we do not have sufficient data to construct earnings-profiles for SSS and ARC, therefore we can only compute the social rate of return for the remaining five groups; the rates are 27, 21, 18, 18 and 16% for ENN, CAA, AAH, PHA and SCI, respectively.[10]

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9 This evidence indicates that a model which assumes a high degree of wage elasticity like the one constructed by Bowles cannot be applicable to Thailand. See: S. S. Bowles, Planning Educational Systems for Economic Growth (Cambridge, Massachusetts: Harvard University Press, 1969), pp. 37-86.

10 See Apichai Puntasen, "Manpower and Educational Planning: An Application of A Simple Integrated Model to Selected Groups of Thai University Graduates," unpublished Ph.D. dissertation, Vanderbilt University, 1973, pp. 70-88.

PART V

DEMONSTRATION OF THE UTILITY OF THE MODEL

Since it normally takes four years to turn high school graduates into university graduates, if we plan admissions beginning in 1975, the graduates will not enter the market until 1979. If we have a five year planning period, we have to estimate future demand for new graduates from 1979 to 1983. If we select 18% as the target value of the social rate of return and adopt the present sectoral growth rates as the target rates of growth, Table 1 below, is the estimation of the future demand for new graduates from the private sector.

TABLE 1

ESTIMATION OF THE PRIVATE SECTOR DEMAND FOR NEW GRADUATES (IN BANGKOK GREATER AREA) 1979-1983

year	Field of Study				
	CAA	AAH	ENN	PHA	SCI
1979	868	421	513	139	192
1980	959	483	589	155	216
1981	1,058	553	667	173	254
1982	1,136	635	782	193	297
1983	1,223	729	903	216	349

After the estimation of the demand from other non-private sectors we derive the following figures of the total demand for new graduates.

TABLE 2

ESTIMATION OF THE DEMAND FOR NEW GRADUATES IN THAILAND. 1979 - 1983

year	Field of Study				
	CAA	AAH	ENN	PHA	SCI
1979	1,472	1,426	977	256	1,296
1980	1,600	1,572	1,092	277	1,426
1981	1,738	1,732	1,226	301	1,612
1982	1,857	1,912	1,395	326	1,821
1983	1,988	2,111	1,560	355	2,059

To compute the number of admissions we have only to replace the above figures in the average admissions graduates relationship of the educational process and solve for the number of admissions.

Conclusion

We have attempted in this paper to offer an alternative approach to the study of manpower and educational planning. However, there are still many assumptions made in both the C-B and the M-R which have been retained in our study. One of the most crucial of these is the the C-B assumption of the constancy over time in the shape of graduate earnings-profiles, so that any shift in initial earnings entails a corresponding shift in the whole profile with the slope of each ordinate unchanged. Without this key assumption we would have no efficient connection between the two approaches as we have combined them in our integrated model. Nevertheless, this model still represents certain significant improvements over either of the two approaches. For example, this integrated model incorporates the question of the efficiency of resource allocation and, at the same time considers the growth aspect of the whole economy. Furthermore, the distributive aspect of the earnings of graduates, never discussed in the C-B or in the M-R can now be treated explicitly in the model because we are now dealing with a model which allows flexibility in the starting earnings of new graduates. We could easily include distributive objectives concerning the earnings of new graduates on top of the other two policies which we have previously introduced namely, the policies on the rate of growth and on resource allocation.

Because of its potential for more practical service in assisting manpower and educational planning, additional efforts should be made to refine this approach until better alternatives are discovered.[11]

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[11] An obvious improvement of this model is to work with "shadow wages" instead of real wages as in this study. Unfortunately, the calculation of "shadow wages" which are derived from production functions in most cases are not feasible. However, the gain from doing so is quite substantial for there is no need to test the demand-supply relationship in the private sector as we have done in this study. The use of the shadow wage method is more general than the method employed in this study because the cost-benefit can be applicable to all cases and the distinction between public and private employes is not needed.