MANPOWER AND EDUCATIONAL PLANNING:
AN APPLICATION OF A SIMPLE INTEGRATED MODEL TO SELECTED GROUPS OF THAI UNIVERSITY GRADUATES

By

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TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

TABLE OF CONTENTS (Cont.)

APPENDICES

LIST OF TABLES

LIST OF TABLES (Cont.)

LIST OF TABLES (Cont.)

LIST OF TABLES (Cont.)

LIST OF TABLES (Cont.)

LIST OF FIGURES

CHAPTER I

INTRODUCTION

The government of Thailand officially recognized the need of incorporating manpower planning into its National Economic and Social[1] Development Plan in plans developed during the second phase of the first planning period (1964-1966). Paragraph 13 in Chapter V of 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]

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[1]The word "Social" has been added since 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.

In spite of clear objectives on what the plan needs to accomplish, the actual planning has not been very successful.[3] This failure is due largely to both the unsettled theoretical approaches to be used for planning and insufficient information to implement the formulation of the approaches.

This study will not attempt to analyze manpower and educational planning for the whole economy of Thailand. Rather, it will, to a certain extent, seek to unravel some issues regarding which approach should be used for manpower and educational planning in Thailand, and how to proceed from this study to the formulation of comprehensive planning. Our pilot study will be focused on university education planning in Thailand with special emphasis on how to allocate limited university resources to educate students in different fields so that we can be assured to some degree that resources have been properly allocated. Hopefully, the insight gained from this study will help us to be better prepared for more comprehensive studies required in the future.

This study is organized as follows: Chapter II will survey the two main approaches currently used for manpower and educational planning in most countries. These are the manpower-requirement approach and cost-benefit analysis. We will indicate the strengths

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[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.

and weaknesses of each approach and observe the present state of development in the uses of these two approaches in manpower and educational planning in Thailand.

Chapter III will investigate further whether there is any way to combine the two approaches mentioned above into one model in such a way that the unique advantages of each approach would be obtained and their weaknesses reduced. We will first observe one specific combination made by Bowles which is based on a linear programming model of the educational sector.[4] Later, we will propose our own integrated theoretical model and demonstrate that this model provides a better solution than the use of either approach independently. Specifically, it provides a definite answer regarding how many trained people should be produced at each specified wage, and at the same time it deals with the problem of efficiency of resource allocation without having to make additional assumptions beyond those previously made in each approach.

In Chapter IV we will discuss the background of university education in Thailand, university characteristics, and the distribution of university graduates by academic field. From this information and the chronicle of changes in the Thai economy during the past 50 years, we will explain why the scope of this study has been limited

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[4]Samuel Bowles, A Linear Programming Model of the Educational Sector, in Economics of Education, ed. by Mark Blaug (Middlesex, England: The Penguin Press, 1968), pp. 168-80.

to the graduates working in the private sector and why our study is confined to the period from 1950 to 1970

We will continue our discussion of general concepts of educational markets and labor markets in Chapter V. There, we will also present some empirical dimensions on the market for graduates and the percentage distribution of graduates employed in Bangkok-Thonburi Greater Area classified by their field of study. In this context, we shall show that in the general field of social sciences, the graduates in the field of commerce and accountancy have the highest percentage of employment in the private sector in both absolute and in relative terms, followed by the graduates in the fields of economics, law, and arts and humanities. In the field of natural sciences, graduates in engineering have the highest percentage of employment in the private sector, followed by pharmacy, architecture and science, respectively. In the final part of this chapter, we show the percentage distribution of graduates employed in the private sector by industry group (i.e., manufacturing, construction, banking, and insurance, etc.).

In Chapter VI we will follow the logical sequence of our model by testing the wage-employment relationship in the market for new college graduates in Thailand. The results indicate that a significant wage-employment relationship exists in the job markets for graduates in commerce and accountancy, sub-fields of social

science, arts and humanities, engineering, pharmacy, architecture, and science.

Since the above test has indicated the validity of applying cost-benefit analysis to these groups of graduates, Chapter VII will calculate their social rates of return as accurately as data and concepts permit. The actual calculations have been made only for those groups whose earning profiles can be constructed from a sufficient number of observations. The "lower limit" of the social rates of return computed from education-adjusted earnings and dropout-rate adjusted costs[5] in 1970 yields the following results: the rate for graduates in engineering is 27%, 21% for graduates in commerce and accountancy, 18% for those in pharmacy and arts and humanities, and 16% for science graduates. With these results we conclude that a substantial rise in the number of admissions of students in engineering is indicated. No other substantial change in admission policy is indicated for other groups.

In Chapter VIII we will demonstrate how we obtain the solution to the problem of precisely how many students should be admitted in each academic field after the "lower limit" of the social rate of return and the target rate of growth are specified. These computations are based on empirical results which are developed in Chapters VI and VII. The concluding remarks in this chapter establish

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[5]The definition of this rate is discussed in Chapter VII.

the fact that the improvement in the estimations of the demand function and the gross sectoral product of each industry group is quite crucial in our study because our final predictive results rest heavily on these two estimates.

CHAPTER II

A SURVEY OF APPROACHES USED IN ASSISTING MANPOWER AND EDUCATIONAL PLANNING

Human capital has been recognized as one of the sources of the national wealth by economists since Adam Smith. Unfortunately, this source of wealth was neglected by most economists for many years, and the concept was displaced in importance by non-human capital. The concept has regained ascendancy since 1960, thanks largely to the pioneering efforts of Theodore W. Schultz. In his several studies, Schultz has pointed out the reasons why human capital was neglected by economists. Among these reasons is the fact that it is a very broad and slippery concept which encompasses the non-economic aspects of the use and development of human resources.[1] Without the current development of new analytical

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[1] See Theodore W. Schultz, "Investment in Man: An Economist's View," The Service Review, XXXIII (June, 1959), 109-117; Education and Economic Growth, in Social Forces Influencing American Education, Sixtieth Year Book of the National Society for the Study of Education, ed. by Nelson B. Henry (Chicago: University of Chicago Press, 1961), Part II, pp. 46-48; Investment in Human Capital in Poor Countries, in Foreign Trade and Human Capital, ed. by Paul D. Zook (Dallas, Texas: Southern Methodist University Press, 1962), pp. 3-5; The Economic Value of Education (New York: Columbia University Press, 1963); Investment in Human Capital: The Role of Education and of Research (New York: Free Press, 1970).

tools, economists would have encountered numerous difficulties in clarifying this concept for their analysis.

Since the studies of Schultz, more attention has been focused on the use and the development of human resources within the context of manpower and educational planning with particular emphasis on the growth and development of the economy. One stream of development of this concept has proceeded through the work of Herbert S. Parnes whose work has led to the development of the tools known as the manpower-forecasting or the manpower-requirement approach.[2] The other stream of development has been centered around the pioneering studies of Gary S. Becker and Mark Blaug who have used cost-benefit analysis to assist their educational planning efforts.[3]

The Manpower-Requirement Approach (M-R)

The M-R is the translation of projected manpower demands into the 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 education backgrounds) is a function

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[2]Herbert S. Parnes, Manpower Analysis in Educational Planning, and Relation of Education Qualification, in Planning Education for Economic and Social Development (Paris: O.E.C.D., 1964), pp. 73-80 and pp. 147-57.

[3]Their works can be seen in Gary S. Becker, Human Capital (New York: National Bureau of Economic Research, 1964), and Mark Blaug, "The Rate of Return on Investment in Education in Great Britain," The Manchester School, XXXIII (September, 1965), 205-51.

of some fixed coefficient production function in the educational system. The demand vector is aggregatively determined by the gross domestic product (for the closed economy model) adjusted by some related indices. Sometime the demand is estimated from the growth trends of various economic sectors adjusted by the productivity index of that sector.

A well-known econometric model using the M-R is the one by Tinbergen and Bos.[4] They tried to incorporate growth through the demand vector by establishing a constant relationship between the demand for manpower with a certain level of education and the gross domestic product. Afterward, they generalized their formula using the regression relationship by adding per capita income, which they called a "productivity index," as an independent variable. This particular demand function has been tested by Rado and Jolly using the data of East African countries in 1965. They found a significant relationship among the three variables, and the signs were as they anticipated: namely, there was a positive relationship between the demand for labor and the GDP and a negative relationship between the "productivity index."[5] The exogenous factor in the Tinbergen-Bos Model is the desired rate of growth. This desired rate of

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[4]Jan Tinbergen and H.C. Bos, A Planning Model for the Educational Requirements of Economic Development, in Econometric Models of Education (Paris: O.E.C.D., 1965), pp. 9-13.

[5]E.R. Rado and A.R. Jolly, "The Demand for Manpower: An East African Case Study," Journal of Development Studies, I (October, 1965), 226-43.

growth is the target constraint in their model and after it has been set, the future demands for different kinds of manpower can be easily calculated. These projected demands will be translated into desired supplies of educational output.

The typical M-R, including the Tinbergen-Bos model is frequently criticized on the following grounds: (1) the model does not recognize compositional change in the GDP where educational requirements of workers for each industry are different; (2) it assumes rigid technical coefficients; (3) productivity change is sometimes assumed to be uniform across industries. However, the most significant fault of this approach is that it is not an equilibrium approach based on the efficiency of resource allocation.

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 the priority for investment projects by establishing certain criteria for the comparison of 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 uses of resources.

Many different criteria have been used in ranking investment projects, but the most common ones are the present value rule and the internal rate of return rule. In this study, however, we will

confine ourselves to the use of the internal rate of return rule only.[6]

Although the C-B is conceptually better than the M-R, it is not free from criticism, especially on empirical grounds. By the very nature of all investment projects, especially the ones which have long life, the projection of benefits in future years is subject to rather large errors. This difficulty is especially pertinent for investment in education. Not much can actually be done about this problem except to admit its existence as one weakness of the analysis.

Other attacks on the C-B stem from the use of the earnings profile to represent part of the benefits from investment in education. As has normally been done in the studies of this nature, earnings are postulated to have some functional relationship with the educational background of the worker and other related factors. This functional relationship is usually viewed as the reduced form of the demand-supply relationship.[7] With the additional assumption

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[6]Mathematically, the internal rate of return is computed from the following formula:

$$0 = \sum_{t=0}^{m} NB_t \, (1+i)^{-t} \qquad (2-1)$$

where NB_t is the net benefit (benefit minus cost) at the end of each period; i is the internal rate of return, and t is the discrete time index starting from zero to m.

[7]This assumption is implicitly made in the studies of the similar nature of Blaug's, see Mark Blaug, The Rate of Return to Investment in Education in Thailand, Report to the National Edu-

that the labor market in question operates under conditions of perfect competition, real earnings of a person can be viewed as equivalent to his marginal productivity; however, this assumption has been criticized frequently with regard to its economic validity.

One way to handle the above criticism is to test the implications of this assumption. Given the equilibrium conditions of the labor market, the responsiveness of the quantities demanded to a change in wages will imply, to a certain extent, the operation of the market mechanism which in turn implies the equality between real earnings and the marginal productivity of labor.

Two alternative methods have been suggested for the direct calculation of the marginal productivities of labor. The first suggestion is to construct a production function having different work-experience trained workers as elements among the other factors of production (to form a basis for projecting successive marginal productivities of trained workers having different amounts of work-experience). It is quite obvious that this procedure requires so many related sets of data that its practical value is limited. The other alternative is the estimation of a "shadow wage" for educated people. As Blaug remarks, however, "This is easier said than done. Short of developing a 'dynamic programming' model of the economy, the 'dual' of which would furnish shadow prices for

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cational Development Plan, December, 1971 (Bangkok: National Educational Council, 1971).

labour, there would seem to be no way of estimating the actual relative scarcities of educated people."[8] These alternatives do not seem to provide any practical improvement for the analysis. Therefore, using earnings profiles to represent part of the benefits from education and admitting the weakness of the assumption seems to be the only practical procedure to use.

Another criticism of C-B stems from the use in most studies of cross-section earnings profiles in estimating benefits.[9] Among several points of weakness that have been pointed out, the following are worth noting. The first criticism concerns impact of the choice of the base period being selected for the study on its results. For any given period, one can always calculate the corresponding value of the internal rate of return. Hence, it is possible that the computed internal rate of return will vary with the particular period selected. If there is no inconsistency in the values of the internal rates of return for all periods being selected, any choice will be as good as the others. However, if the contrary is true (as is likely), the choice of period can be crucial. The internal rate of return computed under this condition may therefore turn out to be misleading.

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[8]Mark Blaug, "The State of Educational Planning in Thailand" (A Report to the National Education Council, Bangkok, October, 1968), p. 23 (Mimeographed).

[9]All of the studies of Becker and Blaug which have been done up to the present are based on the cross-section data.

A second point of criticism is that the internal rate of return computed from the cross-section data of the earnings profile may be an underestimate of the true theoretical rate. This argument is based on the presumption that the quality of the original education of a person who has been trained many years ago is lower than that of the one who has been trained more recently. Cross-section earnings of persons who have been trained previously, which are projected (from a higher base) as the future earnings of recent graduates, will cause a downward bias in the estimation of earnings of the latter group. As a consequence we will obtain an under estimation of the true internal rate of return, ceteris paribus. The bias will, however, be diminished when the life of the project is relatively long and the internal rate of return is relatively high. In this case, the differences between the true values and the estimated values of absolute earnings for higher age cohorts will not produce very different results in the value of the internal rate of return, because the absolute discount $((1+i)^t)^{10}$ will increase very rapidly when i and t are high. The absolute difference in earnings for higher age cohorts will be narrowed by the rapid increase of these absolute discounts. Therefore, it is possible that this source of bias will not cause a significant distortion in the estimation of the internal rate of return. As a result, criticisms based on this point should

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[10] See footnote 6.

not carry too much weight. However, when being asked on theoretical grounds as to what the internal rate of return computed from this method means (since earnings computed this way will contain different qualities of education), the answer will make sense only when we can assume that the average quality of education is the same throughout the period of 30 to 40 years under the study. Having made a general observation on the average change of the quality of education in Thailand within that length of period, I doubt whether the above assumption holds. The acceptable procedure is to view the rate computed in this way as a proxy for the theoretically correct value.

Time series data have often been suggested as an alternative to the use of the cross-section data. However, there are also defects attached to the use of the time series data as well. Usually, the time series data used in the estimation of earnings profiles are obtained from survey data taken in only one period of time. Some of these data are collected from the incomplete recollection of an individual's memory resulting in errors of unknown magnitude to the estimation of the true earnings. Time series data on earnings also incorporate the effect of structural changes in demand and supply over time into the estimation of earnings, while there is no such problem with the cross-section data. For these reasons, there seems to be no absolute advantage in the use of one set of data over the other. In practice, an individual's choice of which set of data is

to be used depends largely on the constraints and options before him.

Present Situation of the Manpower and Educational Planning in Thailand

Since 1963, there have been five different manpower forecasts in Thailand:

1. The Joint Thai-USOM Human Resource Study, Preliminary Assessment of Education and Human Resources in Thailand (Bangkok: AID-USOM Thailand, 1963), 2 Vols., the first of which has also been published separately in 1967 by the Ministry of Education.
2. The Secondary Education Programs (Bangkok: Educational Planning Office, Ministry of Education, Thailand, 1966).
3. Methodology on Manpower and Employment Projection in the Second Plan in Thailand (Bangkok: N. E. D. B., Office of the Prime Minister, 1967).
4. G. Hunter's Study for UNESCO and I. A. U. carried out in 1963-64 but not published until 1967.
5. I. L. O.'s Asian Employment and Training Projection, Report on a Case Study on Thailand (Bangkok: Cyclostyed, 1968).[11]

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[11] Blaug, "The State of Educational Planning in Thailand," pp. 24-25.

Not one of these studies deserves to be called true economic analysis of education since each of them merely extrapolated trends and based their predictions on the long term (10 to 15 years) result of the extrapolation. Some have come a little closer to economic projections with the authors attempting to estimate the future demand for manpower based on a forecast of future national income adjusted by the productivity trends in various economic sectors. The trends which were used were selected arbitrarily from the study of other nations having the similar stage of development as Thailand. Given the data situation in Thailand at that time, these are the best studies to date, however it has been argued that, because of the arbitrary nature of the productivity trends selected, the results led to a misprojection of the manpower output for the plan of 1967-1971. As the result, the National Economic Development Board (NEDB) with the help of the Asian Productivity Organization began to calculate the productivity indices of the Thai economy by economic sector in 1970.[12] These findings will be incorporated in the Manpower Planning Chapter of the Third National Economic and Social Development Plan of Thailand, 1972-1976.

The first study of the C-B ever undertaken to assist educational planning in Thailand was recently completed by Mark Blaug.[13]

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[12]Thailand, The National Economic Development Board, The Measurement and Promotion of Productivity, by Saburo Yamada (Bangkok, Thailand: Government House Printing Office, February, 1971).

[13]Blaug, The Rate of Return to Investment in Education in Thailand.

Like the pioneering study of Hunt,[14] Blaug also used cross-section data with a stepwise regression technique to help him eliminate the effect of factors other than education. However, Blaug has carried out his study on a relatively more comprehensive basis. Having done this, he was able to estimate the so-called "private" and "social" rates of return from education with and without the effects of other factors. He has calculated these two rates of returns for all levels of education. However, for higher education, he has not classified the rates by the field of study. As far as manpower and educational planning in Thailand is concerned, Blaug's study is the latest development in this area.

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[14] Shane J. Hunt, "Income Determinants for College Graduates and the Return to Educational Investment," Yale Economic Essays, III (Fall, 1963), 305-57.

CHAPTER III

THE THEORETICAL MODEL

Having discussed the essence of the cost-benefit analysis (C-B) and the manpower requirement approach (M-R), this chapter will investigate further a combination of the two approaches. Finally, we will present our own theoretical model which will be used in the rest of our study.

An earlier attempt to develop a unified model was made by Bowles using linear programming. His constraint equations define an intertemporal production possibility set for the educational system. The contribution of the educational system to future national income, which forms the maximand (or objective function), is measured by the increment in discounted lifetime earnings attributable to additional years of education. The objective function represents the net economic benefits attributable to educational activities, namely, the present value of benefits associated with the output of each level of the system in each period of time minus the present value of the associated costs.[1]

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[1] Samuel Bowles, Planning Educational Systems for Economic Growth (Cambridge, Massachusetts: Harvard University Press, 1969), pp. 83-86.

We can see that the information used to form the constraint equations in this model is the same kind of information used in the M-R, and the information for forming the maximand is the type of information required in the typical C-B. Therefore, this linear programming model combines the features of the M-R and the C-B into one unique model.

Like the typical C-B, Bowles also assumes a high degree of substitutability among factors so that the relative marginal products of each type of labor remain constant, regardless of the available amounts of each factor. This assumption allows him to compute the contribution to the present value of the future stream of national income for each type of schooling and choose, from the feasible set of enrollment levels of the educational plan, that one yielding the largest total contribution to national income. If, however, the marginal product function for each type of labor is downward sloping (as it presumably is), the contribution of each type of education to national income cannot be determined until the enrollment mix to be chosen is known.[2] Under these conditions, the maximand and the constraints will be interdependent and the model will become dynamical. Therefore, the key assumption which allows Bowles to work with his linear model is his assumption of infinite elasticity (or perfect elasticity) of the demand function for trained workers.

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[2] Ibid., pp. 37-38.

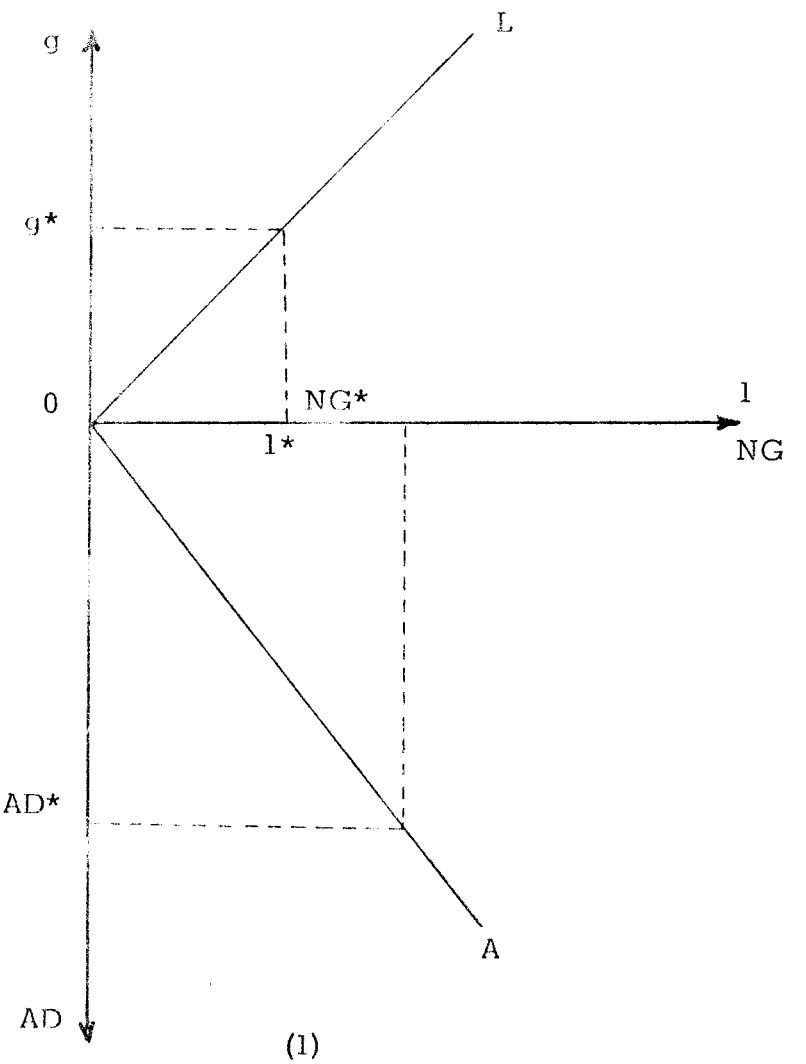
Without making additional justifications for this model, we will proceed further to see if there is any way to bring about a fuller integration of both the C-B and the M-R without making any substantial change in the nature of each approach. Then we shall see whether such integration results in any improvement in the analysis.

Graphic Representation

It is now appropriate to pause briefly to present the M-R and the C-B graphically. This is done in order that the reader will better understand how the two models are integrated later in this chapter. (See Figure 1.)

Figure 1 is a simplified version of the M-R. In the upper sector of this figure, OL indicates the positive relationship between the rate of growth of the gross domestic product and the rate of growth of the 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 an 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 the GP g^{*}, has been specified, the required rate of growth of trained manpower, l^{*}, is



(1)

Figure 1. The Typical Manpower-Requirement Approach

where:

g = rate of growth of GDP
l = rate of growth of the required manpower
NG = number of graduates
AD = number of admissions

determined. This enables us to compute the absolute number of trained manpower (NG^*) required to achieve the target rate of growth with AD^*, the required number of admissions, correspondingly determined. Notice that we use the aggregate number of the two variables. Later on, corresponding lower case letters will be used to represent each homogeneous subset of graduates from the aggregate model. Observe also that the above model is designed to show the M-R in its very simplest form. For example, there is no classification of admissions and graduates by different education levels. Neither have we classified graduates by the different education backgrounds required in different economic sectors. We will retain this simplified structure in our models throughout this chapter.

The typical M-R has often been criticized for failing to include a wage variable in its analysis.[3] According to its frame of reference, variation in wages is irrelevant to the analysis for it has been predetermined by the choice of the target rate of growth (g^*) and the fixed relationship of required manpower (l^*) to the rate of growth. 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 a small homogeneous units, we should be able to discuss the change in wages in a more meaningful way.

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[3] The first attempt to include a wage variable in the manpower planning is made in the study of Carnoy and Thais. See Martin Carnoy and Hans Thais, "Educational Planning with Flexible Wages: A Kenya

This model will be called the "modified" manpower requirement approach. (See Figure 2.)

In 2(a) of Figure 2, we replace the upper portion of Figure 1 by the demand and supply relationship of a homogeneous 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. Conventionally the negative slope is drawn for the demand schedule. 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 that period. Part (b) of this figure is the modified version of the upper diagram of Figure 1. It shows the iso-growth rate of the 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 admissions 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 the technical coefficients, $s^*_y s_y^*$ will be the corresponding supply schedule of new graduates. If he chooses z instead $s^*_z s^*_z$ will be the corrspondent

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Example" Journal of Economic Development and Cultural Change, XX (April, 197_, 438-_.

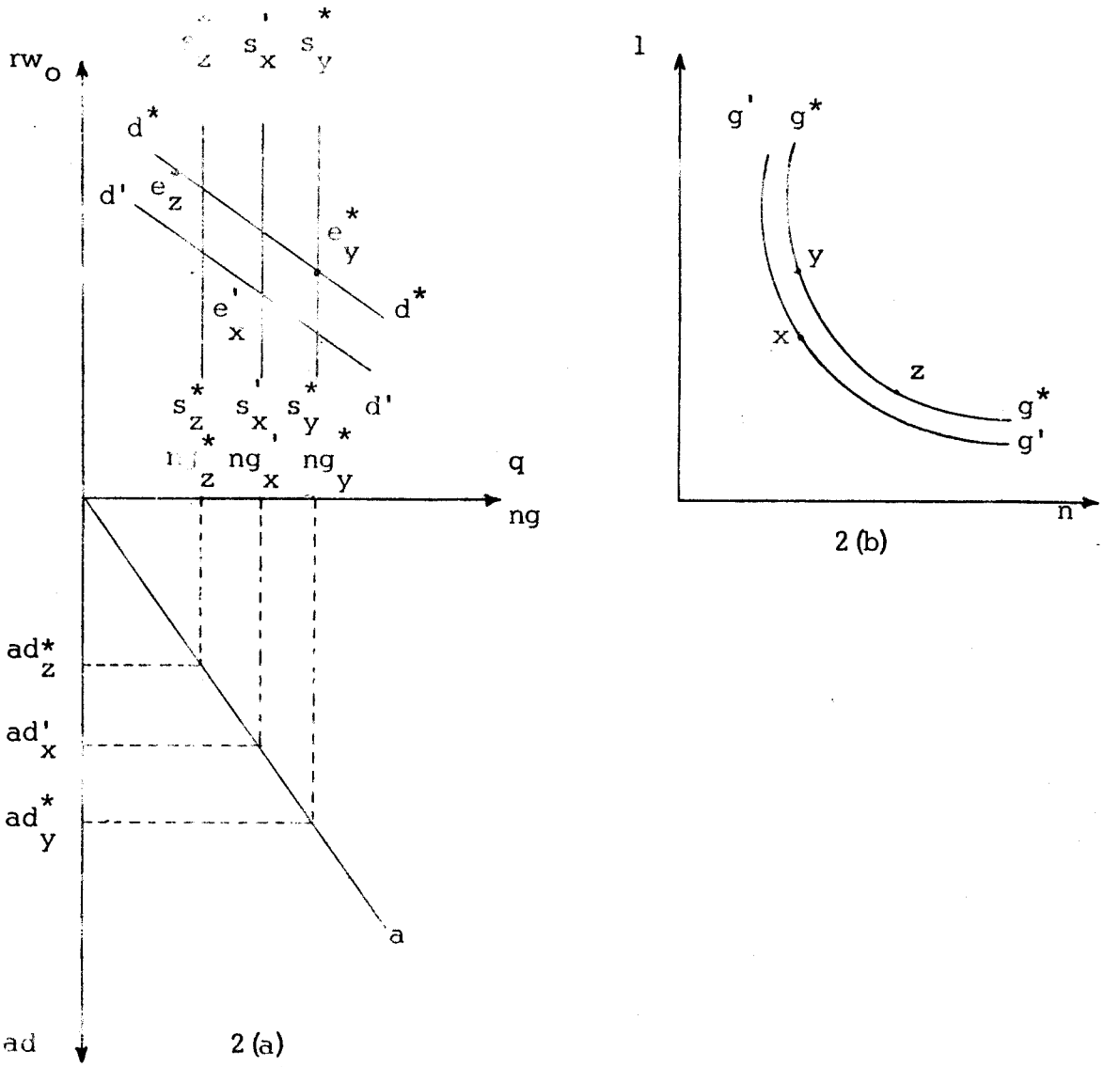

Figure 2. The Modified Manpower-Requirement Approach

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

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 conventional approach. Although we have modified this analysis from its traditional form, we can still claim that this approach is strictly the M-R. After the target rate of growth has been specified, and the technical coefficient has been selected, it follows that a certain number of trained workers should be supplied regardless of what the internal rate of return from investment in their training is in comparison with the rates of return from the alternative uses of resources.

Let us now turn to the C-B. The typical C-B begins from the relationship in the right hand diagram of Figure 3, where earnings tend to rise at a decreasing rate with years of work-experience. In the typical profile, earnings will increase at a relatively rapid rate during the early years of work-age with the rate of increase falling thereafter. Earnings may even 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 $\underline{i}$ can be computed from equation (2-1). Normally, a cost-benefit analyst must also assume implicitly or explicitly that

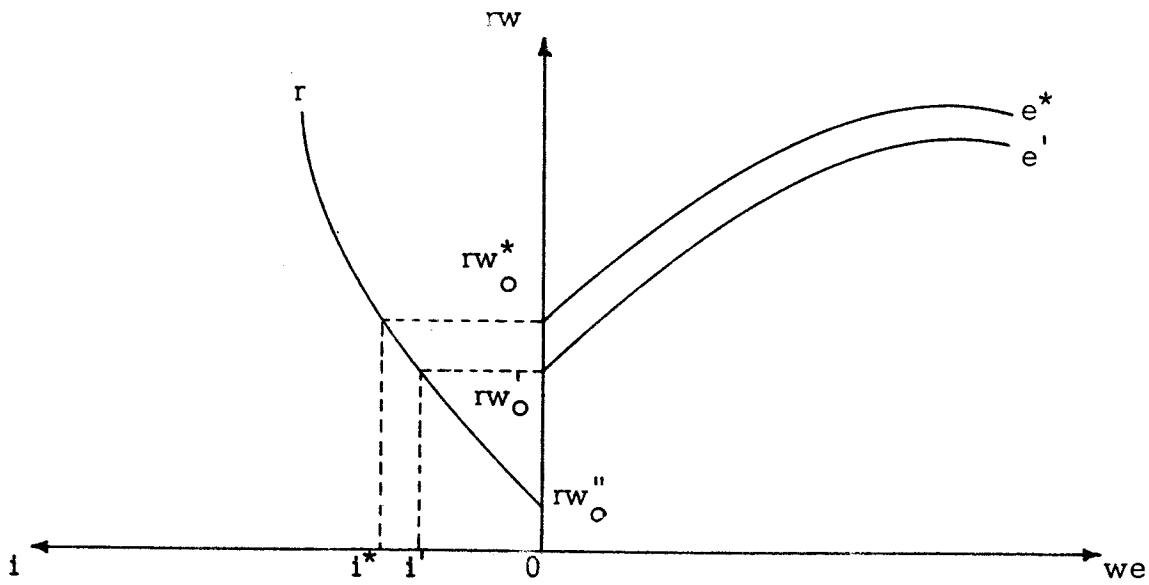

Figure 3. The Typical Cost-Benefit Analysis

where:

we = years of work-experience
i = internal rate of return

the shape of the earnings-profile will not change. 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 assumption holds (which is rather unlikely), he will be able to show the relationship between rw_o and $\underline{i}$ in the left-hand diagram of Figure 3. This relationship is such that $rw''_o - r$ is a monotomically increasing function and rw''_o must always be positive.

Given the relationship between rw_o and $\underline{i}$ in the left-hand diagram, the cost benefit analyst can now indicate the direction of change when the target value of $\underline{i}$ is specified. Suppose i^* is the target internal rate of return,[4] rw^*_o will be the target value of the 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 analysis further.[5] (See Figure 4.)

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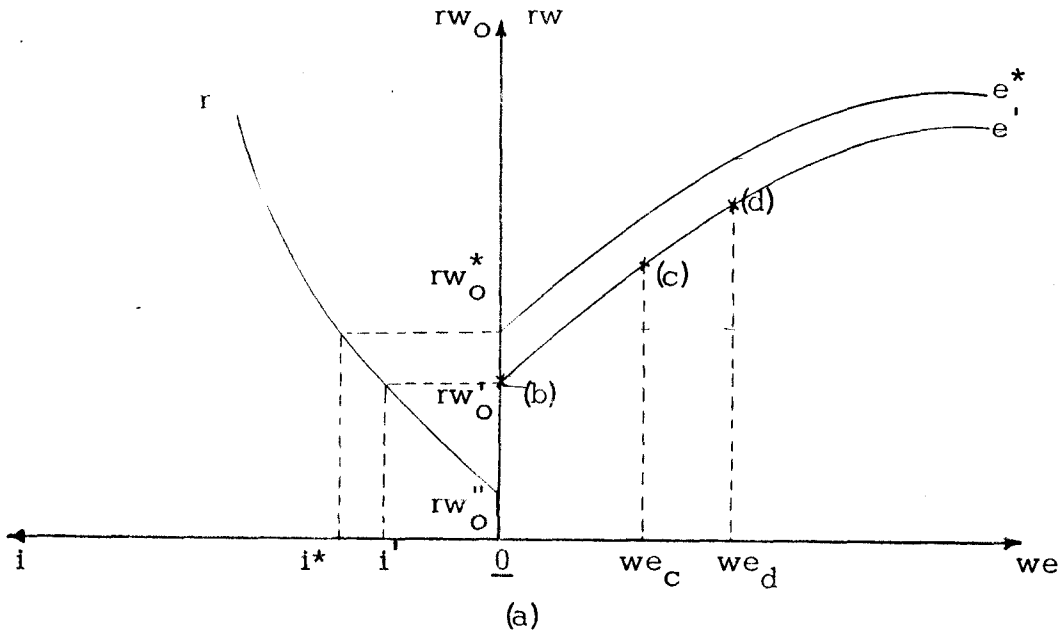
[4]This target variable ($\underline{i}^*$) for the planner is supposed to be consistent with the social rate of discount -- the rate that is to guide all other investments as well.

[5]A similar analysis can be seen in M. Glaug, An Introduction to the Economics of Education (London: Allen Lane the Penguin Press,



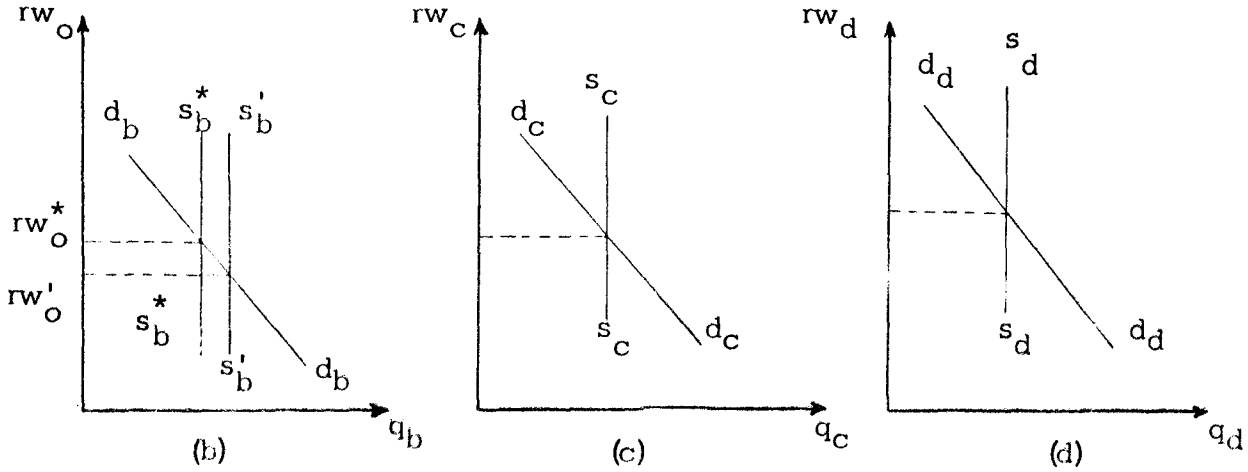


Figure 4. The Modified Cost-Benefit Analysis

The demand-supply models in Figure 4(b), 4(c) and 4(d) are intended to show how the corresponding points, b, c and d on the earnings-profile $rw_o'e'$ in the right-hand side diagram of 4(a) are established. Conceptually, every point on $rw_o'w'$ should be derived from the equilibriums of the set of these demand-supply models. Practically, given the time series data limitations in most countries, the construction of a model encompassing only the demand-supply relationship in the market for new graduates is difficult enough. With this data constraint, it is not possible to construct the whole set successfully. This is why the typical cost-benefit analyst has never tried to test this key assumption; however, the advantage of doing so is obvious if such a test is feasible. For example it will give the cost-benefit analyst some indication on how the market mechanism works for older graduates. Having the market of new graduates in his framework and knowing rw_o^*, the cost-benefit analyst will be able to specify that $s_b^*s_b^*$ new graduates must be supplied.

The Integrated Model

After examining both the M-R and the C-B, we see clearly that the missing part from both analyses is the conventional demand

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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 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).

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 $i\text{-}rw_o$ 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. (See Figure 5.)

To describe the operation of this model we begin with the technical coefficient at the point $\underline{x}$ on the iso-growth rate g'g'; ng' and ad'_x in the fourth quadrant of Figure 5(b) are the required number of graduates and the number of admissions, respectively. Also $ar'_{o,x}$ and i'_x are the equilibrium real wage and the corresponding value of the internal rate of return. A point to be observed from this integrated model is that the value of $\underline{i}$ varies with the choice of technical coefficient on the iso-growth rate curve. Therefore, for every specified i_x there exists a corresponding point x of technical coefficient on g'g' such that the supply of new graduates $s'_x s'_x$ is also determined. Suppose again that g* has been determined outside this system, the demand schedule will shift from d'd' to d*d*. If the planner picks i^*_y to be the target rate of return, the point of technical coefficient y on g*g* will be selected, accordingly. Consequently, the supply will be the new equilibrium real wage. If the selected value of i* represents the rate at which all resources are used optimally, with this scheme of analysis, this specified target rate

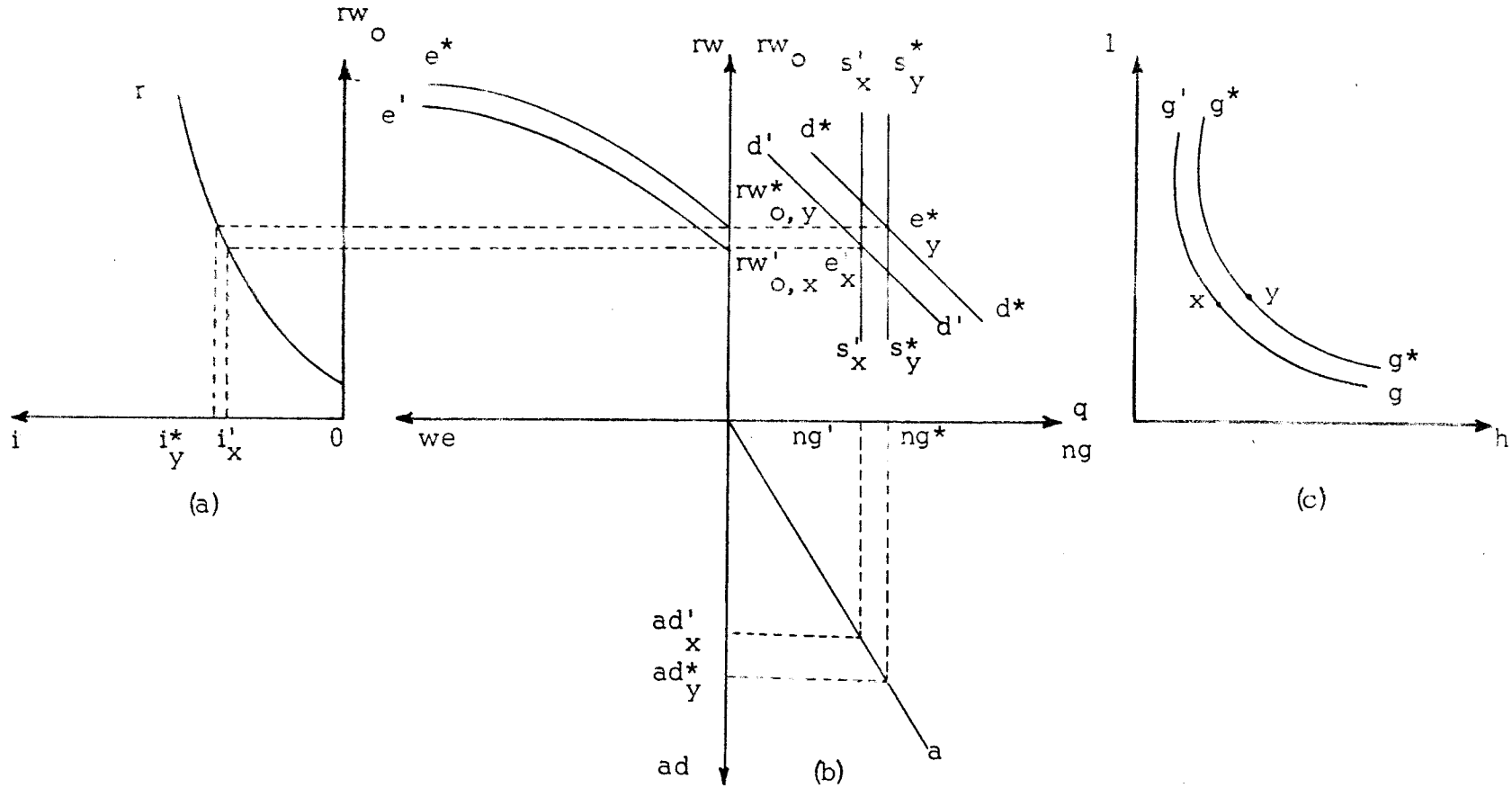

Figure 5. The Integrated Model

of growth will be reached at the point of efficient resource allocation.

Conceptually, the above procedure should be better than either the M-R or the C-B for it will alleviate the shortcomings arising from the application of each approach independently. However, the reader should also be aware of its limitations arising from the inclusion in the integrated model of all the assumptions made previously for the M-R and the C-B. Therefore, the results of the empirical study from the application of this model must be interpreted with care.

Proposed Study

The theoretical model which will be used in our study is very much like this integrated model except we are presently not able to find the technical coefficient of the iso-growth rate for the economy of Thailand. Therefore, in our study we can only make some predictions about the shift of the demand schedule resulting from the expansion of the economy; and, after the target value of i* is determined, we can recommend the number of new graduates which should be produced to meet the above conditions. Unfortunately, we will not be able to tell whether this number of new graduates corresponds to any particular point on iso-growth rate curve. This situation will add to the limitations of our analysis. Nevertheless the recommendations developed from this model are probably the

best that can be made, given the current availability of data for the Thai economy.

CHAPTER IV

INSTITUTIONAL AND ECONOMIC BACKGROUND

The original purpose of education in Thailand was to train people for public service. This phenomenon is not unique for Thailand; it is true for most Asian countries especially those encompassed by the Old Chinese Empire. Chien-Sheng Shih suggested that "for thousands of years, the Chinese people have regarded becoming government officials as the goal to be sought through education."[1] Certainly this was also the intent of the university system in Thailand; at least at the time of its establishment.[2]

This situation gradually began to change with the beginnings of industrialization shortly before the outbreak of World War II (1939). However, the most rapid change in educational philosophy

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[1] Chien-Sheng Shih, "Reflections on the Problems of Human Resources Development in Taiwan," Economic Research Journal, XV (September, 1968), 72.

[2] The confirmation of this claim can be seen from the statement of the National Education Council (NEC): "The early development of the Thai universities was closely related to the administration of various ministries. Some institutions, at least in the initial stages of their development, serve as the pre-service training centers for their respective ministries." See Thailand, The National Education Council, Office of the Prime Minister, "Higher Education," Bangkok, 1967, p. 1. (Mimeographed.)

came about as a result of the growth of the competing private sector beginning in 1950. From that time until the present, graduates have been produced in increasing numbers for their private sector. Without this change, a study of this nature which explicitly includes the operation of the price mechanism in the model, would not have been possible because incentives in the public sector do not operate in a way which can be readily analyzed using the tools of economic analysis.

University Characteristics and the Distribution of University Graduates

Seven universities are included in this study. They are Chulalongkorn, Thammasat, Medical or Mahidol, Kasetsart, Silpakorn, Chiangmai and Khonkaen Universities. Each university has its own unique heritage and its own characteristics which are worth considering because these characteristics have shaped the quality of university graduates and their areas of educational specialization in Thailand since 1932. (A detailed historical background of each university will be found in Appendix A.)

Thailand was never under the direct control of any western nation during the colonial period. The universities in Thailand, therefore, do not conform to any particular form (as do universities in the former colonial countries). For instance, the original form of Chulalongkorn was along the lines of the British model; admissions were made on a very restrictive basis and specialization was emphasized at the beginning of the first year. Thammasat, however,

was similar to French universities. Admission was granted to all high school graduates or the graduates of equivalent qualification; class attendance was not required and specialization was emphasized at the graduate level. Kasetsart, on the other hand, resembled the typical American university with specialization beginning at the junior level and class attendance compulsory. Here, the semester system was employed, and tests were conducted throughout the academic session ending with a final examination.[3] Today, it is quite fair to say that all seven Thai universities are moving toward this American mode. However, in spite of this direction of movement, the emphasis on specialization at the undergraduate curriculum is still a distinctive feature of the Thai university.

At present, Chulalongkorn and Medical University are the big producers of graduates in natural sciences; while Thammasat supplies the major share of graduates in the general field of social sciences. From 1950 to 1970, the data revealed by each university's records show that there were 51,088 graduates produced by the university system included in our study; 33,307 were graduates of the general field of social sciences, and 17,781 were graduates of natural science programs. Thammasat alone produced 22,360 graduates, or 67 percent of the graduates in social sciences. Chulalongkorn was responsible for 9,573, or 29 percent of the graduates. Kasetsart

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[3]Thomas H. Silcock, Southeast Asian University: A Comparative Account of Some Development Problems (Durham, North Carolina: Duke University Press, 1964), pp. 36-38.

produced 3 percent; with Chiangmai and Silpakorn together producing only one percent. These figures are summarized in Table 1.

Within the broad scope of the social sciences, there are five major areas of study at these Universities: commerce and accountancy (CAA), economics (ECO), law (LAW), sub-fields of social science (SSS), and arts and humanities (AAH). There are six fields of classification under the general heading of natural sciences: engineering (ENN), pharmacy (PHA), architecture (ARC), science (SCI), agriculture (AGR), and medicine and denistry (MED). For a detailed classification of each field of study by the degree conferred by each university, see Appendix B.

Table 2 establishes that Thammasat produces most of the graduates in the general field of social science. The single exception is in the area of AAH in which 87% of all graduates in the period of 1950-1970 were graduated from Chulalongkorn.[4] Looking further, we see Kasetsart has specialized in the field of agriculture, while Chulalongkorn specializes more in the fields of engineering, science and architecture. Graduates in pharmacy and medicine have been

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[4]The dominant role of Thammasat in supplying those social science graduates was partly due to the fact that Thammasat was the only university to have had an unlimited admission policy. This policy was in effect since 1933. The rapidly rising enrollment in the late 1950's forced Thammasat to restrict admissions in 1960. This change in admission policy began to take its effect in terms of the reduction in the number of graduates only after 1967 when the majority of students enrolled under the old admission policy were either graduated or dropped out. Because of this change, the share of social science graduates supplied from Thammasat has been declining gradually since 1967 (see Appendices C-1 to C-4).

TABLE 1

GRADUATES PRODUCED BY THE UNIVERSITIES FROM 1950 TO 1970

	Number	Percentage	
General Field of Social Sciences:			
Thammasat	22,360	67%	
Chulalongkorn	9,573	29	
Kasetsart	1,027	3	Percentage
Silpakorn	184	.5	of Total
Chiangmai	163	.5	Production
	33,307	100%	65%
General Field of Natural Sciences:			
Chulalongkorn and Medical University	12,857	72%	
Kasetsart	3,908	22	
Chiangmai	550	3	
Silpakorn	348	2	
Khonkaen	118	1	
	17,781	100%	35%
			100%

Source: From the registrars' records of the seven universities.

TABLE 2

THE COMBINATION OF GRADUATES CLASSIFIED BY FIELD OF STUDY (1950-1970)

Field	Number of Graduates				Percentage of Graduates			
	Total	Male	Female	Unclassified	Total	Male	Female	University
01.								
Commerce and	9,918	4,304	5,601	13	100	43	57	
Accountancy	7,457	3,485	3,972	-	75	47	53	Thammasat
	2,488	819	1,629	-	25	33	67	Chulalongkorn
	13	n.a.	n.a.	13	-	n.a.	n.a.	Chiangmai
02.								
Economics	3,429	2,232	1,169	28	100	66	34	
	2,226	1,512	714	-	65	68	32	Thammasat
	966	628	338	-	28	65	35	Kasetsart
	209	92	117	-	6	44	56	Chulalongkorn
	28	n.a.	n.a.	28	1	n.a.	n.a.	Chiangmai
08.								
Law	9,644	6,808	500	2,336	100	93	7	
	9,239	6,538	365	2,336	96	95	5	Thammasat
	405	270	135	-	4	67	33	Chulalongkorn
09.								
Sub-Field of	4,895	2,972	1,900	23	100	61	39	
Social	3,055	1,820	1,235	-	62	59	41	Thammasat
Science	1,817	1,152	665	-	37	63	37	Chulalongkorn
	23	n.a.	n.a.	23	1	n.a.	n.a.	Chiangmai

TABLE 2 (Continued)

Field	Number of Graduates				Percentage of Graduates			
	Total	Male	Female	Unclassified	Total	Male	Female	University
11.								
Arts and	5,421	798	4,279	344	100	16	84	
Humanities	4,694	733	3,961	-	87	16	84	Chulalongkorn
	383	65	318	-	7	17	83	Thammasat
	184	n.a.	n.a.	184	3	n.a.	n.a.	Silpakorn
	99	n.a.	n.a.	99	2	n.a.	n.a.	Chiangmai
	61	n.a.	n.a.	61	1	n.a.	n.a.	Kasetsart
04.								
Engineering	3,812	3,765	47	-	100	99	1	
	3,359	3,312	47	-	88	99	1	Chulalongkorn
	398	398	-	-	10	100	-	Kasetsart
	55	55	-	-	2	100	-	Khonkaen
03.								
Pharmacy	1,612	140	197	1,275	100	42	58	
	1,612	140	197	1,275	100	42	58	Chulalongkorn and Medical University
10.								
Architecture	1,049	584	117	348	100	83	17	
	701	584	117	-	67	83	17	Chulalongkorn
	348	-	-	348	33	n.a.	n.a.	Silpakorn

TABLE 2 (Continued)

Field	Number of Graduates				Percentage of Graduates			
	Total	Male	Female	Unclassified	Total	Male	Female	University
07.								
Science	3,066	490	1,962	614	100	20	80	
	2,137	353	1,784	-	71	17	83	Chulalongkorn
	413	n.a.	n.a.	413	13	n.a.	n.a.	Kasetsart
	315	137	178	-	10	43	57	Medical University
	138	n.a.	n.a.	138	4	n.a.	n.a.	Chiangmai
	63	n.a.	n.a.	63	2	n.a.	n.a.	Khonkaen
06.								
Agriculture	3,097	2,446	651	-	100	79	21	
	3,097	2,446	651	-	100	79	21	Kasetsart[a]
05.								
Medicine	5,145	3,116	1,617	412	100	66	34	
	4,733	3,116	1,617	-	92	66	34	Chulalongkorn and Medical University
	412	n.a.	n.a.	412	8	n.a.	n.a.	Chiangmai

Source: From the registrars' records of the seven universities.

[a]The number also included the graduates from the Faculty of Veterinary Science, Chylalongkorn University, but the percentage is quite small.

supplied mostly by Mahidol. Due to the specialized nature of each university, the quantity of graduates in each classified field tends to be uniform in spite of the difference in the quality of education provided at each university from which the graduates are supplied.

Some Basic Facts and the Choice of Period

In this study we will confine ourselves to new graduates employed in the private sector. The complexities of the incentives offered in the public sector and the difference in the quality of graduates being employed in the public and private sectors are among the reasons for this simplification. However, our "private sector" will include all public enterprises[5] (such as the Bank of Thailand and the Thai tobacco monopoly) for two very important reasons. Firstly, public enterprises played a vital role in the early development of the private sector, and they still constitute a large portion of the job market for the university graduates. Without these enterprises, the private sector would be too small to produce significant results for the study. Secondly, the rules and regulations for personnel management are less rigid for publicly owned enterprises than for other governmental agencies. The original idea was to run public enterprises in the same way as private enterprises with the primary employee incentives being monetary. Within this context, the current

[5] The term public enterprise, as used in this paper, refers to commercial and quasi-commercial operations sponsored by the government.

pay scales and bonus systems offered by public enterprises are more in line with those of private firms than with those of the civil service.

Our concern with the private sector (with the understanding that the public enterprises are included), leads us at this point to present a brief historical sketch of the growth of public and private enterprises in Thailand. Official recognition of the need for industrialization did not come until the Revolution of 1932 and prior to this time only a few manufacturing industries were in existence. These early industries included the Siam Cement Company, four match factories, several tobacco companies (which were later monopolized by the government in 1941), the Boon Rawd Brewery, and a number of small sugar factories.[6] Due to inadequate investment money coming from the private sector, the government began to invest certain sums of money in textile factories in 1933, followed by other light industries (such as glass and pottery) and then the bigger industries (such as paper) in 1938.

The outbreak of World War II in 1939 caused all manufacturing industries (both private and public) to grow rapidly because of the cessation of imports. At the end of the War, many factories which had operated during the War had to close when the inflow of imports resumed. In early 1950, the industrial sector was still at about the

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[6]James C. Ingram, Economic Change in Thailand 1850-1970 (California: Stanford University Press, 1971), pp. 122-38.

same stage of development it had reached in the immediate prewar period.

Since 1950, industrial development has been impressive. In terms of its share of the gross national product, the industrial sector rose from 18 percent in 1951 to 26 percent in 1960 and to 30 percent in 1969.[7] The growth of the industrial sector has led to the expansion of other related sectors such as banking, insurance and real estate (BIR), construction (CON), electricity and water supply (EWS), transportation and communication (TAC), wholesale and retail trade (WRT), and services (SES). These sectors are the only ones which offer large numbers of jobs in the private sector for university graduates. The agricultural sector, while relatively large, does not by itself provide employment for university graduates except through the stimulation of other sectors.

In consideration of the low levels of development in the private sector prior to 1950, the empirical analysis in this study has been confined to the period from 1950 to 1970. I do not wish to go further back in time because prior to 1950 the universities produced only a relatively small number of graduates in each field, and almost all of these graduates took jobs in the public sector. Besides, the universities' records before 1950 are quite incomplete, and consistent estimates of the GDP are not available before that year.

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[7] Ibid., pp. 284-85.

Once the above period has been specified, it is now appropriate, in the light of our empirical demand-supply model, to trace the significant developments in the Thai economy which may have affected graduate earnings during this period. We begin our discussion in 1950 with the Korean War boom which came to an end in 1953. It is notable that the Korean War boom brought great prosperity only to primary products -- namely, rice, tin and rubber. Non-agricultural sectors which were engaged in services and trade, such as CMR, WRT, TAC, and SES, benefitted to a lesser degree by this boom. In fact, this boom actually brought a slower rate of growth to the manufacturing sector because it diverted resources to the production of traditional primary product exports. Consequently, graduates in the general field of social sciences were the only group that benefitted from this expansion.

When the Korean boom ended and export prices dropped, the government tried to assume an entrepreneurial role by launching over a hundred manufacturing enterprises in the period 1953-1958. The program as a whole was a failure, requiring net outlays of 600 million bahts from the government, with no return on the investment.[8] Even though the government was losing money, these enterprises did generate employment of the natural science graduates and their earnings increased gradually during the period. The rate of increase,

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[8] G. Artamanoff, "State-Owned Enterprises of Thailand," USOM-AID, Bangkok, 1965. (Mimeographed.)

however, was not as high as the rate after 1959, when investment from the private sector started to grow at a more rapid rate as a result of strong encouragement from the government. This was true for all of natural science graduates, except the graduates of pharmacy whose earnings began to increase in 1957.

Commencing in 1955-1956, foreign money began to pour into Thailand. Total foreign aid in 1956 was $32 million, more than 10 percent of the Thai government budget, plus an additional $17 million in loans. In the same year, Japan agreed to pay 1.5 billion yen for war reparations. Foreign investment also rose rapidly, especially after 1959. This was partly due to the improvement in administration and the liberalization of trade.[9] In 1959 exports began to rise marking the end of the long period of trade stagnation after the Korean War.

Rubber exports increased rapidly and the export of maize increased over 50 percent in a single year, caused mainly by the growth of livestock demand in Japan. There was also a spectacular increase of kenaf exports from under 30,000 tons in 1958 to over 300,000 tons in 1961 because of the crop failures in Pakistan.[10] In contrast to the Korean War boom, economic growth in this period was much broader because both the agricultural and industrial sectors

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[9]Thomas H. Silcock, Thailand: Social and Economic Studies in Development (Durham, North Carolina: Duke University Press, 1967), pp. 14-20.

[10]Ibid., p. 22.

grew together. The growth of these two sectors helped to generate income growth in all other sectors for several years afterwards. Before the peacetime boom died down in 1965, an expansion caused by the Vietnam War took up the slack. The peak of this boom occurred in 1967 and 1968 and began to recede only in 1969 when the policy of gradual withdrawal of the U. S. ground troops was announced.

Within the broad scope of the discussion above, we can see economic conditions in which the demand-supply forces would tend to produce changes in the earnings of graduates in our study. Our survey data for earnings of graduates in Appendix F conform very well to the above events. In 1952, the peak of the Korean War boom, the earnings in both money and real terms of social science graduates were quite high in comparison with earnings of natural science graduates. These earnings had dropped a little bit by 1953, and continued to decline relatively until 1958 and 1959. Real earnings of social science graduates started increasing steadily again after 1960.

For natural science graduates, a large majority of whom were employed in the public sector, the Korean War boom did not have any effect on their real earnings. However, during 1953 to 1958, as the result of massive investment in public enterprises, the real earnings of natural science graduates increased in both absolute and relative terms to those of social science graduates. After 1960, which was the year that growth in both agricultural and industrial

sectors began to move together, we observe that real earnings of both social science and natural science graduates rise together. Since the industrial sector set the pace for growth, the most rapid increases in real earnings were observed among the natural science graduates.

Without going into a more detailed analysis, we can now see roughly how these survey results and the expected income relationship between the natural science and social science graduates conform quite well to the economic conditions prevalent in the Thai economy over this period. Consequently, we can reasonably expect to find some wage-employment relationships in the market of new graduates when we seek to analyze this aspect of the job market.

CHAPTER V

SOME GENERAL CONCEPTS AND EMPIRICAL DIMENSIONS OF EDUCATIONAL AND LABOR MARKETS

The chapter will first examine some of the universal concepts of labor markets for university graduates to be followed by some empirical dimensions of the markets for these graduates in Thailand.

Educational and Labor Markets

It is necessary at the outset to distinguish clearly between two sets of demand and supply forces operating in the two separate markets -- namely, the markets for higher education and for the graduates of higher education.[1] The market for higher education, which we may call the educational market, is one in which high school graduates are the buyers, or the demanders, and a university, or a system of universities, is the seller or supplier. The services which are bought and sold in this market are educational services. The price variable in this market may be looked upon from two different points of view. From the supplier's point of view, the price is composed of tuition plus fees. From the demander's point of view,

[1] M. Blaug, "An Economic Interpretation of the Private Demand for Education," Economica, XXXIII (May, 1966), 172.

the price includes tuition plus fees and the earnings foregone by the student.

Each year, at the going "price" of tuition plus fees, a certain number of high school graduates (or graduates with equivalent qualifications) are admitted to the universities. Those who have been admitted are not inputs in the universities' educational process. After a certain period of time, output known either as university graduates or dropouts will begin to flow out of the educational system.

The output of most concern to us is the graduates, for they make up the supply function in the labor market for graduates of higher education. The buyers or the demanders in these markets are all firms who want to use the services of this manpower in their production process. If the price mechanism is fully operational, demand and supply will determine the equilibrium wages in these markets.

Unlike the conventional market, the supply of educational opportunity available at a university is limited by financial and institutional constraints. At the same time the price (tuition plus fees) charged by the university is much lower than its actual costs. With such attractive university pricing the demand for seats in the university is usually much higher than the number of seats available. Consequently, the market solution must be reached by a system of rationing in which a limited number of intellectually qualified students will be selected to exercise their demand prerogatives in the market.

The above discussion typifies the demand and supply side of the market for higher education in Thailand. Therefore, there is no reason to construct a model for this "market" based on demand and supply in which the price mechanism plays an equilibrating role. The manpower planner can take advantage of this situation because, under such conditions, he will be equipped with the powerful instrument of the admission policy, thereby enabling him to gain certain control of future supply levels in the educated labor market. However, to use this instrument more effectively, the planner must gain additional information about these markets, especially the market for new graduates. We propose to proceed on this basis because this is the only market from which we can derive sufficient data to base our analysis. Besides, we need only to know the explicit market solution to work with the integrated model introduced above. Hopefully, the solution of the price mechanism in the total market will not be too different from the market of new graduates.

Data

In order to specify the demand and supply functions for the market of new graduates and to construct the earnings-profiles for our integrated model, we need two crucial sets of time-series data. The first set is the earnings of the new graduates classified by the major field of study. The second set is the earnings classified by the work-experience of graduates in the same specialty.

Unfortunately, these two sets of data are not published anywhere. To obtain those series, I had to conduct my own survey (for a detailed explanation of how the survey was conducted and how the data were tabulated, see Appendix D). The data on the first set of earnings are presented in Appendix F; the data on the second set of earnings are in Appendix I. Employment data for the public sector are quite complete, but are widely scattered among the records of each governmental personnel office. The only way to obtain this data is to work from the records of each individual office, which I have done with generally satisfactory results. The series on the number of admissions and the number of graduates is taken from the registrar's record of each university. These two sets of statistics are also very reliable. The employment data of the private sector are computed from the survey data adjusted by appropriate indices (for details, see Appendix E). The remaining data, such as the sectoral GDP data and price indices, are obtained from government publications.

Markets for University Graduates

The Labor Force Survey conducted by the National Statistical Office in July-September 1969, provides a rough picture of the market structure of university graduates in Thailand. This structure is presented in Table 3 on the following page.

TABLE 3

EMPLOYMENT OF UNIVERSITY GRADUATES IN THAILAND IN 1969

Working Classification	Grand Total	Bangkok and Thonburi Municipal Areas			All Other Municipal Areas			Non-Municipal Areas		
		Total	Male	Female	Total	Male	Female	Total	Male	Female
Total Employment	49,600	38,500	24,300	13,700	8,500	6,800	1,700	2,600	2,600	--
Employer	1,300	1,200	1,100	100	100	100	--	--	--	--
Government's Employee	33,100	25,400	15,700	9,700	6,400	5,000	1,400	1,300	1,300	--
Private Employee	11,900	9,700	6,200	3,500	900	700	200	1,300	1,300	--
Own Account Worker	2,400	1,700	1,600	100	700	700	--	--	--	--
Unpaid Family Worker	900	500	200	300	400	300	100	--	--	--
Unknown	--	--	--	--	--	--	--	--	--	--

Source: National Statistical Office, 1971.[a]

[a]I am most grateful to the National Statistical Office for making this table available on special request.

Figures in the table are based on the survey data; therefore all the numbers have been rounded up to the nearest hundred. As shown in the table, about 78% of all graduates are working in Bangkok-Thonburi Municipal Areas. About 66% of them work in the public sector; only 34% work in the private sector.

Given the above information, I also tried to determine the structure of markets for each major field for this study (see Appendix E). The results are not very different from those of the National Statistical Office (NSO). The results of my study indicate, however, that different groups of graduates, classified by major field of study, have different employment patterns within the sector of concentration. It should also be added here that the pattern of distribution across the fields is about what one would expect. These results are shown in Table 4.

Within the general fields of social sciences, commerce and accountancy (CAA) has the highest proportion of employment in the private sector (61%), followed by economics (ECO) (40%), law (LAW) (25%), the sub-field of social science (SSS) (23%) and arts and humanities (AAH) (22%). The apparent reason for this distribution is that the private industry groups which employ the majority of social science graduates are commercial service-oriented sectors, such as wholesale and retail trade (WRT), transportation and communication (TAC) and especially banking, insurance and real estate (BIR). The

FIGURE 4

CUMULATIVE EMPLOYMENT FIGURES OF FIRST-YEAR UNIVERSITY GRADUATES IN PRIVATE AND PUBLIC SECTORS IN BANGKOK-THONBURI GREATER AREA, CLASSIFIED BY MAJOR ACADEMIC FIELDS 1940-1970

Field	Total	Public Sector	Private Sector	Percentage in Private Sector
Social Sciences	28,686	18,065	10,621	37
01. Commerce and Accountancy	9,082	3,573	5,509	61
02. Economics	2,924	1,761	1,163	40
08. Law	8,887	6,798	1,163	25
09. Sub-field of Social Science	3,320	2,546	774	23
11. Arts & Humanities	4,473	3,487	968	22
Natural Sciences	14,861	10,630	4,231	28
04. Engineering	4,074	1,579	2,495	61
03. Pharmacy	1,460	980	480	33
10. Architecture	1,122	814	308	27
07. Science	2,868	2,461	407	14
06. Agriculture	2,001	1,731	270	13
05. Medicine	3,336	3,065	271	8

demand for graduates in CAA and ECO from these sectors would normally be relatively higher than the social science graduates in all other fields.

Within the field of natural sciences, engineering (ENN) is most heavily concentrated in the private sector (61%), followed by pharmacy (PHA) and architecture (ARC) (33 and 27%, respectively). The leading private industry groups which employ the natural science graduates are manufacturing (MAN), electricity and water supply (EWS) and construction (CON). Since these three groups demand the most engineering graduates, the above results should come as no surprise.

After this broad survey of the distribution of graduates by field between public and private sectors, we should look more closely at the distribution within the private sector alone. For convenience, we will classify the private sector by the same industry groupings used to compile the GDP data. These groups are agriculture, mining and quarrying (MAQ), MAN, CON, EWS, TAC, WRT. BIR and services (SES) sectors. By classifying our private sector in this way, we can use the GDP data in our study. There are also international organizations (INO) which, unfortunately, cannot be classified under any of the above categories, and which constitute part of the demand side of the job market for graduates. We will list graduates working for these organizations under a separate name. Agriculture is not included in our study, for it does not employ any university graduates

(at least in the private sector in the Bangkok-Thonburi Greater Area). MAQ is included, but it has only negligible impact on the result of our study.

From our sample of 5,214 university graduates working in the private sector in Bangkok-Thonburi Greater Area, out of the population of less than 16,248 graduates,[2] we found the following pattern of distribution summarized in Table 5.

The figures above show that BIR absorbs more graduates than any other sector. This is partially due to its rapid expansion. The real GDP of this sector rose from 415.2 millions bahts in 1950 to 4,758.5 million bahts in 1970 (about a 22 fold increase in 21 years). The sector which employs large percentages of graduates next to BIR is MAN. This sector is also growing rapidly, but since the period of rapid growth did not begin until 1959, the growth of employment in this sector has not been as impressive as in the previous one. Next come the EWS and TAC sectors. EWS is the most rapidly growing of all. With only 39.7 million bahts in 1950 (in 1962 prices), it grew to 1,680.6 million bahts in 1970 -- an increase of about 4,200 percent. The expansion here is due to public works programs designed to increase the supply of electric power, so that more power will be available at low cost. Since this sector is relatively capital intensive, employment has not increased proportionately to

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[2] This is the number of the upper limit, the true figures should be less than this (See Appendix D).

TABLE 5

THE DISTRIBUTION OF THE SAMPLE OF UNIVERSITY GRADUATES, BY PRIVATE INDUSTRIAL SECTOR OF EMPLOYMENT IN 1971

	Total	MAQ	MAN	CON	EWS	TAC	WRT	BIR	SES	NO
	5,214	12	973	168	844	885	592	1,240	403	97
(%)	100.00	0.23	18.66	3.22	16.19	16.97	11.34	23.78	7.73	1.86

its share of GDP. The growth of the TAC sector somewhat resembles that of the MAN sector. The relatively slow growing sectors of WRT, CON and SVS employ relatively smaller numbers of graduates (as expected).

Given the above set of conditions, one would also like to know the distribution of graduates by fields within each industry. This information is shown in Table 6 with each column showing the percentage distribution of total employment of graduates in various fields within each indicated sector. In MAQ the distribution is not very reliable since the number of observations is quite small. Nevertheless, the pattern of distribution is not far from what could be expected since engineers account for the largest share of employment. In BIR, the pattern is also as one would expect: the largest components are graduates from one of the general fields of the social sciences. In CON, the largest groups are from ENN, CAA and ARC respectively. It is fair to say that in general there are no surprising results in this table.

The Manpower Division of the NEDB made on earlier study of the related data, but that study only covered the MAN sector and the classification of labor input is by profession, not educational background.[3] There is no direct relationship indicated in that study

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[3]Thailand, Manpower Planning Division, The National Economic Development Board, Employment Situation in Manufacturing Industries, in Technical Papers on Manpower Studies, by Surajit Wanglee (Bangkok, Thailand: Government House Printing Office, 1968), pp. 1-19.

TABLE 6

THE PERCENTAGE DISTRIBUTION OF GRADUATES WITHIN EACH INDUSTRIAL SECTOR IN 1971

Field	MAQ	MAN	CON	EWS	TAC	WRT	BIR	SES	INO
Social Sciences									
01. Commerce & Accountancy	--	26.72	23.21	36.96	21.58	39.69	57.66	23.82	27.83
02. Economics	16.66	6.57	4.76	7.22	5.08	8.10	16.37	3.72	3.09
08. Law	33.32	8.32	10.11	9.24	20.33	12.83	11.20	25.55	9.27
13. Sub-field of Social Science	8.33	3.49	1.19	4.97	7.45	3.88	6.04	4.21	4.12
11. Arts and Humanities	--	5.19	0.59	2.36	8.58	5.23	4.83	6.45	9.11
Natural Sciences									
04. Engineering	41.66	16.03	52.38	34.12	16.83	10.81	1.04	4.71	16.49
03. Pharmacy	--	8.73	--	0.59	0.79	8.27	0.24	7.69	--
10. Architecture	--	1.13	6.54	0.94	3.95	1.68	0.48	1.73	--
07. Science	--	14.38	1.19	2.03	9.49	3.88	1.93	--	2.06
06. Agriculture	--	6.37	--	--	--	5.40	0.16	1.98	--
05. Medicine	--	3.18	--	1.42	5.87	0.16	--	20.09	--
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

between a person's chosen profession and his educational background; thus, there is a gap between manpower planning and educational planning that must be bridged.

The last table in this Chapter (Table 7) tells us how the graduates in particular disciplines are distributed across industrial sectors. Although the graduates in most disciplines are widely dispersed over many sectors, there is a faint pattern of concentration of graduates from certain fields in certain sectors. Examples include economics, whose graduates tend to concentrate in BIR, pharmacy graduates in MAN, etc. In most cases over one-third of the graduates of a discipline will be employed only in one sector; the rest are dispersed over other five sectors (these six sectors are: MAN, CON, EWS, TAC, WRT and BIR). The information from this table will help us determine the appropriate income (demand) variable used in the demand function in this study.

TABLE 7

THE PERCENTAGE DISTRIBUTION OF GRADUATES OF EACH FIELD IN VARIOUS SECTORS IN 1971

Field										
Social Sciences										
01. Commerce and Accoutancy	--	13.86	2.08	16.64	10.18	12.53	38.13	5.12	1.44	100.00
07. Economics	0.45	14.51	1.81	13.83	10.20	10.88	46.03	3.40	0.68	100.00
08. Law	0.58	11.79	2.47	11.35	26.20	11.06	20.23	14.99	1.31	100.00
09. Sub-Field of Social Science	0.37	12.87	0.75	15.90	25.00	8.71	28.40	2.19	1.51	100.00
11. Arts and Humanities	--	16.38	0.33	6.68	25.41	10.36	20.06	8.96	11.04	100.00
Natural Sciences										
04. Engineering	0.61	19.30	10.89	35.64	18.44	7.92	1.60	2.35	1.98	100.00
03. Pharmacy	--	47.22	--	2.77	3.88	27.22	1.66	17.22	--	100.00
10. Architecture	--	12.22	12.22	8.88	38.88	11.11	6.66	7.77	--	100.00
07. Science	--	47.78	0.68	6.14	28.66	7.84	8.19	--	0.68	100.00
06. Agriculture	--	59.61	--	--	--	30.76	1.92	7.69	--	100.00
05. Medicine	--	17.51	--	6.77	29.37	0.56	--	45.76	--	100.00

CHAPTER VI

A TEST OF THE MARKET MECHANISM

Having discussed institutions of higher education, the educational market and the markets for university graduates in Thailand, it is now appropriate to apply the integrated model developed in Chapter III to our empirical study. With the non-price rationing system now being operated in the educational market in Thailand, the number of new graduates will be determined largely by the number of admissions and the technical coefficient of the university education process. A fixed coefficient type of admissions-graduates (ad-ng) relationship, like the one in the manpower requirement model, can be readily applied to this case. However, in analyzing the market for new graduates, the actual situation is a little more complicated. Although we have good reasons to separate the demand-supply relationship in the market for new graduates in the private sector from the one in the public sector, an interaction is still likely between the two markets which may generate distortions in our empirical study.

These distortions arise from an interaction effect between the demand for and supply of new graduates to the private sector and

the perceived level of total compensation in the public sector, such that the typical equilibrium solution in that market of the private sector may not be observed. This interaction effect is caused by the peculiar nature of the demand for new graduates by the public sector. This sector's demand schedule for new graduates has a horizontal band shape representing a specified quantity demanded within a certain range of wages, instead of the more usual labor demand schedule. The lower edge of the band[1] stands for the stated monetary wage (known to all), but the upper edge which is not exactly known to the would-be government employees, represents the sum of the monetary wage plus all other benefits (pecuniary and non-pecuinary) from government employment expressed in monetary terms. The interaction effect is caused by the uncertain reaction to this wage range from both the new graduates and the employers in the private sector according to their perception of where the upper edge of the band would be. Consequently, when the real wage (including fringe benefits) prevailing in the private sector falls inside this range of real wages offered by the public sector, some graduates will believe that total compensation is higher in the public sector, while others will have the opposite view. Therefore, the exact number of graduates who would be willing to accept employment in the private sector at

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[1]The horizontal lower edge of the band indicates that the quality demanded is at a fixed monetary wage, and this quantity is usually limited by the number of positions available in various government offices.

any given wage rate there cannot be precisely specified. At the same time, the wage that large firms in the private sector decide to offer to new graduates will probably depend on the number of graduates expected to seek these jobs. (This, of course, assumes some degree of monopsony power by these firms -- an assumption which is realistic in the case of some of the more important industries in the Greater Bangkok-Thonburi Area.)

The upshot of this analysis is simply that when we attempt to estimate empirically the "demand" schedule for labor by the private sector, we have no a priori reason to expect a significant negative relationship between wages and employment within the "band" of wages offered by the public sector.

There are two important cases in which this wage-employment indeterminary may appear in this study. The first is the case of a profession where the majority of graduates in question are employed in the public sector. This phenomenon may indicate the relatively high non-monetary incentives provided by the public sector and/or that the private sector has no strong desire to bid away graduates from the public sector. Therefore, it is probable that the wages offered in the private sector will fall within this unspecified wage range. If it is also true that when the absolute number of graduates left to be employed by the private sector is small, there is a greater probability that no precise or fixed demand schedule will be observed. For these reasons, the graduates in the fields of agriculture and

medicine, whose absolute numbers and percentages of employment in the private sector are very small, are removed from this study.

The second case occurs when the critical wage-range in the public sector is unusually wide. When this occurs, there will be more chance for the observed wages to fall into this range of indeterminancy. The above phenomenon is likely to be present for the three groups of graduates (ECO, ENN, MED) where we observe incentives provided by the public sector to be much higher than for all other groups. This significantly different incentive level was created by national policy in the last decade which determined that the graduates in the fields of economics, engineering, and medicine contribute more to the national development efforts than all other fields. Relatively more scholarships for furthering graduate education abroad in these fields are being offered to graduates who agree to work in various government agencies after completing their advanced degrees. To implement this policy, more incentives have been offered to those who go on to obtain Masters Degrees from accredited universities abroad. For example, their initial salary upon receipt of an M.A. degree would be one level higher than that of their counterparts who earn their degrees in other fields. Because of this wider range of incentives offered to new graduates in these three fields, we would expect to observe an indefinite pattern of wage-employment relationships in the demand for these three groups of graduates in the private sector. Since the graduates in the field of medicine have

already been dropped from the study; this influence is expected to be observed in engineering and economic graduates.

Test Procedure

According to the methodology of our integrated model, it is necessary to test the demand-supply relationship in the market of new graduates at the outset. Apart from providing the theoretical underpinning needed for valid cost-benefit analysis, a significant wage-employment relationship in the demand function will also provide firm ground on which to work with the whole model afterward. The markets which are indicated by this test to have poor wage-employment relationships will be withdrawn from the study on the same principle as we have already removed the graduates in medicine and agriculture.

We shall begin by observing this wage-employment relationship in each individual market. Later we will pool the observations from the groups which have some common characters into one main group.[2] The pooled model that yields the highest explanatory value will then be selected for further analysis.

Test of an Individual Market

As our main concern is to test the responsiveness of the negative wage-employment relationship in the demand function, we

[2]For detailed methodology, see J. Johnston, Econometric Methods (New York: McGraw-Hill Book Company, Inc., 1963), pp. 221-28.

propose to work with the structural demand supply model. However, only the demand function will be estimated because the number of graduates to be supplied will be almost totally determined by the admissions policies of university.

Structural Demand-Supply Model

$$D = f(RW, RWO, RY) \quad (6-1)$$

$$S = g(RW, NG) \quad (6-2)$$

$$D = S \quad (6-3)$$

In this model we will use time series data for the period 1958-1970. These data are made up of observations for each market of new graduates with each market being classified by the type of training. After dropping graduates in the fields of agriculture and medicine, we are left with nine groups of graduates: five for social sciences (SS), -- namely, commerce and accountancy (CAA), economics (ECO), law (LAW), subfield of social science (SSS), and arts and humanities (AAH); and four groups in the natural sciences (NS): engineering (ENN), pharmacy (PHA), architecture (ARC), and science (SCI). Altogether, there will be nine equations for each model. The variables in these models are:

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

RW = real wage (annual earnings) of new graduates

RWO = real wage (or average real wage) of graduates in other closely related fields where substitution is

possible, for example ECO and CAA substitute for each other. Also LAW and SSS are considered for the purposes of these tests as another pair of close substitutes. For AAH, RWO is the average RW's from the rest of the four fields in SS; for NS, RWO of the reference field is the average of RW's from the rest of the three fields.

RẎ = 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 is selected to be the income (demand) variable of that group. This variable is so defined because it provides better explanatory values than all other acceptable concepts of income variables (i.e., combination of the weighted rate of growth of the real gross domestic product). 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 and PHA; electricity and water supply (EWS) employs the highest proportion of ENN.

NG = the number of new graduates

The sign for the regression coefficient of RW in equation (6-1) is expected to be negative while the signs for RWO and RY are expected to be positive. The results of the linear form which has first been tried are not encouraging. This is particularly true for the social science (SS) graduates since only CAA has all signs correct. The rest of the fields have correct signs for only some of the variables. However, the results for the natural science (NS) group are a little better, for all signs for PHA, ARC, and SCI are correct with the exception of ENN.

The situation is generally improved for all groups of graduates, when we try the log linear form. The signs are correct for more groups of graduates and the $\underline{t}$ values of the groups which have the correct signs for RW's have generally been improved. The $\underline{t}$ values for the groups which do not have the correct signs for RW's are now smaller than before. The R^2's for most groups of graduates are higher than that in the previous form. Also, by using the log linear form, the regression coefficients now represent the elasticities of the variables in their original non-linear form. The summary of the results of the log linear form of equations (6-1) is shown in Table 8.

The results reveal that CAA, SSS, AAH, PHA, ARC, and SCI have the expected signs in most cases. However, only CAA, SSS, PHA, and SCI have $\underline{t}$ values for RW's within or a little higher than

TABLE 8

SUMMARY OF THE RESULTS OF THE LOG LINEAR FORM OF EQUATION (6-1)
$\ln D = \ln a_1 + a_2 . \ln RW + a_3 . \ln RWO + a_4 . \ln RY$

Field	$\ln a_1$	a_2	a_3	a_4	R^2	SE	DW	F
SS								
01. CAA	-.5146	-1.3185	1.5277	.6572	.8702	.2889	1.7744	41.2421
	(-.2039)	(-3.1431)	(5.3784)	(7.9075)				
02. ECO	-9.6353	.6563	-.2258	1.4815	.6030	.9910	2.0407	10.1138
	(-1.2175)	(.6292)	(-.1492)	(5.1593)				
08. LAW	-28.2705	.2066	3.9051	1.2940	.4670	.9289	1.2653	6.2575
	(-3.7734)	(.1736)	(2.2481)	(2.6096)				
09. SSS	3.8550	-1.2365	-.7391	1.3290	.8864	.4106	2.6184	47.8344
	(1.3587)	(-2.0033)	(-1.6184)	(11.4490)				
10. AAH	-20.3186	-.2736	.6445	2.5974	.8828	.4175	2.2324	46.2046
	(-5.2721)	(-.4605)	(.6182)	(11.6287)				
NS								
04. ENN	-1.1217	.2937	.0234	.5065	.7192	.3715	.8981	16.3694
	(-.0346)	(.4624)	(.0465)	(1.7826)				
03. PHA	-11.1366	-.9520	.9089	1.6017	.5452	.4174	2.6282	9.8223
	(-4.1835)	(-1.6725)	(.9523)	(2.8666)				

TABLE 8 (Continued)

Field	ln a_1	a_2	a_3	a_4	R^2	SE	DW	F
10.ARC	-16.4803 (-4.6677)	-.5877 (-.7177)	.5534 (.3147)	2.2303 (1.8237)	.6279	.7591	1.9406	11.1229
07.SOI	-15.6095 (-4.8744)	-1.3448 (-2.0234)	1.6670 (1.6914)	1.7183 (2.1549)	.7330	.5793	2.2928	17.4684

Note:

The value in parenthesis is the t value. The regression covers the period of 1952-1970, which provides 19 observations for all groups. R^2 = adjusted R^2, SE = standard error of estimation, DW = Durbin-Watson statistic and F = F- value. OLS is used for all above regressions.

the border of significance. They are not significant for AAH and ARC. ECO and ENN do not have correct signs for RW's. (We have already anticipated some of these problems previously.) Also, as expected, their t values are not significant either. For LAW, we also anticipated poor results. Its RW does not yield the correct sign (though the t value is also insignificant), and its R^2 is so small that the F value is on the border of significance. These poor results are attributable to factors of a different nature than those affecting ECO and ENN. One possible source is the grouping error during the period of 1950-1953.[3] Another possible source of error is the way in which the data on wages have been collected for this group. About 15 percent of the graduates in this field work for law firms and earn their income on a fee basis after each assigned case. Even greater numbers of lawyers working for other business firms earn their income on the same basis. Under these earnings conditions, the usual negative wage-employment relationship can hardly be established. These two sources of errors are probably responsible for the largest part of the generally poor results we have indicated earlier. Therefore, we decided to drop this group from our study.[4] (The corresponding matrices of simple correlation are in Appendix H-1.)

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[3]See the explanation after the classification in Appendix B and also see the data in Appendix C-3.

[4]There are also some other reasons for dropping this group. Later on in our pooled model, we do not find strong justification to

The Pooled Model

The t-values, especially for RW's, are not significant for many groups of graduates. Besides the possibility of an essentially weak wage-employment relationship, the insignificant t values are also caused by the possibility that some observations from each group may have fallen into the indeterminant range on the demand function, hypothesized earlier, there will be fewer observations left to explain the relevant range of the demand schedule in our study.

At the end of Chapter IV, we discussed a similarity in the pattern of wage variations for groups in the social sciences and natural sciences as a group. It is plausible therefore that the theoretical demand function is homothetic with respect to a change in wages. Since we are working with the long linear form we shall assume in particular that wage elasticities (of RW and RWO) to the change in the number of new graduates demanded is the same in each group. With this assumption we can increase our observations by pooling them. This assumption of equal elasticities is less likely to hold for RY, because industries experience different rate of change in their technical coefficients over time (i.e., in college

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keep this group with the rest in the main SS group, because of the very specialized nature of the type of training of graduates in this group. Also, in our empirical experiments, we tried to incorporate this group with others in SS; the results of the whole group were found to be insignificant. We then tried the other alternative by keeping this group and dropping ECO. The results were much poorer than the other way around. Therefore, we have both conceptually and empirically good reasons to remove this group.

manpower productivity). In order to acknowledge these differences we insert the slope-dummy variables of RY into our pooled model indicated below.

The Pooled Demand Equation

$$\ln D = \ln b_1 + b_2 \cdot \ln RW + b_3 \cdot \ln RWO + b_4 \cdot \ln RY + b_5 \cdot \ln RY_1 + b_6 \cdot \ln RY_2 + b_7 \cdot \ln RY_3 + b_8 \cdot X_1 + b_9 \cdot X_2 + b_{10} \cdot X_3 \quad . \quad . \quad . \quad (6\text{-}4)$$

For SS, we pool CAA, ECO, SSS, and AAH together; for NS we have ENN, PHA, ARC, and SCI. Each group now contains 76 observations. RWO for SS the group has now been defined in a slightly different way from its previous definition so that the new definition will be in line with the one given for the NS group. It is now defined as the average real wage of other three groups within the same general field. In this pooled model CAA and ENN are assigned to be the reference group of SS and NS, respectively. RY_1, RY_2, and RY_3 are the respective slope dummies of RY; and X_1, X_2, and X_3 are the respective intercept dummies of each main group.

The results of the two regressions are as indicated below:

SS

$$\ln D = \underset{}{0.9859} - \underset{(-0.8043)}{0.2931} \ln RW + \underset{(0.2340)}{0.0912} \ln RWO + \underset{(4.1906)}{0.7545} \ln RY$$

$$+ \underset{(3.0691)}{0.7862} \ln RY_1 + \underset{(2.2173)}{0.5636} \ln RY_2 + \underset{(4.8152)}{1.8389} \ln RY_3$$

$$\underset{(-4.2065)}{-7.7157} X_1 - \underset{(-3.3681)}{6.1342} X_2 - \underset{(-5.9223)}{18.3027} X_3 \qquad (6\text{-}5)$$

$R^2 = 0.8252$

$S = 0.6351$

$F = 40.3474$

*N = 76

SS

$$\ln D = 1.6981 - 0.6831 \ln RW + 0.5178 \ln RWO + 0.6781 \ln RY$$
$$(.8145)\ (-2.1060)\qquad (1.1156)\qquad (3.5080)$$

$$+ 0.9192 \ln RY_1 + 1.6278 \ln RY_2 + 1.5284 \ln RY_3$$
$$(2.2064)\qquad (4.3863)\qquad (3.9144)$$

$$- 12.2101 X_1 - 18.0964 X_2 - 18.8527 X_3 \qquad (6\text{-}6)$$
$$(-3.0833)\qquad (-5.6667)\qquad (-5.0733)$$

$R^2 = 0.8336$

$S = 0.5462$

$F = 42.7608$

*N = 76

*N = number of observations

The general results from this pooled model are better than the results obtained from the regression on each individual group. All signs are now correct for both SS and NS. However, the t value of the RW for the SS group is quite low, while the t value of its NS counterpart is significant. The difference between these results may partly be explained by the possibility that more observations of ECO have fallen into the questionable range than that of ENN. Since the pay to the engineering graduates has been much higher than that to

economics graduates during the past decade,[5] it is conceivable that many observations on earnings of ENN have fallen above that region.[6] The sign for RWO, though correct, has a t value which is insignificant for both groups, consequently, we will drop this variable from our pooled model.

The pooled model without RWO is expected to be the final form which we will use in the later part of our analysis. Also, because of the fact that we do not have enough observations to construct the profile for ECO in the cost-benefit model, we will drop this group so that we will have better results for the rest of the three groups. The results are shown in equations (6-8) and (6-9) below:

SS

$$\ln D = \underset{(1.7445)}{3.1662} - \underset{(-2.1168)}{0.6221} \ln RW + \underset{(5.7875)}{0.7552} \ln RY + \underset{(3.0770)}{0.5683} \ln RY_1 + \underset{(6.5510)}{1.8299} \ln RY_2 - \underset{(-4.6714)}{6.1983} X_1 - \underset{(-8.0776)}{18.2565} X_2 \quad \ldots \quad (6\text{-}7)$$

$R^2 = 0.9002$

$S = 0.4645$

$F = 85.2324$

$N = 57$

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[5] See Appendices F-1 and F-2.

[6] Although the t value for the RWO of the NS group is much higher than that of the SS group.

NS

$$\ln D = 3.4125 - 0.6073 \ln RW + 0.7962 \ln RW + 1.0512 \ln RY_1$$
$$(2.4155) \quad (-1.9115) \qquad (4.9158) \qquad (2.6265)$$

$$+ 1.8037 \ln RY_2 + 1.7441 \ln RY_3 - 3.8370 X_1$$
$$(5.6595) \qquad (5.1317) \qquad (-3.7514)$$

$$- 20.0333 X_2 - 21.1505 X_3 \quad (6\text{-}8)$$
$$(-7.4606) \qquad (-6.8255)$$

R = 0.8330

S = 0.5477

F = 47.7751

N = 76

After dropping ECO, the t value for RW is now significant for the SS group. The signs of all variables are correct and the t values are now all significant. The wage-elasticities of the two groups are quite close together (-0.62 for SS and -0.61 for NS). Supported by this empirical evidence, we might be able to claim that the wage-elasticity of new graduates in Thailand in the fields under our study is around -0.6. This finding is contradictory to the assumption of perfect elasticity of demand in Bowles' study.[7] If this finding is correct, the application of his linear programming model to educational planning in Thailand does not seem to be appropriate.

With the test showing a significant wage-employment relationship for CAA, SSS, AAH, ENN, PHA, ARC, and SCI, we will

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[7] Bowles, Planning Educational System for Economic Growth, pp. 41-42.

now proceed to work with the cost-benefit analysis for these groups of graduates in the next chapter. After the empirical study of the cost-benefit model, we will proceed to demonstrate how a tentative policy on the number of admissions can be reached within the framework of the integrated model.

CHAPTER VII

THE EMPIRICAL FINDINGS OF THE COST-BENEFIT ANALYSIS

In this chapter we will be dealing with one particular rate of return known as the social rate of return. This rate is very useful for educational planning because it takes into consideration both social benefits and costs. The true values representing these two theoretical concepts are very difficult to capture empirically. However what we propose to do in this chapter is to compute this rate as accurately as possible within the limitations of our data.

Social Benefits

In the world of perfect competition (containing no imperfect elements such as monopoly and externalities), the marginal productivity of an individual will be equal to his marginal social productivity, and his marginal social product will be equal to his real wages (real earnings before tax). Under this assumption, real earnings before tax will represent social benefits.

In other circumstances, where the price mechanism also operates in the labor market but certain externalities exist, it is conceivable that a person's real wage will equal his marginal private

product but will be less than his marginal social product. In this case real earnings before tax will constitute only a part of social benefits.

In his calculation of the social rates of return from college education in the United States from 1929 to 1957, Becker has included externalities created by the contribution of "advancement in knowledge" (which is calculated from the residual part of the Denison's production function).[1] He found that the rate computed this way was almost double of the rate he had previously computed when only earnings before tax were taken into account. He called the rate computed from earnings before tax, the "lower limit" of the social rate of return, and the rate which included the contribution of "advancement in knowledge," the "upper limit" of the social rate of return. However, Becker did warn us that the high rate of the upper limit social rate of return was due to the assumption that all of the residual was attributable to education. If the residual were all attributable to business capital the social rate of return to education would be approximated by the lower limit rate (the rate computed from earnings before tax).[2]

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[1]Edward F. Denison, The Sources of Economic Growth in the United States: and the Alternative Before Us (New York: Committee for Economic Development, 1962), pp. 67-69; Why Growth Rates Differ (Washington, D.C.: The Brookings Institution 1967), pp. 78-108.

[2]Becker, Human Capital, pp. 119-121.

So far we have discussed externalities in terms of their [illegible] definition. In addition to what we have already spelled out -- the contribution of advancement in knowledge, externalities should also include what Welch called "entrepreneurial capacity,"[3] and the contribution of education on social and cultural evolution.

With the present state of our knowledge, we can only scratch the surface of the first two concepts of the residual concept externalities and entrepreneurial capacity, while the last one (social and cultural evolution) has been left completely untouched. Given the data situation in Thailand the attempt to include these two concepts in the cost-benefit study is not now possible. Therefore the benefits to be used in this study will only include earnings before tax, which are relative measures of social benefits of graduates among different academic fields. However it seems to be appropriate to apply these measures in this study because it is quite sufficient to base the policy of allocation of higher-education resources among different academic fields on the order of magnitude of the absolute social rate of return to related groups of graduates. The only possibility that these measures could reflect an incorrect order of

[3]By this, he means the ability of educated workers to reallocate factors of production or introduce new factors (in order to increase output) into the production process. He has distinguished this term from the so-called "worker effect" by which he means the ability of educated workers to produce more output given the pattern of allocation and the resources at hand. This latter term represents the usual concept of the marginal product of education. See Finis Welch, "Education in Production," Journal of Political Economy, LXXVIII (Winter, 1970), 42.

this social rate of return is when the benefits from externalities vary greatly among different groups of graduates and their order of magnitude is in complete disarray. Certainly, no valid evidence suggests the generality of the above possibility; therefore, it is legitimate to claim the usefulness of these relative measures of social benefits for a practical purpose of our study.

Social Costs

Social costs include the schooling costs borne by both the university and the student at the time of his undergraduate study plus the whole stream of his earnings foregone while he was in school and after his graduation. In actual computation, there is always some bias attached to the computation of each component of these costs. Usually there will be an overestimation in costs of schooling and an underestimation of earnings foregone by the graduates. The reasons for these over-estimation and under-estimation are explained in the paragraphs below.

A university is a multi-product firm; its outputs are not only the graduates but also the dropouts. It does not limit itself to academic activities such as teaching, producing textbooks and doing research, but also includes in its functions non-academic activities such as its participation in athletic competition and other community activities. Among its academic activities, only a small part directly benefit the advancement of knowledge of its students exclusively.

There is even some part that does not have any direct benefit to its students at all -- such as some special contractual research work. Because of the multiplicity of university products, it is very difficult to try to differentiate the costs of educating students from all other costs. In actual computation, we have no alternative but to include all the costs incurred by the university as costs for schooling. Therefore, there is a considerable amount of the over-estimation of costs in the actual computation.

We also know that expenditures on education borne by a student consist of consumption and investment components, but in actual computation this distinction cannot be readily made.[4] Therefore, the out-of-pocket costs borne by the student are usually over-estimated. Since these costs (especially for a Thai student) are only a small fraction of the total costs, this source of bias does not seem to cause much distortion in the computation of the social rate of return.

Earnings foregone by university graduates are usually estimated from the actual earnings of high school graduates. This method of estimation will under-estimate the true earnings foregone of a university graduate, because of the average student entering the university

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[4]The distinction between these two components of expenditures also applies to expenditures by schools. In general, when we talk about expenditures on education of an individual we think of them in terms of investment in human capital and expenditures on consumer durables. In the cost-benefit-study we only consider the investment part. That is why, conceptually, we must exclude the consumption part from our study.

is really more competent than the average high school graduate. Had he not gone to college, he would probably have earned more income from work than the average high school graduate. Therefore, his true earnings foregone should be higher than this estimate.

Estimation of the Earning-Profiles

The rate of returns computing from earnings gross of tax should be correctly called the gross-of-tax rate of returns and the rate computing from earnings net of tax should be called the net-of-tax rate of returns rather than the "social" and "private" rates of return as have been fully defined in the literature of economies of education. However the two sets of concepts are quite close together and are used interchangeably as proxies. To avoid confusion from the different uses of terminology, we will follow the definition given by Becker by calling the rate of returns computing from earnings gross of tax, the lower limit of the social rate of return (i_{LS}). To compute our i_{LS}, we must know the future stream of earnings of the current group of graduates. In order to obtain such information, we will estimate them from our time series data of graduates' earnings.

In discussing the earnings-age profile in Chapter III, we pointed out that we would expect earnings of graduates to increase at a relatively rapid rate during the early years of work. At this time, graduates are in the most physically and mentally active period of their lives, therefore their marginal productivities tend to rise more

rapidly than when they become older. Consequently, we should observe earnings to increase less rapidly or even decrease as retirement age approaches. (The average age at which graduates begin work is 25 and the average retirement age is 60.)

Mathematically, there are two curvilinear relationships which are commonly used with earnings-profiles. These are the double log and semi-log second degree polynomial forms.

Double Log Form:

$$\ln RW_t = \ln RW_o + a.\ln t \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (7\text{-}1)$$

Semi-log Second Degree Polynomial Form:

$$\ln RW_t = RW_o + b.t + c.t^2 \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (7\text{-}2)$$

where:

RW_t = earnings before tax in real terms of graduates in the specified field at the time $\underline{t}$

$\underline{t}$ = time period (years of work experience) starting from 0 to $\underline{m}$

Having defined these two relationships, we will run regressions for both of them for each academic field. Then, for each field, select the regression yielding the best fit for incorporation in our model. Besides the goodness of fit criterion, the predicted value of the intercept ($\ln RW_o$, and RW_o) must also be close to its observed value. This criterion is necessary because the smaller the error of the value of intercept, the better the estimation of the shift of the earnings-profile. These two criteria were given equal weight at the

outset, but as it turns out, each regression has an R^2 value greater than .90 therefore, the latter criterion turns out to be the determining factor. (For details on how the profiles have been constructed and how the particular forms of the relationship have been selected, see Appendix I.)

Since we do not have a sufficient number of graduates in certain subfields of social science and in architecture, we discard them from our analysis and are left with only five earnings-profiles. These remaining five fields are the following: For the general field of social sciences (SS), we are left with the fields of commerce and accountancy (CAA), and arts and humanities (AAH); for the general field of natural science (NS), only engineering (ENN), pharmacy (PHA) and science (SCI) are now left. In addition to these results, we must also compute the earnings-profile of high school graduates (H) to serve as a proxy for earnings foregone by university graduates. The results are indicated in Table 9.

The earnings-profiles shown in this table are based on gross-earnings and are influenced by factors other than education. Such factors include natural abilities of graduates, their family backgrounds, the nature of the business in which the graduate works, etc. To find the net contribution of education to earnings we must eliminate all these other effects from the gross earnings. From the study of Blaug for Thailand, the average net contribution of a college education accounts for 67.5% of a college graduate's gross earnings,

TABLE 9

SUMMARY OF THE RESULTS OF THE REGRESSION OF THE TIME-SERIES EARNINGS-PROFILES

Field	R^2	SE	DW	F	N
Social Sciences					
$\ln RW_{t,CAA} = \ln RW_{o,CAA} + \underset{(19.7526)}{0.6237 \ln t}$	.9374	.1355	.1640	390.1582	27
$\ln RW_{t,AHH} + RW_{o,AAH} + \underset{(15.0327)}{0.1936 t} \underset{(-7.3644)}{-0.0035 t^2}$	.9745	.1347	.4218	496.9802	27
Natural Sciences					
$\ln RW_{t,ENN} = RW_{o,ENN} + \underset{(19.7271)}{0.1744 t} \underset{(-11.8029)}{-0.0034 t^2}$	.9753	.1133	.3318	592.7173	31
$\ln RW_{t,PHA} + RW_{o,PHA} + \underset{(12.9791)}{0.0877 t} \underset{(-4.3019)}{-0.0010 t^2}$	.9777	.0746	1.0733	593.8252	28
$\ln RW_{t,SCI} = RW_{o,SCI} + \underset{(14.7019)}{0.1855 t} \underset{(-8.0086)}{-0.0034 t^2}$	.9647	.1540	.2398	397.6528	30
High School Graduates					
$\ln RW_{t,H} = RW_{o,H} + \underset{(18.4106)}{0.1378 t} \underset{(-11.0587)}{-0.0021 t^2}$	.9636	.1397	.7907	516.8725	40

Note:

The predicted value of the intercept has not been reported here, because, in our prediction of earnings-profiles of the current and future group of graduates, we will replace this value by the relevant value of RW_o. The actual predicted value from this regression is reported in Appendix I.

TABLE 9 (Continued)

The value in parenthesis is the t value. R^2 = adjusted R^2, SE = standard error of estimation, DW = Durbin-Watson statistic, F = F-value, and N = number of observations. The last observations of all groups are in 1971.

while the net contribution of high school education accounts for 77.8% of a high school graduates' gross earnings.[5] These two statistics will be used to adjust our estimated gross earnings of both college and high school graduates in our computation of the lower limit of the social rates of return (i_{LS}) later on.

Estimation of Social Costs

Costs per student borne by the university have been calculated from several sources. The Office of the National Education Council (NEC) has published the annual report of the Educational Report on Institutions of Higher Education in Thailand since 1964. In this report university expenditures have been classified into two main items: general administrative costs and academic costs. General administrative costs are classified only by university while the academic costs are classified by the faculty in each university. Both general administrative and academic costs are classified into ten sub-items: salaries, permanent wages, temporary wages, remunerations, ordinary expenses, material and supplies, equipment, land and buildings,

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[5] Blaug, The Rate of Return to Investment in Education in Thailand, footnote on pp. 5-28.

subsidies, and other expenses. We will not include the sub-items of equipment, land and buildings in our computation of current costs because they are not current expenditures of the university. The inclusion of these two sub-items of costs would cause our estimate of costs to fluctuate inconsistently from year to year depending on the size of such capital investments in each year. Therefore, we will replace these two sub-items by the estimate of annual depreciation and annual interest foregone per student by the university. These two estimates have been made by Blaug for the university costs in 1968/1969.[6]

Although we have included graduates from seven universities[7] in our study, when we compute costs per student we exclude Chiangmai and Khonkaen. Since these two are newly founded universities and they have not admitted students up to their full capacities, they have experienced unusually high costs per student at their early years of operation and rapid decreasing costs per student afterward. Inclusion of average costs per student from these two universities would cause distortion in the long run cost structure of university graduates. For this reason, we computed the average costs per student only from the costs of the remaining five universities.

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[6]Ibid., Table 18, pp. 4-13.

[7]Kasetsart, Khonkaen, Chaingmai, Chulalongkorn, Thammasat, Mahidol and Silpakorn.

We assume that administrative costs per student are the same for all fields within each university (but vary from university to university). Since we do not have the breakdown of these costs by field, we have adjusted these costs by the proportion of students within each field from each university to obtain the administrative cost per student classified by field of study. We are also forced to employ the same techniques to figure the costs of annual depreciation and annual interest foregone. However, we do not expect much distortion of these costs from the actual depreciation cost and interest foregone per student in each field in our study since each university tends to specialize in producing graduates in a limited number of fields.[8] After adjusting these costs figures by the 1962 price index, we obtain the figures in Table 10 on the following two pages.

It should also be noted here that we did not include taxes on university properties in this category of costs because universities are not normally required to pay property taxes as other business organizations. Had a university paid these taxes the average costs per student borne by the university would have been higher, consequently the exclusion of this cost item causes an under estimation of the actual social costs of higher education.[9] This source of underestimation together with the underestimation of foregone earnings will offset to some extent the overestimation of the costs for

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[8]See Chapter IV.

[9]Becker, Human Capital, p. 175.

TABLE 10

AVERAGE COSTS PER STUDENT BORNE BY THE UNIVERSITY 1964-1969[a]

	Total Cost	Current Costs			Capital Costs	
		Total Cost	Academic Cost	Administrative Cost	Total Cost	Depreciation	Interest Foregone
Social Sciences							
01. CAA							
1964	912	549	366	183	363	25	338
1965	1,132	741	528	213	391	27	364
1966	1,334	938	680	258	396	28	368
1967	1,575	1,130	883	247	445	30	415
1968	1,809	1,326	1,073	253	483	33	450
1969	2,067	1,549	1,290	259	518	35	483
11. AAH							
1964	4,672	4,111	3,812	299	561	44	517
1965	6,058	5,282	4,954	328	776	53	723
1966	6,267	5,512	5,249	264	754	51	703
1967	5,579	4,848	4,590	258	731	50	681
1968	5,697	4,964	4,691	273	733	50	683
1969	5,692	4,965	4,667	298	727	50	677
Natural Sciences							
04. ENN							
1964	5,724	4,794	4,261	533	930	64	866

TABLE 10 (Continued)

	Total Cost	Current Costs			Capital Costs		
		Total Cost	Academic Cost	Administrative Cost	Total Cost	Depreciation	Interest Foregone
1965	5,482	4,543	4,158	385	939	63	876
1966	5,620	4,691	4,388	303	929	63	866
1967	5,470	4,496	4,194	302	974	66	908
1968	5,585	4,605	4,275	330	980	66	914
1969	5,594	4,654	4,309	345	940	63	877
03. PHA							
1964	8,893	7,587	6,253	1,334	1,306	88	1,218
1965	9,382	8,076	6,977	1,099	1,306	88	1,218
1966	9,525	8,219	7,045	1,174	1,306	88	1,218
1967	9,670	8,364	6,986	1,378	1,306	88	1,218
1968	10,687	9,381	8,107	1,274	1,306	88	1,218
1969	9,739	8,433	7,279	1,154	1,306	88	1,218
07. SCI							
1964	8,668	7,854	7,503	351	814	55	759
1965	8,723	7,909	7,607	302	814	55	759
1966	7,592	6,778	6,508	270	814	55	759
1967	7,404	6,590	6,396	194	814	55	759
1968	8,310	7,496	7,305	191	814	55	759
1969	8,419	7,605	7,383	222	814	55	759

[a]In 1962 prices in bahts.

TABLE 10 (Continued)

Sources: Current costs have been computed from Thailand NEC, Educational Report, Institutions of Higher Education, Thailand: 1964-1969, NEC, Office of the Prime Minister (Bangkok, Thailand: Government House Printing Office, 1965-1970).

Capital costs have been computed from Blaug, The Rate of Return to Investment in Education in Thailand, Table 18, pp. 4-13.

schooling resulting from the inclusion of university expenditures for purposes other than educating students. However, we do not know whether each will cancel the other out. Nevertheless, it is quite certain that the remaining (net) error will not be as large as either gross bias by itself.

Students must pay their own costs associated with going to the university (tuition, books, etc.). These costs should not include the usual consumption expenditures in their daily lives, for they have to make these outlays whether they go to the university or not. Out-of-pocket costs in 1970, which have been used in the study of Blaug, are calculated to be 1,400 bahts.[10] Ideally, we also would like to know how the out-of-pocket costs vary across the fields, but no such information is presently available. Therefore, the same costs have to be used for all fields. After adjusting this figure by the 1962 price index, we reach the figure of 1,189 bahts. This figure is the out-of-pocket costs in 1970 expressed in 1962 prices. What we actually need to know is the series of these costs from 1964-

[10]Blaug, The Rate of Return to Investment in Education in Thailand, pp. 4-10.

1969 -- the same as the series of costs borne by the university. We do not know how much these out-of-pocket costs have increased each year. However, from our computation of the costs borne by the university, we found that the average rate of increasing cost was 5%. Therefore, we also assign 5% to be the increasing rate of the out-of-pocket costs as well. Having adjusted by this rate of increasing cost, we reach the series of out-of-pocket costs shown in Table 11.

TABLE 11

AVERAGE OUT-OF-POCKET COSTS 1964-1969[a]

Year	1964	1965	1966	1967	1968	1969	1970
Costs	889	932	979	1,027	1,079	1,133	1,189

[a]In 1962 prices, in bahts.

Source: The 1970 figures are taken from Blaug, The Rate of Return to Investment in Education in Thailand, pp. 4-10.

There are two other related statistics in the computation of costs for schooling of graduates. They are the average period of studying and the average dropout rate. Since the average student usually spends a longer period working for his degree than the minimum period required by the university, we have to adjust both out-of-pocket costs and the costs borne by the university by this additional length of time.

An important question remains with regard to dropouts: whether we should regard dropouts as the "waste" in the educational process or we should treat them as other outputs of the university. Actually dropouts are outputs of the university, but they are different from graduates, and they are output which the university does not intend to produce. We do not know how much the university is willing to pay to educate dropouts and we do not know how to allocate the university costs for them. One possible approach is to attribute zero costs for them and charge the additional costs for educating the dropouts as part of the costs for producing graduates. In this case the costs for schooling have to be adjusted by the rate of dropout.[11] However, if we regard dropouts as other outputs of the university in their own right, no adjustment of costs of graduates would be necessary. Because of the lack of any conclusive answer for this controversial issue, we will calculate the costs for producing a graduate with and without adjusting for the rate of dropout. Then, we will calculate the internal rates of return based on both cost concepts separately.

The average period for study of a graduate, classified by the faculty in each university, is available in the Report of the Research

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[11] $c' = c/(1-d)$

where:

c' = the costs of schooling after the adjustment of the rate of dropout.

c = the initial schooling costs.

d = rate of dropout.

Committee on Expenditures of Institutions of Higher Education by the NEC.[12] The average rate of dropout of college students computed by Blaug is 23%.[13] We assume in addition that the rate of dropout for Kasetsart and Mahidol is 13%. The rate at Thammasat is 33%. This should be a rough approximation to the real situation, for Thammasat has always had a tradition of having the highest dropout rate while Kasetsart and Mahidol have the contrary experience.

After adjusting for the number of students in each field in each university, we reach the following figures of the average period of study and the average rate of dropout classified by the field of study.

The last cost item to be included in social costs is the earnings foregone of a graduate. As we have already mentioned earlier, we have to use the average earnings before tax of a high school graduate as a proxy for the graduate's earnings foregone. In actual computation, we deduct this high school graduate's earnings-profile from the earnings-profile of a university graduate in each field before we apply equation (2-1) to compute the i_{LS}. Observe also that the net earnings figures of university graduates (earnings-

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[12] Thailand, The National Education Council, Office of the Prime Minister, Expenditures of Institutions of Higher Education, Report of a Research Committee, The National Education Council, 1970, Bangkok, Thailand, pp. 59-62.

[13] Blaug, The Rate of Return to Investment in Education in Thailand, Footnote to Table 18, pp. 4-13.

TABLE 12

AVERAGE PERIOD OF STUDYING AND AVERAGE DROPOUT RATE, 1965 to 1969

Field	CAA	AAi	ENN	PHA	SCI
Average Period of Studying (Years)	4.87	4.96	5.43	5.59	4.55
Average Rate of Dropout (%)	30	24	21	13	23

Sources: The average period of studying is calculated from Thailand, NEC, Expenditures of Institutions of Higher Education, pp. 59-62. The average dropout rate of 23% for college students is taken from Blaug, The Rate of Return to Investment in Education in Thailand, Footnote to Table 18, pp. 4-13.

profile of the university graduate minus the proxy of his earnings foregone) are negative while they are in school.

Computation of the Lower Limit of the Social Rates of Returns (i_{LS})

Since we have the actual total cost of university education for graduates up to 1969, we will compute the i_{LS}'s of the group of university graduates in 1970 (with the assumption that the shape of the earnings-profile of a graduate is unchanged over the period under study). With the information of costs borne by the university and out-of-pocket costs, together with the average period of studying and the average rate of dropout, we can now compute the cost per

head of the 1970 graduates. The total schooling costs are shown in Table 13.

We now have all necessary information for the computation of the i_{LS}. Before doing this, however, we will try to eliminate all other factors which might affect earnings (i.e., natural ability, family background, etc.) so that our earnings profiles will conceptually represent the net contribution from education. (The parameter for this adjustment is .675 for earnings of a university graduate and .778 for earnings of a high school graduate.) There are now four possible combinations for the computation of the i_{LS}'s: the rate computed from unadjusted earnings and unadjusted costs ($i_{1, LS}$), the unadjusted earnings and dropout rate-adjusted costs ($i_{2, LS}$), the education-adjusted earnings and the unadjusted costs ($i_{3, LS}$), and the education-adjusted earnings and dropout-rate-adjusted costs ($i_{4, LS}$). The $i_{2, LS}$ and $i_{4, LS}$ are the rates closest to the concept used in the study by Blaug.

The results indicate that the values of $i_{j, LS}$'s ($j = 1 \ldots, 4$) are different for every value of j, but the order of magnitude of $i_{j, LS}$"S are the same for every value of j. ENN has the highest $i_{j, LS}$ for all values of j followed by CAA, PHA, LAW and AAH and SCI respectively. These results are as indicated in Table 14.

Without further analysis, the above results indicate that a substantial rise in the admission of students in engineering is

TABLE 13

TOTAL COST OF UNIVERSITY EDUCATION PER GRADUATE DURING PERIOD OF UNDERGRADUATE STUDY: ALL STUDENTS BEGINNING STUDY IN 1965[a]

Field	1st year	2nd year	3rd year	4th year	5th year[b]
Social Sciences					
01. CAA	2,064	2,313	2,602	2,906	2,784
	2,882	3,177	3,585	4,101	3,849
11. AAH	6,990	7,246	6,606	6,794	5,870
	9,182	10,097	8,676	8,870	8,160
Natural Sciences					
01. ENN	6,414	6,599	6,497	6,682	9,620
	8,150	8,385	8,259	8,471	12,229
03. PHA	10,314	10,504	10,697	11,784	17,286
	11,995	12,219	12,450	13,685	20,137
07. SCI	9,655	8,571	8,431	9,407	5,254
	12,394	11,004	10,827	12,043	6,746

[a]In 1962 prices, in bahts.

[b]Or fraction or multiple thereof (see Table 12).

Note:

The upper line indicates the cost without the adjustment of the rate of dropout. The lower line indicates the costs after the adjustment of the rate of dropout. The costs with the adjustment of the rate of dropout is the procedure used in Blaug, The Rate of Return to Investment to Education in Thailand.

TABLE 14

THE LOWER LIMIT OF THE SOCIAL RATE OF RETURN OF GRADUATES IN SELECTIVE FIELDS, 1970

Field	The Lower Limit of the Social Rate of Return (%)			
	Unadjusted Earnings		Education-Adjusted Earnings	
	Unadjusted Costs ($i_{1, LS}$)	Dropout Rate -Adjusted Costs ($i_{2, LS}$)	Unadjusted Costs ($i_{3, LS}$)	Dropout Rate -Adjusted Costs ($i_{4, LS}$)
Social Sciences				
01.CAA	28	27	22	21
11.AAH	23	22	19	18
Natural Sciences				
04.ENN	34	33	28	27
03.PHA	26	24	20	18
07.SCI	21	20	17	16

recommended. For the rest of the fields in our analysis, no substantial change in any direction is indicated. The nature of this conclusion is typical of cost-benefit analysis, because with these tools of analysis, we cannot be more specific in our statement than what has been indicated above. However, with the demand-supply model developed in Chapter VI, we can proceed further and make some predictions regarding the future demand for new graduates for every specified target rate of growth. After the target i_{LS} has

been specified, the number of graduates to be supplied for each field will be determined. With this scheme of analysis we can be more specific in both our objectives and our answers. From the set of information now available to us, we will demonstrate how our model actually works in the next chapter.

CHAPTER VIII

CONCLUSION

The primary utility of the integrated model is its ability to indicate the number of students to be admitted in each major academic field when the target values of the social rate of return and the sectoral growth rate are specified. Therefore, it is necessary to specify those two rates at the outset. We shall, however, begin with the social rate of return. Since its true value is unknown, we must work instead from the rate which we previously defined as the "lower limit" of the social rate of return (computed from education-adjusted benefits and the dropout rate-adjusted cost -- $i_{4, LS}$). In order to find some criteria to determine a particular value for this rate, we shall first observe the market rate of interest in Thailand.

According to a survey conducted in 1967, Rozental reports that commercial banks in Thailand pay a maximum rate of 7% on deposits but charge 15% to ordinary borrowers.[1] Even the rate of 15% is well below much higher rates prevailing in the unorganized financial market. Interest rates range from 18-24% in the informal capital

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[1]Alek A. Rozental, Finance and Development in Thailand (New York: Praeger, 1970), pp. 281-82.

markets outside the realm of commercial banking (compradores, bank officers, branch managers, and agency partners who lend their money to businessmen). Even higher than the above are rates of 10% per month and over in the small market of unofficial pawnshops, gold shops and "night watchmen" who lend their money for households' consumption.[2] Rozental adds in his conclusion that: "the level of interest rates in both organized and unorganized market is high (especially in the latter), and the rates are almost certainly higher than they would be if either of these markets were truly competitive . . . about 25 percent is the model rate payable by a legitimate entrepreneur of moderate size . . . ."[3] Based on the above we have taken 25% to be the market interest rate in Thailand. Therefore, investment in college education in Thailand will be a worthwhile project only if its social rate of return is higher than 25%.

Not knowing the true social rate of return, we will assume that a lower limit rate ($i_{4, LS}$) of 18%[4] is the rate which yields a true social rate equal to or higher than 25%.[5] Given our current

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[2] Ibid., p. 249. [3] Ibid., p. 253.

[4] This rate is selected because it is the model rate for the group of graduates in 1970.

[5] This assumption is a heroic one because it assumes in addition that the additional rate of return created by externalities is equal to 7% or higher for all groups of graduates. However, without this assumption, we cannot move beyond this point since we have no better criteria for selecting the target value of the $i_{4, LS}$. The only other alternative is to assign some number to be the target value of the $i_{4, LS}$ arbitrarily.

information, it seems at this time that 18% is the most appropriate rate to be used. It is at least a reasonable value for the purpose of demonstrating our empirical analysis and we are free to later select a different rate in light of better information or changed economic conditions.

Estimation of Real Earnings of New Graduates (RW_o's)

After the target value of $i_{4,LS}$ has been specified, we are able to specify the corresponding levels of earnings of new graduates (RW_o's) for all groups of graduates at the given social costs. These values of RW_o's will then be used in the demand function for the projection of future demand for new graduates thereby determining the number of admissions required. Suppose we want to begin our planning for the number of admissions in 1975, the projection of the demand for new graduates should start from 1979. Consequently, the estimated values of RW_o must begin in 1979 also.

Since the initial values of $i_{4,LS}$'s do not equal 18% for all groups of graduates, we will allow the rate to increase or decrease one percent annually for those groups whose initial $i_{4,LS}$'s differ until the rate of 18% is reached. We recommend this gradual change in the values of $i_{4,LS}$'s due to the fact that it is not feasible to make abrupt changes in admission policy because such

changes would entail rapid expansion and contraction in the size of the various programs offered by the university system.

Having the $i_{4,LS}$'s specified for every year in our planning period, we shall now discuss the estimation of our social costs. At present, we have only six observations (1964-1969) on the costs of schooling. Because of this small number of observations, no established pattern for the rate of increasing costs can be observed from each individual group of graduates. However, when we reclassify them into two groups -- one group influenced by the rapidly rising costs of Thommasat[6] and the other non-Thammasat-influenced group,[7] the patterns become relatively clearer than before. The annual rate of increase in costs for the Thammasat-influenced group is around 6-7% while the rate for the other group is around 3-4%.[8] Because of this cost increase differential, we will assume a 6-7% rate of increase for schooling costs for CAA students, and 3-4% for AAH, ENN, PHA, SCI, respectively. Earnings of high school graduates, the proxy of college graduates earnings-foregone, is assumed to increase at the rate of 3% (the average rate of increase in labor

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[6]CAA, ECO, LAW, and SSS.

[7]AAH, ENN, PHA, ARC, and SCI.

[8]The relatively higher rate of the Thammasat-influenced group is due to Thammasat's present efforts to improve both its teaching

productivity in Thailand). With these cost assumptions and the above specified target values of the $i_{4,LS}$'s, the corresponding value of RW_o's can now be calculated from our cost-benefit model. The results of these calculations are summarized in Table 15.

Observe that a one percentage point increase in the rate of increase in costs, at any given value of $i_{4,LS}$, will cause a less than one percent increase in the value of RW_o for all groups of graduates. Considering this fact, together with the fact that a one percent change in RW_o causes only 0.6 percent change in the demand for graduates, we can conclude at this point that the error resulting from the computation of schooling costs will not cause much variation in the final estimate of the demand for new graduates.

Observe also that RW_o of PHA at the $i_{4,LS}$ of 18% is much higher than that of all other groups at the same rate.[9] We bring this point to light because there is another aspect of this model which has not been discussed before -- the distributive aspect. The question raised by the issue of distribution is whether equality in starting earnings of graduates should be one of the objectives (in determining the admission policy) specified in the integrated model. This question certainly deserves careful consideration at the actual

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facilities and its teacher: student ratio resulting in rapidly increasing costs.

[9] This difference is caused by the relatively high costs for schooling and the relatively slow rate of increase in earnings of this group of graduates. (See Tables 13 and 10.)

TABLE 15

THE TARGET $i_{4,LS}$'S AND THEIR CORRESPONDING VALUES OF 1979-1983[a]

	1979	1980	1981	1982	1983
01. CAA					
$i_{4,LS}$ (%)	20	19	18	18	18
RW_o	262	260	257	266	276
RW'_o	267	264	262	272	282
11. AAH					
$i_{4,LS}$ (%)	18	18	18	18	18
RW_o	267	275	284	298	301
RW'_o	274	283	293	303	313
04. ENN					
$i_{4,LS}$ (%)	26	25	24	23	22
RW_o	511	497	496	469	456
RW'_o	529	516	513	490	478
03. PHA					
$i_{4,LS}$ (%)	18	18	18	18	18
RW_o	576	594	612	630	649
RW'_o	596	617	638	660	682
07. SCI					
$i_{4,LS}$ (%)	17	18	18	18	18
RW_o	282	312	321	331	341
RW'_o	290	323	334	345	356

TABLE 15 (Continued)

[a]RW_o is in hundred bahts in 1962 prices.

Note:
RW_o is the value corresponding to the rate of increasing costs of 6% for CAA, and 3% for AAH, ENN, PHA, and SCI. RW'_o is the value corresponding to the rate of increasing costs of 7% for CAA, and 4% for AAH, ENN, PHA and SCI.

policy level because the postulation of this question poses both economic and non-economic problems, and a policy maker must examine all of these aspects carefully before any final decision is made. Since we are not ready to make any strong recommendation based upon the empirical results from our study, this point is only brought forward to the reader to assure him that it would be treated adequately at the actual policy level.

Estimation of the Future Demand for New Graduates

To calculate the demand for new graduates from the private sector from equations (6-8) and (6-9), we now have to know only the estimated values of the gross sectoral domestic product (GSDP) of each related sector. We begin our computations by assuming that the present relationship between the sectoral growth rates and the overall growth rates will continue throughout our planning period.[10] Presently, we have no better way to project the GSDP's than from

[10]The average rate of 6-8% is for the overall growth rate, 15% for BIR, 8% for TAC, 18-20% for EWS and 10% for MAN. These figures are calculated from the data in Appendix A.

TABLE 16

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

	Field of Study									
	CAA		AAH		ENN		PHA		SCI	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
1979	878	868	421	414	513	503	139	136	192	189
1980	968	959	483	474	589	576	155	151	216	211
1981	1,070	1,058	553	542	667	639	173	169	254	247
1982	1,152	1,136	635	620	782	761	193	188	297	290
1983	1,240	1,223	729	711	903	877	216	210	349	340

Note:
(1) is the estimate from the values of RW_o's in Table 15 and (2) is the estimate from the values of RW'_o's from the same table.

their growth trends. Both log linear and the linear trends have been employed for the projection. They yield radically different results and we have used the average values of the GSDP's from both estimates.[11] After substituting these values of GSDP's and RW_o's in the two equations above, we reach the following figures of the estimated demand for new graduates in the private sectors (in Bangkok-Thonburi Greater Area) from 1979 to 1983.

We have made general observations earlier in this chapter regarding what should be expected from the variation in the estimation of the demand for new graduates resulting from different estimates of schooling costs. The results from the above table confirm what we have claimed earlier: that the results of the two estimation procedures should not differ greatly. A factor of greater significance affecting the number of new graduates demand is the GSDP. This is reflected in the fact that its elasticity is relatively higher than that of RW_o (elasticity values range from .76 for CAA to 2.6 for AAH, while the corresponding value of RW_o is only -0.6).[12] Enhancing the effect of the elasticity differential is the rapid increase in its annual absolute value. Therefore, the correct estimation of the GSDP's is a key

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[11]The log linear projection yields very high values of the GSDP's while the linear projection provides much lower estimates of these values. In spite of the theoretically questionable nature of averaging these estimates, the results so obtained are reasonable in view of the long run demand trend established in the private sector for graduates in each group.

[12]See equation (6-7).

element in the estimation of the demand for new graduates from the private sector.

The next step in our prediction process is to estimate the total demand for new graduates. Again, due to the present data limitations, we must propose two indirect methods for this estimation. The first method is to assume a fixed relationship between the percentage of new graduates entering government service and those being employed in the private sector each year. It is possible that this fixed employment relationship exists, but it is not very likely because the rates of growth in demand from the private sector and non-private sector[13] cannot be expected to be completely parallel. However, with few realistic alternatives, we may be forced to retain this assumption. Our second alternative is to estimate the demand for the rest of the new graduates from annual expenditures on public administration and defense (PAD). This method is probably better than the previous one because the demand from the non-private sector is estimated independently.[14]

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[13]The number of new graduates assigned to this sector is the number left from the number employed in private sectors in Bangkok-Thonburi Greater Area. About 90% of graduates included in this total are employed in the public sector.

[14]Ideally, we would like to have the figures from the actual plan for future employment of new graduates from the public sector, because this information would help reduce the error from our prediction substantially.

TABLE 17

ESTIMATION OF THE DEMAND FOR NEW GRADUATES FROM THE NON-PRIVATE SECTOR 1979-1983

Year	Field of Study				
	CAA	AAH	ENN	PHA	SCI
1979	604	1,005	464	117	1,077
1980	641	1,089	510	122	1,210
1981	680	1,179	559	128	1,358
1982	712	1,277	613	133	1,524
1983	765	1,382	673	139	1,710

Note:
The regression coefficients for these estimates are in Appendix J.

In spite of their differences the two methods of estimation discussed above do not provide vastly different results. However, the results from the second method have been selected because they take into consideration the gradual decline in the percentage of the number of new graduates being employed in the non-private sector. The results are as indicated in Table 17.

To find the total demand for new graduates, we simply add the figures in Tables 16 and 17 together. The results are show in Table 18.

TABLE 18

ESTIMATION OF THE DEMAND FOR NEW GRADUATES 1979-1983

Year	Field of Study									
	CAA		ATH		ENT		PHA		SCI	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
1979	1,482	1,472	1,426	1,419	977	967	256	253	1,296	1,266
1980	1,609	1,600	1,572	1,563	1,092	1,086	277	273	1,426	1,421
1981	1,751	1,738	1,732	1,731	1,226	1,198	301	297	1,612	1,605
1982	1,873	1,857	1,912	1,897	1,395	1,374	326	313	1,821	1,814
1983	2,005	1,988	2,111	2,093	1,576	1,560	355	349	2,059	2,050

Note:
(1) and (2) correspond to (1) and (2) in Table 16 respectively.

Estimation of the Required Number of Admissions

With the above total demand for new graduates, it is not too difficult to estimate the required number of admissions -- provided the relationship between the two variables is known to us. To approach this problem, we are forced to estimate the required admissions from the "average admissions to graduates" ratio calculated for the period 1960 to 1970. The averages yielded the following results: For CAA, the average is 1.4644, 1.4124 for AAH, 1.2226 for ENN, 1.0197[15] for PHA and 1.3494 for SCI. Since there will be a four-year lag in the educational process for most groups of graduates, our required admission policy will include the period 1975 to 1979.

Although we have already indicated that we merely want to show the process by which we reach the final figures yielding the required number of admissions for students in various fields under our study, we will not rule out the possibility of using these empirical findings to guide future admissions policy in Thailand. However, recalculation is needed as additional information becomes available. For example, we should recalculate the number of new graduates demanded in the private sector, if we can determine more precisely what the target value of the $i_{4,LS}$, or its corresponding

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[15] The average dropout rate of PHA in Table 12 indicates certain inconsistency in its value to this "average admissions to graduates" ratio of 1.0197. The dropout rate in Table 12 is, however, corresponding to the overall university average rather than the rate of PHA alone. If the above ratio is correct the true dropout rate of this group of graduates should be much lower than 13%.

TABLE 19

ESTIMATION OF THE REQUIRED NUMBER OF ADMISSIONS 1975-1979

Year	Field of Study									
	CAA		AAH		ENN		PHA		SCI	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
1975	2,170	2,155	2,015	2,005	1,195	1,182	-	-	1,713	1,709
1976	2,356	2,343	2,221	2,208	1,343	1,327	261	258	1,942	1,917
1977	2,564	2,545	2,447	2,431	1,499	1,465	283	279	2,175	2,166
1978	2,743	2,720	2,760	2,679	1,709	1,680	307	303	2,458	2,448
1979	2,937	2,912	2,982	2,947	1,926	1,907	303	319	2,779	2,767

Note:

The number of admissions of PHA is calculated on a three-year lag basis. (Beyond these three years, an additional two years of basic science training are required for a bachelor's degree in pharmacy.) Admissions in 1976 yield the graduates of 1979.

value of RW_o of new graduates in each field should be. Recalculation is also needed when we have better information to estimate future costs for schooling. It should be pointed out again that a large part of the error from the prediction of the required number of admissions is due to the error in the estimation of the GSDP's which are used for the prediction of the demand for new graduates in the private sector. Of equal significance is the error in the method of estimation of the demand from the non-private sector. Finally we have the error due to the method used for the prediction of the number of admissions itself. Therefore, the present empirical results should only be used with an awareness of all these defects.

Conclusion

What we have attempted to do in this paper is to offer an alternative approach to the study of manpower and educational planning. With this approach, which utilizes the combined features of the manpower requirement approach (M-R) and the cost-benefit analysis (C-B), we hope to unravel some problems raised by the independent application of each approach.[16] 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

[16]Weaknesses in the C-B and M-R methods which are often cited include: the question for not being an equilibrium approach in touch with the efficiency of resource allocation of the M-R and the failure to test the key assumption of the operation of the price mechanism for the valid use of earnings to represent marginal productivity of labor in its estimation of benefits of the C-B analysis.

C-B assumption of 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.

Our study has suffered from the same type of empirical problems faced by the C-B (i.e., the inability to estimate social benefits and costs inclusively.) Nevertheless, this model still represents certain significant improvements over either of the two other approaches. For example, this integrated model takes care of the question of the efficiency of resources allocation and at the same time considers the growth aspect of the whole economy. Additionally 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 this model. Finally, this model provides a more definite set of recommendations for admission policy than that of the typical C-B. Supplemental to the above direct advantages, the wage elasticity and the income elasticity derived from the demand function also indicate the strength of the policy variables inherent in the C-B and the M-R independently. Since the cost-benefit analyst aims at influencing the demand for new graduates through the change in wages; low wage elasticity implies the weakness of the primary policy variable

associated with the C-B. On the other hand, high income elasticity indicates the strength of the policy variable most useful in the M-R.[17]

The demand function is the crucial link in our model. Its wage and income elasticities can be used as parameters to indicate the strength and weakness of the principal policy instrument in both the C-B and the M-R; therefore more attention should be given to the estimation of this function. The more information available to specify the demand function (i.e., a more definite concept for the income variable, employment data of other related factors) the more accurate the results which can be obtained from the model.

Given the present sets of limitations, this study can best serve only as a pilot project, with a more comprehensive analysis to be undertaken later. Although the study has indicated several defects encountered in the integrated model, its utility still proves to be superior to complete reliance on either the C-B or the M-R above. Because of its potential for better practical service in assisting manpower and educational planning, additional efforts should be made to develop this approach further, at least until a better alternative is discovered.

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[17] See Blaug, An Introduction to Economics of Education, p. 216 and Bowles, Planning Educational Systems for Economic Growth, p. 180.

APPENDICES

APPENDIX A

UNIVERSITY HISTORY

Chulalongkorn University

Chulalongkorn University had its beginning in 1902 where the Royal Pages' Bodyguard Regiment of King Rama V (Chulalongkorn) was organized into a full scale educational facility which became known as the Royal Page School. By 1910 this school had been developed into Civil Service College, and finally became a full university in 1916.[1] It is quite appropriate to regard Chulalongkorn as the first university in Thailand. Being the first university, it performs the function of being a nucleus for two other universities, Medical or Mahidol and Thammasat -- and plays a vital role in supporting newly established universities such as Chiangmai and Khonkaen. Prior to the founding of the Civil Service College, there were two other schools. They were the Medical School at Siriraj Hospital, founded in 1897. The Medical School was renamed the Raja Paethayalai by Royal command in 1900.[2]

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[1]Kasem Udyanin and Rufus D. Smith, The Public Service in Thailand: Organization, Recruitment and Training (Brussels: International Institute of Administrative Science, 1954), p. 49.

[2]Thailand, Office of the Prime Minister, Thailand: Official Year Book, 1964 (Bangkok, Thailand: Government House Printing Office, 1965), p. 438.

During the time Chulalongkorn was Civil Service College, the courses being offered to train prospective civil servants were education, medicine, agriculture, jurisprudence, engineering, commerce, foreign relations and public administration. At this time there was a separate institution, the School of Engineering, in operation at Hor Wang in 1913. In 1916, the College of Civil Service was raised to full university status and its name changed to Chulalongkorn University. After being created a university, Chulalongkorn took Raja Paethayalai and the School of Engineering into its operation. It, therefore, began operations with four faculties: Arts and Science, Medicine, Engineering and Public Administration, all of which entailed three year curriculae.

Through the financial assistance of the Rockefeller Foundation, which was seeking to advance medical science, great strides were made in medical education in Thailand between 1923-1934. Medical courses were extended to six years with the graduate obtaining the Degree of Bachelor of Medicine. The first group of doctors with this degree was graduated in 1928.

In 1932 Chulalongkorn assumed control of the School of Architecture from the School of Handicraft to make the fifth faculty in the University. In 1933, it took over the Law School of the Ministry of Justice and combined it with the Faculty of Public Administration to form the new Faculty of Law and Political Science. At the end of the same year this Faculty was taken from Chulalongkorn

to form a new University called Thammasat Lae Karnmeung (University of Moral and Political Science). Because of political agitation on campus, caused by students from this University, The Revolutionary Government of 1958 shortened its name to Thammasat University (University of Morality). The Faculty of Veterinary Science was added to Chulalongkorn in 1937 and followed by the Faculty of Commerce and Accountancy in 1939. 1942 marked the establishment of the third new university, the University of Medicine. This University was formed by the Faculty of Medicine, the Faculty of Pharmacy and the Faculty of Veterinary Science; all separated from Chulalongkorn University. A close relationship between the two Universities was maintained because Chulalongkorn continued to offer the two year pre-medical curriculum.

Following the opening of Thammasat, Chulalongkorn re-established the Faculty of Public Administration under the new name of the Faculty of Political Sciences in 1948. The period from 1957-1972 was one of numerous changes in the organization of Chulalongkorn. These changes, along with those discussed above, are summarized in Table A-1.

The duration of course work for the fulfillment of the bachelor degree for most faculties is four years. The only exceptions are: the Architectural Degree and the Degree of Pharmacy requiring 5 years; and Veterinary Science and Medicine requiring 6 years.

TABLE A-1

TIME SEQUENCE OF THE OPENING OF VARIOUS FACULTIES IN CHULALONGKORN

No.	Name of the Faculty	Years of Operation
1	Arts	1916-
2	Science	1916-
3	Political Science (Public Administration)	1916-1933 and 1948-
4	Engineering	1916-
5	Medicine	1916-1942 and 1967
6	Veterinary Science	1937-1942 and 1967-
7	Commerce and Accountancy	1939-
8	Education	1957-
9	Graduate School	1962-
10	Mass Communication and Public Relation	1967-
11	Economics	1970-
12	Dentistry	1972-
13	Pharmacy	1972-

Source: Pranote Nantiyakul, "University Administration in Thailand," (unpublished Master Thesis, Chulalongkorn University, 1969), pp. 15-24.

We have devoted considerable space to Chulalongkorn University because it, together with Medical University, provides the biggest source of graduates in the natural sciences. The relationship between these two Universities is very close; therefore, the quality of graduates produced by the two Universities in the field of natural sciences is considered to be equivalent. The ties between the two have been now separated and Medical University has assumed the new name of Mahidol University and is trying to form its own distinct organization as a university.

Thammasat University

The history of Thammasat University before 1933 can be traced from the above discussion. The University was first under the control of the Ministry of Education as was Chulalongkorn University. Thammasat is, in a way, a complementary university to Chulalongkorn University in that it specialized in producing graduates in social sciences. The University was founded by Pridi Phanomyong, leading Promoter of the Revolution of 1932. Since he was graduated from the University of Paris, Thammasat University was patterned after the Parisian École des Hautes Études Politiques.[3] Its original purpose, apart from training people to be qualified civil servants, was to provide an education in constitutional democracy to the masses.

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[3]Virginia Thompson, Thailand: The New Siam (New York: The Macmillan Company, 1941), p. 785.

This was necessary because at this time the country had undergone a change from Absolute (Paternal) Monarchy to Constitutional Democracy and the majority of the Thai people did not know the difference between the two systems. For this reason Thammasat became the first university of unlimited admission in Thailand. Anyone who had a high school certificate, or its equivalent, could qualify to be enrolled at Thammasat. Students were not required to attend classes and might graduate by only buying text books and lecture notes and studying at home. In fact, the majority of students of this University did just that. The only requirement was that they had to appear at the final examination on the subjects which they decided to take. If they failed in the first exam, they only had to prepare again for the second exam, which was due within two months after the first one. An individual could maintain his student status as long as he wanted, so long as he paid his registration fee of 90 bahts (approximately $4.50) a year. Operated on this basis for twenty-seven years, the University found that the enrollment had increased beyond its ability to function efficiently.[4] It also happened that there were groups of "professional students," who never tried to leave the University, and caused considerable political trouble for the University. The University, therefore, limited the maximum duration for anyone to be enrolled as a student

[4]For example, in 1956-57 the number of enrollment was about 22,000.

to not longer than eight years. If within eight years, a student could not complete his degree, the University would drop him.

At the opening of the University in 1933, there were three Faculties: Law, Political Science, and Economics, and a School of Commerce and Accountancy. The normal period required to complete a degree at Thammasat is four years. Each of these programs provided basic training to all students, with the heaviest emphasis on Law. The University granted only one common degree, somewhat like the B.A. degree in the United States, however, a graduate might pursue advanced specialization after completion of his degree. In 1947 the system's direction became more British with the emphasis on specialization beginning at the first degree level. Each faculty now recruited and trained its own students independently and had its own curriculum with an emphasis on the specialized subjects starting from the freshman year. Under this system, degrees were conferred separately by each faculty. At this time the School of Commerce and Accountancy changed its status to that of just another faculty in the University, and the Faculty of Social Administration was added in the University.

A major change was instituted in 1960 when Thammasat began to limit the number of admissions. The admissions policy was changed to a competitive basis reflecting the limited number of seats available in the University. The number admitted and the

number enrolled began to drop drastically and enrollment in 1969 was only half of what the University had in 1957.[5]

Other major changes took place in 1962 when the University began to move toward the American system of higher education. Among these changes was the establishment of a Faculty of Liberal Arts which was added with the idea of providing common basic training in Arts and Sciences to all students -- like the School of Arts and Sciences in some American universities. This Faculty was composed of six departments: Mathematics and Statistics, Library Sciences, History, Linguistics, Psychology and Literature. Every student is required to take a number of courses from this Faculty before pursuing his own area of specialization. In 1972, a full scale adoption of the American system was carried out. Today, after the completion of the University's required courses, students are free to take their major, minor and selected subjects at will. Common registration is conducted through the office of the registrar and the credit system has been instituted. It is interesting to note that these changes in the nature of the University's operation have had a strong impact on the quantity and quality of graduates from Thammasat.

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[5]Thailand, The National Education Council, Office of the Prime Minister, Educational Report Institutions of Higher Education: Thailand 1969 (Bangkok, Thailand: Government House Printing Office, 1970), Table 1.

Medical or Mahidol University

The early history of this University before 1942 can also be traced back from the history of Chalalongkorn University; and until the University was renamed Mahidol, the relationship between the two was quite close. After separation from Chulalongkorn, this University was placed under the control of the Ministry of Public Health. The majority of classes were given in Siriraj Hospital and Chulalongkorn Hospital with the Office of the Rector located at Siriraj Hospital. Chulalongkorn University, however, still provided the first two years of basic training before channeling students to the Medical University. Before the organization of Chiangmai University in 1964, a Faculty of Medicine was established at Chaingmai and added to the operation of Medical University. The pressing need for medical doctors became more severe over time. This situation was aggravated by the poor incentive system of the Thai civil servant plus heavy competition from the United States. Because of this fact the big modern Ramathibodi Hospital was built in Bangkok in 1966. This hospital was a part of a master plan to enlarge Medical University. In 1969 the name of Medical University was changed to Mahidol University in honor of Prince Mahidol, the father of the present King, who has been highly regarded as the father of modern Thai medicine. Since that time Mahidol University has operated independently of Chulalongkorn University; and is now composed of the Faculty of Medicine at Siriraj Hospital, the Faculty

of Medicine at Ramathibodi Hospital, the Faculty of Pharmacy, the Faculty of Dentistry, the Faculty of Denistry at Phayathai, the Faculty of Medical Technology, the Faculty of Public Health, the Faculty of Tropical Medicine, and the Faculty of Medical Sciences. The last Faculty is rendering the same kind of service which was given before by Chulalongkorn University. A strong Graduate School is also operating in this University.

Kasetsart University (University of Agriculture)

Kasesart University was opened under the Ministry of Agriculture in 1943.[6] It was developed from the existing Agricultural and Forestry College under the same Ministry with the original intent of training agricultural technicians, agricultural extensionists and forestry officials. There were four Faculties at the outset: Agriculture, Forestry, Fisheries, and Cooperative with special emphasis on farm cooperative. Today Kasetsart has 7 Faculties: Agriculture, Veterinary Sciences, Forestry, Economics and Business Administration, Engineering, Fisheries, and Sciences and Arts. The last one is intended to be the nucleus for a School of Arts and Sciences like the one at Thammasat.

As opposed to the conventional degree requirement of four years, Kasetsart University had required five years for its students

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[6]Office of the Prime Minister, Thailand, Official Year Book 1964, p. 484.

to complete the course work for all degrees (with the exception of the degree of Veterinary Science which requires six years of training). There were certain advantages for organizing a five year program. With the Civil Service regulations prevailing at that time, graduates with 5 years of training would gain an increase in pay equivalent to two years of service above the graduates with 4 years of training. This required year of additional work certainly reflected the attitude of the administrators who viewed the role of education to be to produce graduates to serve the public sector. The requirement was dropped to 4 years when the Civil Service Commission no longer recognized the difference of an additional year of the training period.

Silpakorn University (University of Fine Arts)

This University was inaugurated at the end of 1943, about 10 months after Kasetsart University. It was under the administration of the Ministry of Education and proven to be the slowest growing one. Given the number of graduates turned out each year as compared with the budget per student allocated by the government, the existence of the University is hardly justified if we do not take into consideration the recent developmental efforts of the University.

Silpakorn also started out with four Faculties: Painting and Sculpture, Thai Architecture, Archaeology, and Decorative Arts. The Faculty of Arts was added recently in this University to make a fifth Faculty.

Chiangmai University

After the Revolution of 1958, there were changes made in the organization of the system of universities in Thailand. All universities were taken away from various Ministeries and put together under the Office of the Prime Minister with the National Education Council acting in an advise and consent role. Although the attitude of using universities primarily to train qualified persons to serve in various government bodies had been gradually changed by university administrators and educators prior to this time, a marked change in attitude could be noted in this year. After 1958, the purpose of setting up a university has corresponded to the national goal of the development of education and human resources for the development of the country as a whole.

The Chaingmai University project is a part of the Project of Educational Development in the Northern Region. This Project began its operation in 1960 pursuing two phases of the National Plan for Economic and Social Development.[7] Trying to be a complete university within itself, Chaingmai started off with six faculties with various related departments in the faculty. They are Medicine, Sciences, Education, Agriculture, Social Sciences, and Humanities.

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[7]Thailand, The National Education Council, Office of the Prime Minister, "Evaluation of Educational Development: Chaingmai University, 1967-1971," Bangkok: Thailand, 1972. (Mimeographed.)

Khonkaen University

The founding of Khonkaen University, like Chiangmai University, is part of the development program for the Northeastern region of Thailand. The aim is to have the University be one of the foundations of future progress, and to have Khonkaen Province be a technical and cultural center for the region. Construction was started in October, 1963 and the first class was admitted in 1965. The University started with three Faculties: Science and Arts, Agriculture, and Engineering.

APPENDIX B

DEGREE CLASSIFICATION OF UNIVERSITY GRADUATES

To understand the nature of each universities' graduates, we would like to classify each field of study in as much detail as possible. The only limitation to our classification is the size of the samples. A careful study of the size of the population of the university graduates in each field based on guidelines provided by UNESCO's classifications resulted in 11 major fields; 5 under the general field of social sciences and 6 under the general field of natural sciences. This classification is shown in the table below.

TABLE B-1

DEGREE CLASSIFICATION INTO 11 MAJOR FIELDS

Field	Degree	University
(01) Commerce and Accountancy (CCA)	Business Administration Accountancy	Kasetsart
	Commerce and Accountancy	Chulalongkorn
	Accountancy Business Administration	Chaingmai
	Accountancy Commerce	Thammasat

TABLE B-1 (Continued)

Field	Degree	University
(02) Economics (ECO)	Agricultural Economics	
	Economics	Kasetsart
	Economics	Chulalongkorn
	Economics	Chiangmai
(02) Economics	Economics	Thammasat
(03) Pharmacy (PHA)	Pharmacy	Medical University or Mahidol
	Pharmacy	Chiangmai
(04) Engineering (ENN)	Agricultural Engineering	
	Mechanical Engineering	Kasetsart
	Irrigation Engineering	
	Civil Engineering	
	Civil Engineering	
	-Structure	
	-Transportation	
	-Hydraulic	
	Electrical Engineering	
	-Power	
	-Communication	Chulalongkorn
	Industrial Engineering	
	-Factory	
	-Chemistry	
	Mechanical Engineering	
	Mining Engineering	
	Public Health Engineering	
	Survey Engineering	
	Civil Engineering	
	Electrical Engineering	Khonkaen
	Agricultural Engineering	

TABLE B-1 (Continued)

Field	Degree	University
(05) Medicine and Dentistry (MED)	Medicine	Chulalongkorn
	Medicine Dentistry	Chiangmai
	Medicine Dentistry	Mahidol
(06) Agriculture (AGR)	General Agriculture Farm Mechanics Enthomology Plant Pathology Soil Science	Kasetsart
(06) Agriculture	Agronomy Horticulture Animal Husbandry Fisheries Veterinary Science Forestry	
	Agriculture	Khonkaen
	Veterinary Science	Chulalongkorn
	Horticulture and Agronomy Animal Husbandry Plant Protection Agricultural Extension	Chiangmai
(07) Science (SCI)	Food Science Science General Chemistry Chemical Biology Organic Chemistry Microbiology Zoology Mathematics Biology	Kasetsart

TABLE B-1 (Continued)

Field	Degree	University
	Chemistry Chemical Technology Mathematics Geology Botany Physics Zoology Marine Sciences General Science	Chulalongkorn
	Biology Chemistry Mathematics Physics Geology Sciences	Chiangmai
	Mathematics and Statistics	Thammasat
	Chemistry	Mahidol
(08) Law (LAW)	Law	Chulalongkorn
	Law	Thammasat
(09) Sub-Field of Social Science (SSS)	Social Science & Anthropology	Kasetsart
	Political Science Foreign Diplomacy Public Administration Social Science Mass Communication & Public Relation	Chulalongkorn
	Political Science Government Foreign Service	

TABLE B-1 (Continued)

Field	Degree	University
	Public Administration	Thammasat
	Political Study	
	Social Administration	
	Sociology and Anthropology	
	Journalism	
(10) Architecture (ARC)	Architecture	
	Industrial Arts	Chulalongkorn
	Painting	
	Sculpture	
	Graphic	Silpakorn
	Architecture	
	Decorative Arts	
(11) Arts and Humanities (AAH)	Arts	
	Languages	Kasetsart
	Education	
	Arts	Chulalongkorn
	Education	
	English	
	French	
	German	Chiangmai
	History	
	Library Science	
	Psychology	
	Home and Community	
(11) Arts and Humanities	Library Science	
	History	
	Linguistics	Thammasat
	Psychology	
	Literature	
	Arts	
	Archaeology	Silpakorn

A few more points should be made here. In SSS, a graduate from the Faculty of Political Science from Chulalongkorn University is better by any standard of quality than a graduate of Social Administration of Thommasat. Yet, we are forced to combine them into one group because of sample size problem.

A second point is that graduates with a common B.A. degree from the original curriculum of Thammasat are classified under "LAW" because it is closer to that field than any others. By doing so the number of graduates of law is quite high at the beginning of the series (see Appendix C-3) and reaches the peak in 1954. Since 1954 the number of graduates has been dropping drastically because only bona fide graduates of law were being produced. After which time it started to increase as did CAA, ECO and SSS in 1962.

In some other studies of this nature, the graduates of ARC are lumped together with ENN. This procedure would be appropriate if the construction sector were so large as to employ the majority of the graduates from the two fields. The actual situation does not seem to conform with the above argument. Thus, the two fields have been classified separately.

I find it quite difficult to assign the degree in veterinary science to the field of agriculture rather than medicine. By the nature of what the graduates do after their graduation and the length of the training period veterinary science is closer to medicine. Graduates in both fields have gone through six years of specialized

training, and after their graduation they usually work with some private clinic in the city to earn their side income. However, for most of the time during the period of this study, the Faculty of Veterinary Science has been operated in Kasetsart University; and some graduates have gone to work with the Department of Livestock, Ministry of Agriculture, while others have been working with slaughtering houses. Since UNESCO has classified this degree in the field of agriculture, I therefore have decided to follow their classification. This classification, however, will not cause any analytical distortion in this study since I finally drop the fields of MED and AGR out of my study due to the difficulty of including these two fields in the same model with the rest of the natural sciences.

The above classification does not cover all colleges and universities in Thailand, for example: the College of Education, Prince of Songkhla University, Asian Institute of Technology, National Institute of Development Administration, College of Technology, College of Tele-Communication, Military, Navy, Air Force and Police Academies. The reason for their exclusion is that they are not directly related to my study. Some of them produce graduates oriented mostly toward the public sector, for example, the College of Education, Military, Navy, Air Force, and Police Academies. Some of them have only graduate programs which are not of our concern, and some of them are newly established and have not yet turned out any graduates.

Finally, some of them may not be of comparable quality to the universities included in our study.

APPENDIX C

GRADUATES FROM EACH UNIVERSITY CLASSIFIED BY MAJOR FIELD OF STUDY

C-1 to C-5 represent records of graduates from the general field of Social Science

C-6 to C-11 represent the records of graduates from the field of Natural Science.

TABLE C-1

GRADUATES IN THE FIELD OF COMMERCE AND ACCOUNTANCY
(01)

Year	Grand Total	Thammasat			Chulalongkorn			Chiangmai		
		Total	Male	Female	Total	Male	Female	Total	Male	Female
1950	81	40	24	16	41	15	26	-	-	-
1951	94	61	40	21	33	11	22	-	-	-
1952	161	132	63	69	29	9	20	-	-	-
1953	180	134	78	56	46	20	26	-	-	-
1954	238	195	104	91	43	16	27	-	-	-
1955	273	227	117	110	46	15	31	-	-	-
1956	197	107	52	55	90	22	68	-	-	-
1957	474	380	176	204	94	13	81	-	-	-
1958	262	185	91	94	77	16	61	-	-	-
1959	258	182	103	79	76	21	55	-	-	-
1960	289	168	77	91	121	33	88	-	-	-
1961	215	106	55	51	109	30	79	-	-	-
1962	382	276	138	138	106	44	62	-	-	-
1963	408	282	145	137	126	49	77	-	-	-
1964	746	579	275	304	167	69	98	-	-	-
1965	1,053	869	456	413	184	60	124	-	-	-
1966	1,765	1,585	730	855	179	84	95	1	n.a.	n.a.
1967	779	629	309	320	149	55	94	1	n.a.	n.a.
1968	566	375	140	235	190	47	143	1	n.a.	n.a.
1969	633	373	131	242	256	87	169	4	n.a.	n.a.
1970	864	572	181	391	286	103	183	6	n.a.	n.a.
Total	9,918	7,457	3,485	3,972	2,448	819	1,629	13	n.a.	n.a.

Source: From the registrars' records of the seven universities.

TABLE C-2

GRADUATES IN THE FIELD OF ECONOMICS
(02)

Year	Grand Total	Thammasat			Kasetsart			Chulalongkorn			Chiangmai		
		Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
1950	14	5	5	-	9	9	-	-	-	-	-	-	-
1951	17	6	6	-	11	11	-	-	-	-	-	-	-
1952	17	5	5	-	12	12	-	-	-	-	-	-	-
1953	23	9	9	-	14	14	-	-	-	-	-	-	-
1954	23	10	10	-	13	13	-	-	-	-	-	-	-
1955	23	10	9	1	12	12	-	1	1	-	-	-	-
1956	36	7	7	-	27	27	-	2	2	-	-	-	-
1957	52	21	19	2	29	28	1	2	1	1	-	-	-
1958	53	17	15	2	34	34	-	2	1	1	-	-	-
1959	58	36	32	4	20	20	-	2	-	2	-	-	-
1960	124	84	73	11	35	31	4	5	1	4	-	-	-
1961	89	51	40	11	32	24	8	6	6	-	-	-	-
1962	95	69	56	13	23	16	7	3	1	2	-	-	-
1963	197	144	121	23	44	17	27	9	3	6	-	-	-
1964	338	257	173	84	66	35	31	15	8	7	-	-	-
1965	388	296	206	90	57	31	26	34	12	22	1	n.a.	n.a.
1966	469	346	263	83	78	42	36	42	18	24	3	n.a.	n.a.
1967	310	196	140	56	83	44	39	29	11	18	2	n.a.	n.a.
1968	367	170	97	73	180	80	100	11	7	4	6	n.a.	n.a.
1969	332	221	110	111	84	49	35	20	10	10	7	n.a.	n.a.
1970	404	266	116	150	103	79	24	26	10	16	9	n.a.	n.a.
Total	3,429	2,226	1,512	714	966	628	338	209	92	117	28	n.a.	n.a.

Sources: From the registrars' records of the seven universities.

TABLE C-3

GRADUATES IN THE FIELD OF LAW
(08)

Year	Grand Total	Thammasat			Chulalongkorn		
		Total	Male	Female	Total	Male	Female
1950	342	342	n.a.	n.a.	-	-	-
1951	302	302	n.a.	n.a.	-	-	-
1952	715	715	n.a.	n.a.	-	-	-
1953	977	977	n.a.	n.a.	-	-	-
1954	114	112	108	4	2	2	-
1955	116	116	112	4	-	-	-
1956	93	92	88	4	1	1	-
1957	112	107	102	5	5	5	-
1958	119	119	111	8	-	-	-
1959	113	113	103	10	-	-	-
1960	117	117	115	2	-	-	-
1961	122	116	114	2	6	6	-
1962	257	233	219	14	24	18	6
1963	576	550	522	28	26	21	5
1964	802	770	733	37	32	23	9
1965	1,146	1,127	1,086	41	19	10	9
1966	1,654	1,629	1,555	74	25	12	13
1967	563	495	463	32	68	38	30
1968	293	254	247	7	39	25	14
1969	479	407	391	16	72	51	21
1970	632	546	469	77	86	58	28
Total	9,644	9,239	6,538	365	405	270	135

Sources: From the registrars' records of the seven universities.

TABLE C-4

GRADUATES IN THE SUB-FIELD OF SOCIAL SCIENCE
(09)

Year	Grand Total	Thammasat			Chulalongkorn			Chiangmai		
		Total	Male	Female	Total	Male	Female	Total	Male	Female
1950	44	31	31	-	13	13	-	-	-	-
1951	53	31	29	2	22	22	-	-	-	-
1952	73	31	30	1	42	42	-	-	-	-
1953	77	30	27	3	47	47	-	-	-	-
1954	84	37	33	4	47	47	-	-	-	-
1955	84	26	22	4	58	52	6	-	-	-
1956	103	34	29	5	69	60	9	-	-	-
1957	115	53	43	10	62	41	21	-	-	-
1958	189	102	85	17	87	59	28	-	-	-
1959	144	56	49	7	88	39	49	-	-	-
1960	213	109	90	19	104	62	42	-	-	-
1961	198	59	41	18	139	100	39	-	-	-
1962	266	144	79	65	122	90	32	-	-	-
1963	247	155	96	59	92	79	13	-	-	-
1964	473	357	181	176	116	79	37	-	-	-
1965	469	375	179	196	94	61	33	-	-	-
1966	570	499	273	226	71	41	30	-	-	-
1967	250	163	111	52	87	43	44	-	-	-
1968	229	116	84	32	113	39	74	-	-	-
1969	370	218	118	100	152	59	93	-	-	-
1970	644	429	190	239	192	77	115	23	n.a.	n.a.
Total	4,895	3,055	1,820	1,235	1,817	1,152	665	23	n.a.	n.a.

Sources: From the registrars' records of the seven universities.

TABLE C-5

GRADUATES IN THE FIELD OF ARTS AND HUMANITIES
(11)

Year	Grand Total	Chulalongkorn			Silpakorn			Thammasat			Kasetsart			Chiangmai		
		Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
1950	52	52	1	51	-	-	-	-	-	-	-	-	-	-	-	-
1951	55	55	-	55	-	-	-	-	-	-	-	-	-	-	-	-
1952	64	64	12	52	-	-	-	-	-	-	-	-	-	-	-	-
1953	72	72	15	57	-	-	-	-	-	-	-	-	-	-	-	-
1954	102	102	18	84	-	-	-	-	-	-	-	-	-	-	-	-
1955	106	106	16	90	-	-	-	-	-	-	-	-	-	-	-	-
1956	147	147	25	122	-	-	-	-	-	-	-	-	-	-	-	-
1957	158	158	20	138	-	-	-	-	-	-	-	-	-	-	-	-
1958	183	183	24	159	-	-	-	-	-	-	-	-	-	-	-	-
1959	198	198	24	174	-	-	-	-	-	-	-	-	-	-	-	-
1960	169	169	23	146	-	-	-	-	-	-	-	-	-	-	-	-
1961	182	182	36	146	-	-	-	-	-	-	-	-	-	-	-	-
1962	277	277	46	231	-	-	-	-	-	-	-	-	-	-	-	-
1963	375	349	74	275	25	n.a.	n.a.	-	-	-	-	-	-	-	-	-
1964	360	343	55	288	17	n.a.	n.a.	-	-	-	-	-	-	-	-	-
1965	351	332	55	277	19	n.a.	n.a.	-	-	-	-	-	-	-	-	-
1966	498	384	50	334	30	n.a.	n.a.	71	13	58	13	n.a.	n.a.	-	-	-
1967	423	330	55	275	28	n.a.	n.a.	47	10	37	15	n.a.	n.a.	3	n.a.	n.a.
1968	519	396	64	332	12	n.a.	n.a.	78	10	68	15	n.a.	n.a.	18	n.a.	n.a.
1969	543	384	60	324	31	n.a.	n.a.	87	12	75	15	n.a.	n.a.	26	n.a.	n.a.
1970	587	411	60	351	21	n.a.	n.a.	100	20	80	3	n.a.	n.a.	52	n.a.	n.a.
Total	5,421	4,694	733	3,961	184	n.a.	n.a.	383	65	318	61	n.a.	n.a.	99	n.a.	n.a.

Sources: From the registrars' records of the seven universities.

TABLE C-6

GRADUATES IN THE FIELD OF ENGINEERING
(04)

Year	Grand Total	Chulalongkorn			Kasetsart			Khonkaen		
		Total	Male	Female	Total	Male	Female	Total	Male	Female
1950	76	76	76	-	-	-	-	-	-	-
1951	57	57	57	-	-	-	-	-	-	-
1952	43	43	43	-	-	-	-	-	-	-
1953	58	58	58	-	-	-	-	-	-	-
1954	67	67	67	-	-	-	-	-	-	-
1955	78	78	75	3	-	-	-	-	-	-
1956	99	99	99	-	-	-	-	-	-	-
1957	97	97	97	-	-	-	-	-	-	-
1958	137	137	136	1	-	-	-	-	-	-
1959	114	114	112	2	-	-	-	-	-	-
1960	186	167	165	2	19	19	-	-	-	-
1961	188	167	165	2	21	21	-	-	-	-
1962	212	181	181	-	31	31	-	-	-	-
1963	240	209	206	3	31	31	-	-	-	-
1964	239	214	214	-	25	25	-	-	-	-
1965	303	274	269	5	30	30	-	-	-	-
1966	262	224	217	7	38	38	-	-	-	-
1967	342	300	293	7	41	41	-	1	1	-
1968	293	258	253	5	29	29	-	6	6	-
1969	323	244	237	7	60	60	-	19	19	-
1970	397	295	292	3	73	73	-	29	29	-
Total	3,812	3,359	3,312	47	398	398	-	55	55	-

Sources: From the registrars' records of the seven universities.

TABLE C-7

GRADUATES IN THE FIELD OF PHARMACY
(03)

Year	Grand Total	Chulalongkorn and Medical University		
		Total	Male	Female
1950	52	52	n.a.	n.a.
1951	55	55	n.a.	n.a.
1952	38	38	n.a.	n.a.
1953	42	42	n.a.	n.a.
1954	41	41	n.a.	n.a.
1955	44	44	n.a.	n.a.
1956	55	55	n.a.	n.a.
1957	81	81	n.a.	n.a.
1958	68	68	n.a.	n.a.
1959	68	68	n.a.	n.a.
1960	23	23	n.a.	n.a.
1961	79	79	n.a.	n.a.
1962	90	90	n.a.	n.a.
1963	99	99	n.a.	n.a.
1964	76	76	n.a.	n.a.
1965	144	144	n.a.	n.a.
1966	108	108	n.a.	n.a.
1967	112	112	n.a.	n.a.
1968	109	109	46	63
1969	118	118	46	72
1970	110	110	48	62
Total	1,612	1,612	140	197

Sources: From the registrars' records of the seven universities.

TABLE C-8

GRADUATES IN THE FIELD OF ARCHITECTURE
(10)

Year	Grand Total	Chulalongkorn			Silpakorn		
		Total	Male	Female	Total	Male	Female
1950	7	7	7	-	-	-	-
1951	10	10	10	-	-	-	-
1952	7	7	5	2	-	-	-
1953	11	11	8	3	-	-	-
1954	6	6	6	-	-	-	-
1955	10	9	9	-	1	n.a.	n.a.
1956	22	21	18	3	-	-	-
1957	16	16	13	3	-	-	-
1958	15	15	9	6	-	-	-
1959	35	31	21	10	4	n.a.	n.a.
1960	50	42	34	8	8	n.a.	n.a.
1961	44	29	25	4	15	n.a.	n.a.
1962	44	34	28	6	10	n.a.	n.a.
1963	60	39	36	3	21	n.a.	n.a.
1964	77	63	53	10	14	n.a.	n.a.
1965	98	71	64	7	27	n.a.	n.a.
1966	100	69	55	14	31	n.a.	n.a.
1967	89	45	38	7	44	n.a.	n.a.
1968	94	47	41	6	47	n.a.	n.a.
1969	128	70	59	11	58	n.a.	n.a.
1970	126	59	45	14	67	n.a.	n.a.
Total	1,049	701	584	117	348	n.a.	n.a.

Sources: From the registrars' records of the seven universities.

TABLE C-9

GRADUATES IN THE FIELD OF SCIENCE
(07)

Year	Grand Total	Chulalongkorn			Kasetsart			Mahidol			Chiangmai			Khonkaen		
		Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
1950	35	35	7	28	-	-	-	-	-	-	-	-	-	-	-	-
1951	16	16	9	7	-	-	-	-	-	-	-	-	-	-	-	-
1952	23	23	7	16	-	-	-	-	-	-	-	-	-	-	-	-
1953	29	29	4	25	-	-	-	-	-	-	-	-	-	-	-	-
1954	40	39	20	19	1	n.a.	n.a.	-	-	-	-	-	-	-	-	-
1955	30	29	12	17	1	n.a.	n.a.	-	-	-	-	-	-	-	-	-
1956	43	40	12	28	3	n.a.	n.a.	-	-	-	-	-	-	-	-	-
1957	85	84	21	63	1	n.a.	n.a.	-	-	-	-	-	-	-	-	-
1958	88	87	21	66	1	n.a.	n.a.	-	-	-	-	-	-	-	-	-
1959	92	87	21	66	5	n.a.	n.a.	-	-	-	-	-	-	-	-	-
1960	129	120	17	103	6	n.a.	n.a.	3	-	3	-	-	-	-	-	-
1961	160	149	13	136	5	n.a.	n.a.	6	6	-	-	-	-	-	-	-
1962	122	106	14	92	8	n.a.	n.a.	8	6	2	-	-	-	-	-	-
1963	154	135	15	120	5	n.a.	n.a.	14	5	9	-	-	-	-	-	-
1964	174	148	9	139	14	n.a.	n.a.	12	7	5	-	-	-	-	-	-
1965	185	149	19	130	20	n.a.	n.a.	16	9	7	-	-	-	-	-	-
1966	202	156	3	153	27	n.a.	n.a.	19	6	13	-	-	-	-	-	-
1967	200	135	11	124	14	n.a.	n.a.	39	23	16	5	n.a.	n.a.	7	n.a.	n.a.
1968	287	150	4	146	23	n.a.	n.a.	43	23	20	46	n.a.	n.a.	25	n.a.	n.a.
1969	418	142	3	139	136	n.a.	n.a.	72	20	52	42	n.a.	n.a.	26	n.a.	n.a.
1970	554	278	111	167	143	n.a.	n.a.	83	32	51	45	n.a.	n.a.	5	n.a.	n.a.
Total	3,066	2,137	353	1,784	413	n.a.	n.a.	315	137	178	138	n.a.	n.a.	63	n.a.	n.a.

Sources: From registrars' records of the seven universities.

TABLE C-10

GRADUATES IN THE FIELD OF AGRICULTURE
(06)

Year	Grand Total	Kasetsart		
		Total[a]	Male	Female
1950	15	15	15	-
1951	19	19	19	-
1952	25	25	25	-
1953	33	33	33	-
1954	27	27	27	-
1955	52	52	48	4
1956	55	55	50	5
1957	86	86	80	6
1958	87	87	78	9
1959	133	133	112	21
1960	130	130	108	22
1961	158	158	129	29
1962	156	156	145	11
1963	157	157	136	21
1964	205	205	158	47
1965	232	232	178	59
1966	276	276	221	55
1967	296	296	228	68
1968	475	475	370	105
1969	194	194	91	103
1970	286	286	200	86
Total	3,097	3,097	2,446	651

Sources: From the registrars' records of the seven universities.

[a]The number includes some small number of graduates in the field of Veterinary Science from Chulalongkorn University.

TABLE C-11

GRADUATES IN THE FIELD OF MEDICINE
(05)

Year	Grand Total	Chulalongkorn and Medical University			Chiangmai		
		Total	Male	Female	Total	Male	Female
1950	149	149	81	68	-	-	-
1951	125	125	71	54	-	-	-
1952	229	229	143	86	-	-	-
1953	191	191	119	72	-	-	-
1954	221	221	156	65	-	-	-
1955	180	180	126	54	-	-	-
1956	204	204	152	52	-	-	-
1957	231	231	148	83	-	-	-
1958	220	220	168	52	-	-	-
1959	211	211	124	87	-	-	-
1960	249	249	183	66	-	-	-
1961	251	251	181	70	-	-	-
1962	265	265	188	77	-	-	-
1963	307	263	174	89	44	n.a.	n.a.
1964	292	244	171	73	48	n.a.	n.a.
1965	298	251	169	82	47	n.a.	n.a.
1966	291	244	133	111	47	n.a.	n.a.
1967	290	238	171	67	52	n.a.	n.a.
1968	321	260	166	94	61	n.a.	n.a.
1969	291	238	142	96	53	n.a.	n.a.
1970	329[a]	269[a]	150[a]	119[a]	60[a]	n.a.	n.a.
Total	5,145	4,733	3,116	1,617	412	n.a.	n.a.

Sources: From the registrars' records of the seven universities.

[a]Estimated figures.

APPENDIX D

SURVEY METHODOLOGY AND QUESTIONNAIRES

The main purpose for conducting this survey is to obtain time series data of earnings for new graduates, and the earnings of graduates of differing degrees of work experience of the same speciality for constructing the empirical demand-supply and cost-benefit models. The time-series data of earnings of new graduates can be obtained by asking the graduates of different work-experience groups how much they made when they started working soon after their graduation. Although the data for these series depends heavily on the correct recollection of those interviewed, we still can expect good results because most people usually remember the amount of their first pay check quite well. The other series can be obtained by asking the same group of graduates how much money they made from the time of graduation until the present time.

I started off by asking all of the possible business firms in the Bangkok-Thonburi Greater Area which are listed in the yellow pages of the telephone directory to give the numbers of their employees who have at least the first degree from universities in Thailand. The listing form is on the following page.

NAME OF THE FIRM

Total number of employees who at least have the first degree from the universities in Thailand

No.	Name of Employee	Sex	Degree	Name of University	Year of Graduation	Years of Work-Experience

I received good cooperation in this effort since I was able to list 5,214 out of a population of less than 16,248 university graduates which makes up about 1/3 of the population. The number 16,248 is taken from the total number of graduates, adjusted by the percentage of graduates working in Bangkok-Thonburi (BK-TH), minus the number employed in the public sector. I personally estimate the actual population in BK-TH at the time of the survey to be around 10,000 to 12,000. If this is true, the listing covers about 50% of the population. The reason for having the number of 10,000 to 12,000 to be actual population is because some of them may have more than one degree, and the universities count one person with 2 degrees as 2 graduates. It is also possible that many female graduates may already have left the job market. Many of the graduates may be working or studying abroad or temporarily out of the job market for other reasons and still others may be decreased. Nevertheless, I was quite satisfied with the listing. I took this listing and classified graduates into 11 major fields; then I classified them again by the amount of work-experience.

At this point I determined that I would take a sample size of 10 out of each classification. The sample size was limited by the budget I had. Each sample was selected by the help of the random table. In certain classes in which the listing population may be less than 10, I had to take them all. The total number of samples in my survey is 1,500, or about 15 percent of the actual population.

For the groups of graduates of more than 10 years of work-experience, the sample may represent more than 50 percent of the actual population. This result is caused by the fact that for many classes within these groups, the populations are less than 10. For the new graduates and the graduates with one year of work-experience, the samples will probably represent much less than 15 percent of the actual population.

Apart from interviewing the university graduates, I also interviewed the high school graduates in order to obtain the earnings data classified by their years of work-experience. This data will be used for constructing their earnings profile. This profile will represent the earnings foregone by the university graduates. The high school graduates were asked the same type of questions with less qualitative details than the university graduates. Both questionnaires will be seen below.

From question 32 of the questionnaire for the university graduates and questionnaire for the high school graduates, I could tabulate their earnings in each designated year in the following fashion.

As we move along the same rows, we have cross-section data for earnings of graduates of different age-cohort and different educational vintage in a given year. If we move along the same columns, we will have the time-series of earnings of graduates of the same educational vintage in different years. If we move along

Year of Graduation	Years of Work Experience in 1972	1	2	3	4	5	6	7	8	9	30
1971		X	X	X	X	X	X	X	X	X	X
1970			X	X	X	X	X	X	X	X	X
1969				X	X	X	X	X	X	X	X
1968					X	X	X	X	X	X	X
1967						X	X	X	X	X	X
1966							X	X	X	X	X
1965								X	X	X	X
1964									X	X	X
1963										X	X
--										. . . . .	X
--										. . . . .	X
1942											X

the diagonal lines, we will have a time-series data of earnings of graduates of the same amount of work-experience (in number of years) but who graduated from college in different years. The first diagonal line (the outermost one) represents the time-series data of earnings of new graduates, the ones which we use in our demand-supply model in Chapter IV.

The questions which are directly related to the tabulation of the above table, apart from question 32, are questions 6 and 36. The information from these two questions are used to adjust the data derived from the answer to question 32.

All other questions which were asked yield qualitative information which will be used in future studies. Data of immediate relevance for this study is the time-series data of earnings of the new graduates (Appendix F) and the time series data of earnings of graduates of the same specialty but of a different amount of work-experience (Appendix I).

CONFIDENTIAL SAMPLE OF QUESTIONNAIRE

The Questionnaire for the Graduates from the Universities in Thailand to Study the Earnings of Graduates

Prepared by the Faculty of Economics, Thommasat University 1971

(I) General Information

1. Sex

1.1 . . . male

1.2 . . . female

2. Month and year of birth

month . . . . . year . . . . . .

age . . . . . .

3. Marital status

3.1 . . . . . single

3.2 . . . . . married

3.3 . . . . . other

4. Do you have any dependents?

4.1 . . . . . yes

4.2 . . . . . no

If the answer is 4.1, go on to question 5. If the answer is 4.2, skip to question 7.

5. Is it because of your dependents that you have to work harder to earn more money?

5.1 . . . . . yes

5.2 . . . . . no

If the answer is 5.1, go on to question 6. If the answer is 5.2, skip to question 7.

6. If you did not have any dependents, would you work less than this?

6.1 . . . . . yes

6.1.1 by reducing work hours . . . . percent

6.1.2 earnings will be reduced by . . . . percent

6.2 . . . . . no

(II) Education

7. Indicate all your bachelor degrees which you have received from the universities in Thailand.

7.1 name of degree . . . . . .

name of university . . . . . .

major subject . . . . . minor subject . . . . . .

month and year of graduation . . . . . .

the length of period required by the university

. . . . . years

How long did it actually take you? . . . . . years

7.2 The same as 7.1

7.3 The same as 7.2

8. Why did you want university education?

Answer by putting 1, 2, 3, 4, and 5 by the priority you had in mind.

8.1 . . . . I expected to earn more money with the university degree than my high school diploma.

8.2 . . . . I anticipated better advancement in my career.

8.3 . . . . I wanted the university degree just for my own prestige and satisfaction.

8.4 . . . . I had ability, and I had enough money to go to a university and I chose to.

8.5 . . . . Others (specified) . . . . . .

9. Why did you choose to study in (7.1)?

9.1 . . . . Because I expected to earn more money than the graduates of other fields.

9.2 . . . . I could not gain admission into the field which I expected to make more money (specify the field which you thought would help you to earn more money . . . .)

9.3 . . . . Because I like the subject

9.4 . . . . I did not have any specific aim before

9.5 . . . . Others (specified) . . . . . .

. . . . . .

10. Who paid for your college education in (7.1)?

10.1 . . . . parents

10.2 . . . . guardian or relatives

10.3 . . . . scholarship

10.4 . . . . I financed my own

10.4.1 . . . . by saving before entering the university

10.4.2 . . . . by working while I was studying

10.5 . . . . by the combination of previous methods (specified) . . . . . .

. . . . . .

If the answer is 10.1 or 10.2 one or the other alone, go on to question 11. If not, skip to question 18.

(III) Profession and Earnings of Parents and Guardians

when the interviewee was a first-year student in the university.

11. What were your parents or guardians doing?

11.1 . . . . daily employed workers

11.2 . . . . employees in small private enterprises

11.3 . . . . employees in big private enterprises

11.4 . . . . civil service . . . . . .

(specify rank and position)

11.5 . . . . employees of public enterprises . . .

(specify rank and position)

11.6 Farmers

11.6.1 . . . own pieces of land of 20 rais or less

11.6.2 . . . own pieces of land of 20-50 rais

11.6.3 . . . own pieces of land more than 50 rais

11.7 . . . . independent operator

11.8 . . . . own businesses

11.8.1 . . . small business

11.8.2 . . . medium size business

11.8.3 . . . big business

11.9 . . . . others (specified) . . . . . .

. . . . . .

12. Approximation of earning made by your parents or guardians both in money and in kind

. . . . baht per month

. . . . baht per year

13. How did you rate the status of your parents or your guardians at that time?

13.1 . . . very poor

13.2 . . . poor

13.3 . . . average

13.4 . . . above average

13.5 . . . very rich

14. Had your parents or guardians any influence in your choice of study?

14.1 . . . yes

14.2 . . . no

(IV) Profession and Earning of Parents or Guardians (when the interviewee graduated)

15. The same as 11

16. The same as 12

17. The same as 13

(V) Profession and Earnings of the Interviewee

18. Did you work in any private enterprise at any time before or after you finished your high school?

18.1 . . . yes

18.2 . . . no

If the answer is 18.1, go on to question 19. If the answer is 18.2, skip to question 20.

19. When I started working after receiving my high school diploma, I was . . . . years old, in the year . . . .
Earnings (both in money and in kind) in that year were . . . . bahts

20. Did you work before your graduation?
20.1 . . . yes
20.2 . . . no

21. Did you gain any promotion after your graduation?
21.1 . . . yes
21.2 . . . no

If the answer is 21.2, go on to question 22. If the answer is 21.1, skip to question 23.

22. The reason for not gaining any promotion.
22.1 . . . . because the job did not require any knowledge of the university training in my field and/or my earning was already high at that time.
22.2 . . . . others (specified) . . . . . .
. . . . . .

23. Did you wish to study further or to change your job?
23.1 . . . . I wish to change my job
23.2 . . . . I wish to study further right away
23.3 . . . . I have no preference

If the answer is not 23.2, skip to question 29.

24. After finishing your first degree, did you study full time in Thailand for another degree right away without working, or study abroad?

24.1 . . . . studied abroad

24.2 . . . . studied full time in Thailand

24.3 . . . . studied in Thailand and worked at the same time

24.4 . . . . went for further study after . . . . years of working

24.5 . . . . I have no other education, so far.

If the answer is 24.1 or 24.2, go on to questions 25 and 26. If the answer is not in the two, skip to question 27.

25. Did you receive any diploma or certificate?

25.1 . . . . yes

25.2 . . . . no

26. After you finished your education, did you realize that your earnings were higher than those who had only their first degree?

26.1 . . . . yes

26.2 . . . . no

If the answer is 26.1, the interview is over. If the answer is 26.2, go on to question 27.

27. Upon graduation, what was your attitude about getting a job?

27.1 . . . . I had to get a job right away

27.2 . . . . I should wait for an appropriate job

27.3 . . . . I should relax for a while and then find a job

27.4 . . . . I intended not to do anything for a while

If the answer is 27.1, go on to question 28. If not, skip to question 29.

28. Was a job made compulsory by the poor situation of your family?

28.1 . . . . yes

28.2 . . . . no

29. How many months were you unemployed right after your graduation? . . . . months

30. What was your first job?

position . . . . . .

type of job . . . . .

type of business enterprise . . . . . .

month and year you first started working . . . . . .

31. How many times did you change your jobs? . . . . . .

No.	Position	Type of Job	Type of Business Enterprise	Duration of Job			
				From		To	
				Month	Year	Month	Year
1							
2							
3							
4							
5							

32. After you started working (since your graduation) until now, how much did you make monthly or annually (in money and in kind)? Please read the instruction in detail and try to answer with the help of Table 1(a) and (b).

No.	Year	All Earnings per month	All Earnings per year	No.	Year	All Earnings per month	All Earnings per year
1.				16.			
2.				17.			
3.				18.			
4.				19.			
5.				20.			
6.				21.			
7.				22.			
8.				23.			
9.				24.			
10.				25.			
11.				26.			
12.				27.			
13.				28.			
14.				29.			
15.				30.			

Note: This question is the most important question of this questionnaire. Please spend as much time as possible and make as much elaborate calculation as possible. Read the instructions for this

question at every interview to be sure that no information is missing. Please note that if the answer in this part is incomplete the whole questionnaire will be useless.

33. Did you have any further training?

33.1 . . . . yes

33.2 . . . . no

If the answer is 33.1, go on to question 34. If the answer is 33.2, the interview is over.

34. Certificates and Diplomas from further training.

34.1 name of a certificate or a diploma . . . . . .

. . . . . .

month and year of receiving . . . . . .

34.2 the same as 34.1

34.3 the same as 34.2

35. Did you gain any promotion after your additional training?

35.1 . . . . yes

35.2 . . . . no

If the answer is 35.1, go on to question 36. If the answer is 35.2, the interview is over.

36. Number of promotions as the result of your additional training . . . . . .

36.1 promotion from first additional training

previous salary . . . . . bahts

new salary . . . . . bahts

month and year of promotion . . . . . .

as a consequence of this promotion, earning was

increased by . . . . . percent

36.2 promotion from second additional training

the same as 36.1

36.3 promotion from third additional training

the same as 36.2

(VI) Interviewer's Note

37. How do you rate the cooperation of the interviewee?

37.1 . . . . very good

37.2 . . . . good

37.3 . . . fair

37.4 . . . . poor

37.5 . . . . very poor

38. What is your comment on the informati about professions and earning of parents or guardians?

38.1 . . . . quite accurate

38.2 . . . . correct

38.3 . . . . fair

38.4 . . . . incorrect

39. What is your comment on the information in question 32?

39.1 . . . . quite accurate

39.2 . . . . correct

39.3 . . . . fair

39.4 . . . . not accurate

39.4.1 about . . . . percent over estimated

39.4.2. about . . . . percent under estimated

Total time for interviewing . . . . hours . . . . minutes.

Time for question 32 . . . . hours . . . . minutes.

Date of interviewing Signature . . . . . .

. . . . . (. . . . . .)

TABLE 1 (a)

TABLE FOR HELPING TO CALCULATE EARNING FOR QUESTION 32

Year	Total Earning	Total Earning from Main Jobs	Annual or Monthly Earning from the Main Job (baht				
			Employee		Self Employed	Working for Family	Others
			Salary	Fringe Benefit			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

TABLE 1 (b)

TABLE FOR HELPING TO CALCULATE EARNING FOR QUESTION 32

Annual or Monthly Earning from Other Part-time Jobs (baht)			
Total Earning from Part-time Jobs	First Job	Second Job	Third Job
(9)	(10)	(11)	(12)

CONFIDENTIAL SAMPLE QUESTIONNAIRE

The Questionnaire for the High School Graduates
to Study the Earnings of the Graduates

Prepared by the Faculty of Economics, Thammasat University 1971

(I) General Information

The same as the questionnaire for the university graduates

(II) Education

7. When did you finish your high school?

. . . . . .

8. What was your major?

8.1 . . . . Science

8.2 . . . . Arts

8.3 . . . . General

9. What was your score on your high school final exam?

9.1 50-59

9.2 60-69

9.3 70-79

9.4 80-89

9.5 . . . . over 90

10. Why did you not want to continue your education in the university?

10.1 . . . . I already had my job, and a university education would not help me to earn more money; it was a waste of time.

10.2 . . . . I wanted to study to earn more income, but I could not afford it.

10.3 . . . . I wanted to study to gain high prestige, but I could not afford it.

10.4 . . . . I was lazy, and I thought high school education was enough for me.

10.5 . . . . Others (specified) . . . . . .

. . . . . .

11. The same as question 30 of the questionnaire for the university graduates.

12. The same as 31 of the questionnaire for the university graduates.

13. The same as 32 of the questionnaire for the university graduates.

APPENDIX E

ADMISSION, GRADUATE, AND EMPLOYMENT FIGURES

The number of admissions and the number of graduates are taken from the registrars' records of the seven universities. The data for graduates working in the public sector has been taken from the records of government personnel from all of the government offices in the Bangkok-Thonburi Greater Area.

The number employed in the private sector is calculated by the following method. The system of universities in our study from 1950 to 1970 produced 51,088 graduates. The data of the National Statistic Office (NSO) in 1969 revealed that almost 78 percent of graduates are employed in the Bangkok-Thonburi, and a little more than 22 percent are employed in the rest of the country.

The data of the NSO includes the existing graduates in Thailand up to 1969. Since our period of study only covers 1950 to 1970, and the recent trend shows that more graduates have been working in the rest of the country, I decided to take 75 percent to be the number of graduates working in Bangkok-Thonburi within our study period. The number of graduates working in Bangkok-Thonburi is then calculated to be 38,316.* Subtracting the 25,023, which is the number of

graduates employed in the public sector, we obtain 13,293 as the estimate for the number of graduates employed in the private sector in Bangkok-Thonburi.

This survey has covered 4,800 graduates who have been working in the private sector within the study period. The distribution of these graduates is as indicated in Table E-1 and E-2.

TABLE E-1

THE SURVEY DATA OF THE SOCIAL SCIENCE GRADUATES WORKING IN THE PRIVATE SECTOR FROM 1950-1970

Year	Commerce and Accountancy	Economics	Law	Sub-Field of Social Science	Arts and Humanities
	(01)	(02)	(08)	(09)	(11)
1950	16	1	9	0	5
1951	21	1	4	1	8
1952	28	1	48	0	1
1953	42	3	21	1	3
1954	37	3	6	3	1
1955	23	3	8	4	5
1956	17	3	5	7	5
1957	54	6	2	7	3
1958	55	5	1	7	5
1959	58	0	10	5	6
1960	75	15	10	15	5
1961	35	3	3	12	8
1962	81	3	17	15	9
1963	121	11	48	8	9
1964	185	41	75	20	32
1965	210	47	89	32	22
1966	277	56	55	27	28
1967	169	37	46	16	29
1968	126	62	23	31	37
1969	154	72	45	48	69
1970	131	49	23	21	45

TABLE E-2

THE SURVEY DATA OF THE NATURAL SCIENCE GRADUATES WORKING IN THE PRIVATE SECTORS FROM 1950-1970

Year	Engi-neering (04)	Pharmacy (03)	Archi-tecture (10)	Science (07)	Agri-culture (06)	Medicine (05)
1950	17	1	0	3	1	1
1951	9	2	1	0	1	3
1952	5	5	1	1	1	5
1953	12	3	1	1	1	2
1954	14	3	1	1	1	5
1955	18	5	0	1	1	5
1956	18	5	1	0	1	3
1957	17	2	1	5	1	3
1958	26	11	1	2	2	4
1959	33	9	2	2	3	4
1960	44	3	9	7	5	2
1961	43	5	1	5	2	4
1962	57	5	1	3	6	3
1963	42	6	5	6	3	3
1964	56	9	8	3	11	5
1965	57	5	14	11	8	4
1966	45	15	3	10	11	1
1967	51	9	18	7	7	3
1968	54	14	11	9	17	4
1969	49	20	16	12	8	1
1970	77	18	7	35	5	4

The numbers of these graduates are then adjusted by the average rate of mortality in Thailand for various age groups.

Age	Average Rate of Mortality
25-29	0.02969
30-34	0.03530
35-39	0.03858

Age	Average Rate of Mortality
40-44	0.04981
45-49	0.05547

Source: Computed from Table 3 of the Kasetsart Economic Report No. 31, Estimates of the Thai Population, 1947-1976, and Some Agricultural Implications, Pradit Charsombuti and Melvin M. Wagner (Faculty of Economics and Business Administration, Kasetsart University: March, 1969), p. 15.

The total number of graduates after the adjustment turns out to be 4,977. To obtain the number of graduates by field in each year, we multiply the newly adjusted number by 2.6740 (or 13,293/4,977 which is the ratio of the population of graduates working in the private sector in Bangkok-Thonburi and the total number of graduates from the survey adjusted by the mortality indices). This computed number is subjected to one constraint, that the sum of this calculated number and the number employed in the public sector must be less than or equal to the number of graduates.

It should be observed at this point that the transferring of jobs from private sector to public sector, though possible, is not very likely. The scale offered by the public sector has been based on the applicant's credentials alone regardless of his experience. The graduate who has for some years been working with the private sector and wishes to work in the public sector, must start all over again as if he were a new graduate. The movement from public sector to private sector is more likely, but it is not common. The

private sector always complains that the previous government employee comes to their organization with his bureaucratic attitude intact, which is unsuitable for the nature of private enterprise, where profit is the prime motive. Because of this barrier of movement between the two sectors, there is a good reason to believe that this estimation is quite respectable. E-3 to E-7 represent the data of the general field of social sciences classified by each major field. E-8 to E-13 represent the data of the general field of natural sciences classified by each major field.

TABLE E-3

ADMISSION, GRADUATE, AND EMPLOYMENT FIGURES:
COMMERCE AND ACCOUNTANCY
(01)

Year	No. of Admissions	No. of Graduates	Graduates Working in BK-TH		
			Total	Public Sector	Private Sector
1945	194				
1946	310				
1947	311				
1948	447				
1949	540				
1950	309	81	79	34	45
1951	425	94	92	33	59
1952	486	161	156	77	79
1953	464	180	178	60	118
1954	556	238	228	124	104
1955	958	273	207	142	65
1956	960	197	167	120	47
1957	1,271	474	396	246	150
1958	1,594	262	249	96	153
1959	1,958	258	253	92	161
1960	2,442	289	279	70	209
1961	844	215	209	112	97
1962	768	382	330	105	225
1963	599	408	382	47	335
1964	505	746	731	218	513
1965	549	1,053	825	243	582
1966	897	1,765	1,143	380	763
1967	1,138	779	769	302	467
1968	1,041	566	558	211	347
1969	859	633	555	130	425
1970	883	864	807	446	361

TABLE E-4

ADMISSION, GRADUATE, AND EMPLOYMENT FIGURES:
ECONOMICS
(02)

Year	No. of Admissions	No. of Graduatees	Graduates Working in BK-TH		
			Total	Public Sector	Private Sector
1945	16				
1946	36				
1947	42				
1948	40				
1949	56				
1950	82	14	11	8	3
1951	74	17	12	9	3
1952	67	17	12	9	3
1953	100	23	20	12	8
1954	220	23	20	12	8
1955	188	23	20	12	8
1956	248	36	26	18	8
1957	341	52	44	27	17
1958	273	53	41	27	14
1959	435	58	30	30	0
1960	799	124	107	65	42
1961	317	89	39	31	8
1962	392	95	58	50	8
1963	288	197	122	92	30
1964	417	338	290	176	114
1965	360	388	331	202	129
1966	714	469	397	243	154
1967	722	310	263	161	102
1968	608	367	362	191	171
1969	750	332	328	130	198
1970	859	404	347	212	135

TABLE E-5

ADMISSION, GRADUATE, AND EMPLOYMENT FIGURES:
LAW (08)

Year	No. of Admissions	No. of Graduates	Graduates Working in BK-TH		
			Total	Public Sector	Private Sector
1945	892				
1946	2,111				
1947	2,885				
1948	331				
1949	343				
1950	819	342	231	177	54
1951	808	302	167	156	11
1952	845	715	506	371	135
1953	1,028	977	606	547	59
1954	1,197	114	75	58	17
1955	1,290	116	82	60	22
1956	816	93	62	48	14
1957	1,280	112	102	96	6
1958	1,736	119	61	58	3
1959	1,959	113	88	60	28
1960	3,028	117	88	60	28
1961	651	122	68	60	8
1962	684	275	180	133	47
1963	265	576	487	354	133
1964	348	802	623	415	208
1965	314	1,146	841	594	247
1966	657	1,654	1,009	857	152
1967	693	563	419	292	127
1968	940	293	215	152	63
1969	744	479	372	248	124
1970	751	632	391	328	63

TABLE E-6

ADMISSION, GRADUATE, AND EMPLOYMENT FIGURES: THE SUB-FIELD OF SOCIAL SCIENCE
(09)

Year	No. of Admissions	No. of Graduates	Graduates Working in BK-TH		
			Total	Public Sector	Private Sector
1945	94				
1946	129				
1947	136				
1948	164				
1949	143				
1950	306	44	22	22	0
1951	225	53	30	27	3
1952	317	73	39	39	0
1953	274	77	48	45	3
1954	363	84	51	43	8
1955	314	84	54	43	11
1956	317	103	72	53	19
1957	685	115	78	59	19
1958	1,159	189	115	96	19
1959	1,597	144	86	72	14
1960	1,583	213	148	106	42
1961	626	198	133	100	33
1962	261	266	177	135	42
1963	335	247	148	126	22
1964	242	473	295	240	55
1965	571	469	327	238	89
1966	605	570	363	289	74
1967	738	250	171	127	44
1968	905	229	202	117	85
1969	993	370	320	188	132
1970	1,077	644	373	315	58

TABLE E-7

ADMISSION, GRADUATES, AND EMPLOYMENT FIGURES:
ARTS AND HUMANITIES
(11)

Year	No. of Admissions	No. of Graduates	Graduates Working in BK-TH		
			Total	Public Sector	Private Sector
1945	61				
1946	53				
1947	57				
1948	67				
1949	64				
1950	140	52	41	27	14
1951	137	55	49	27	22
1952	125	64	40	37	3
1953	145	72	50	42	8
1954	208	102	64	61	3
1955	183	106	73	59	14
1956	249	147	107	93	14
1957	345	158	113	105	8
1958	317	183	137	123	14
1959	393	198	150	133	17
1960	335	169	129	115	14
1961	519	182	165	143	22
1962	598	277	208	183	25
1963	597	375	277	252	25
1964	692	360	273	184	89
1965	757	351	265	204	61
1966	986	498	332	255	77
1967	1,068	423	303	223	80
1968	1,176	519	386	284	102
1969	1,298	542	404	214	190
1970	1,419	587	345	221	124

TABLE E-8

ADMISSION, GRADUATES, AND EMPLOYMENT FIGURES:
OF ENGINEERING
(04)

Year	No. of Admissions	No. of Graduates	Graduates Working in BK-TH		
			Total	Public Sector	Private Sector
1945	85				
1946	139				
1947	100				
1948	76				
1949	131				
1950	172	72	64	16	48
1951	130	57	45	20	25
1952	144	43	28	14	14
1953	155	58	50	16	34
1954	260	67	54	15	39
1955	275	78	69	18	51
1956	311	99	81	31	50
1957	317	97	73	26	47
1958	357	137	114	42	72
1959	370	114	105	13	92
1960	245	186	161	39	122
1961	291	188	163	44	119
1962	300	212	188	30	158
1963	355	240	190	74	116
1964	407	239	208	53	155
1965	407	303	243	85	158
1966	580	262	211	87	124
1967	585	342	262	121	141
1968	524	293	258	109	149
1969	573	323	254	119	135
1970	602	397	302	90	212

TABLE E-9

ADMISSION, GRADUATES, AND EMPLOYMENT FIGURES:
PHARMACY
(03)

Year	No. of Admissions	No. of Graduates	Graduates Working in BK-TH		
			Total	Public Sector	Private Sector
1945	38				
1946	60				
1947	53				
1948	56				
1949	39				
1950	43	52	30	27	3
1951	42	55	35	29	6
1952	45	38	34	20	14
1953	56	42	36	22	8
1954	83	41	29	21	8
1955	69	44	37	23	14
1956	69	55	43	29	14
1957	24	81	48	42	6
1958	81	68	66	35	31
1959	92	68	60	35	25
1960	101	23	20	12	8
1961	77	79	55	41	14
1962	147	90	61	47	14
1963	110	99	69	52	17
1964	114	76	65	40	25
1965	111	144	89	75	14
1966	120	108	97	56	41
1967	113	112	83	58	25
1968	131	109	96	57	39
1969	149	118	116	61	55
1970	167	110	107	57	50

TABLE E-10

ADMISSION, GRADUATES, AND EMPLOYMENT FIGURES:
ARCHITECTURE
(10)

Year	No. of Admissions	No. of Graduates	Graduates Working in BK-TH		
			Total	Public Sector	Private Sector
1945	29				
1946	28				
1947	14				
1948	25				
1949	20				
1950	36	7	7	6	1
1951	44	10	8	5	3
1952	37	7	6	3	3
1953	67	11	11	8	3
1954	99	6	6	4	2
1955	108	10	10	9	1
1956	125	22	22	19	3
1957	127	16	15	12	3
1958	98	15	15	13	2
1959	142	35	33	27	6
1960	132	50	47	22	25
1961	153	44	34	31	3
1962	144	44	44	41	3
1963	136	60	56	42	14
1964	147	77	63	41	22
1965	152	98	92	53	39
1966	179	100	94	86	8
1967	198	89	83	33	50
1968	174	94	91	61	30
1969	164	128	123	79	44
1970	163	126	122	103	19

TABLE E-11

ADMISSION, GRADUATE, AND EMPLOYMENT FIGURES:
SCIENCE
(07)

Year	No. of Admissions	No. of Graduates	Graduates Working in BK-TH		
			Total	Public Sector	Private Sector
1945	45				
1946	21				
1947	30				
1948	37				
1949	45				
1950	129	35	29	21	8
1951	74	16	12	12	0
1952	80	23	23	20	3
1953	108	29	24	21	3
1954	100	40	33	30	3
1955	167	30	23	20	3
1956	167	43	31	31	0
1957	111	85	71	57	14
1958	231	88	56	50	6
1959	141	92	74	68	6
1960	153	129	105	86	19
1961	254	160	130	116	14
1962	401	122	99	91	8
1963	354	154	130	113	17
1964	358	174	147	139	8
1965	404	185	157	127	30
1966	725	202	174	147	27
1967	774	200	174	155	19
1968	817	287	255	230	25
1969	859	418	378	345	33
1970	961	554	538	442	96

TABLE E-12

ADMISSION, GRADUATES, AND EMPLOYMENT FIGURES:
AGRICULTURE
(06)

Year	No. of Admissions	No. of Graduates	Graduates Working in BK-TH		
			Total	Public Sector	Private Sector
1945	25				
1946	33				
1947	41				
1948	36				
1949	70				
1950	72	15	11	8	3
1951	115	19	13	10	3
1952	123	25	16	13	3
1953	186	33	19	16	3
1954	172	27	17	14	3
1955	211	52	30	27	3
1956	210	55	31	28	3
1957	210	86	48	45	3
1958	301	87	54	48	6
1959	310	133	80	72	8
1960	374	130	81	67	14
1961	396	158	88	82	6
1962	769	156	98	81	17
1963	259	157	89	81	8
1964	382	205	147	117	30
1965	394	232	143	121	22
1966	398	276	175	145	30
1967	500	196	173	154	19
1968	751	475	345	298	47
1969	844	194	122	100	22
1970	882	286	162	148	14

TABLE E-13

ADMISSION, GRADUATE, AND EMPLOYMENT FIGURES:
MEDICINE
(05)

Year	No. of Admissions	No. of Graduates	Graduates Working in BK-TH		
			Total	Public Sector	Private Sector
1945	125				
1946	180				
1947	151				
1948	276				
1949	230				
1950	267	149	81	78	3
1951	217	125	77	69	8
1952	248	229	134	120	14
1953	267	191	110	104	6
1954	265	221	130	116	14
1955	254	180	117	103	14
1956	300	204	115	107	8
1957	353	231	124	116	8
1958	372	220	126	115	11
1959	374	211	120	109	11
1960	354	249	135	129	6
1961	359	251	141	130	11
1962	351	265	165	157	8
1963	349	307	167	159	8
1964	386	292	167	153	14
1965	480	298	166	155	11
1966	482	291	154	151	3
1967	468	290	158	150	8
1968	405	321	177	166	11
1969	454	291	154	151	3
1970	502	329[a]	191[a]	180[a]	11[a]

[a]Estimated figures.

APPENDIX F

DATA ON CURRENT EARNINGS OF FIRST YEAR GRADUATES

TABLE F-1

AVERAGE ANNUAL EARNINGS OF FIRST-YEAR GRADUATES IN THE GENERAL FIELD OF SOCIAL SCIENCES

Year	Commerce and Accountancy	Economics	Law	Sub-Field of Social Sciences	Arts and Humanities
	(01)	(02)	(08)	(09)	(11)
1952	22,000	21,200	23,700	20,000	26,800
1953	17,800	19,700	21,600	18,000	22,800
1954	14,500	17,700	10,400	15,400	18,800
1955	15,400	10,800	12,400	13,000	13,500
1956	20,200	10,800	15,000	11,400	12,000
1957	13,900	13,000	13,600	13,000	10,800
1958	12,900	16,800	11,600	18,000	12,800
1959	17,500	18,400	11,900	13,800	[illegible],200
1960	15,200	16,000	16,900	12,700	13,000
1961	19,100	14,200	14,900	15,100	16,000
1962	16,100	21,100	20,500	18,900	14,000
1963	15,900	19,500	14,000	16,300	13,400
1964	17,600	25,400	18,900	16,300	14,100
1965	18,400	20,100	14,500	16,800	16,800
1966	17,800	28,400	14,500	16,400	22,000
1967	18,900	29,000	21,900	22,600	19,500
1968	22,900	18,400	19,300	27,000	20,400
1969	22,800	20,900	20,100	22,500	26,200
1970	26,200	26,200	27,300	20,900	24,900

TABLE F-2

AVERAGE ANNUAL EARNINGS OF FIRST-YEAR GRADUATES IN THE GENERAL FIELD OF NATURAL SCIENCES

Year	Pharmacy (03)	Engineering (04)	Architecture (10)	Science (07)	Agriculture (06)	Medicine (05)
1952	13,000	14,000	17,300	11,900	13,200	14,000
1953	10,800	15,600	13,700	12,900	12,600	21,300
1954	14,900	16,100	11,000	13,900	13,200	18,200
1955	19,000	17,700	12,500	14,900	13,800	16,000
1956	16,400	18,800	12,900	15,900	16,500	29,800
1957	29,000	18,900	13,000	12,000	13,500	27,000
1958	25,600	15,000	13,100	12,300	19,800	16,800
1959	22,600	21,200	13,200	12,600	14,600	17,600
1960	24,000	22,900	13,200	12,000	19,100	19,500
1961	26,500	23,200	20,800	13,900	23,600	16,300
1962	24,000	35,400	35,500	15,000	28,000	31,200
1963	31,800	48,500	25,500	20,300	17,700	25,600
1964	36,000	34,600	28,400	32,800	23,600	32,700
1965	33,400	47,700	24,000	27,500	29,500	18,800
1966	35,800	53,700	27,700	32,100	46,200	20,800
1967	39,300	53,700	31,600	19,500	34,400	37,000
1968	36,600	45,700	22,600	25,500	50,600	25,600
1969	48,900	45,200	28,600	30,200	35,400	23,600
1970	57,200	52,800	32,100	25,200	27,400	24,500

APPENDIX G

SECTORAL GDP DATA AND CONSUMER PRICE INDEX

TABLE G-1

GDP DATA BY ECONOMIC SECTOR AT 1962 PRICE AND CONSUMER PRICE INDEX OF BANGKOK-THONBURI AREA (1962 PRICE=100.0)[a]

Year	GDP by Economic Sector								Consumer Price Index BK-TH Area
	MAN (03)	CON (04)	EWS (05)	TAC (06)	WRT (07)	BIR (08)	PAD[b] (10)	SES (11)	
1950	5,043	875	40	1,421	4,491	215	1,919	3,353	68.6
1951	5,354	1,039	55	1,688	5,198	226	1,8[illegible]7	3,345	77.9
1952	5,655	1,310	58	2,012	5,929	271	1,771	3,308	84.4
1953	6,058	1,433	68	2,191	6,317	350	1,823	3,725	86.3
1954	6,217	1,545	98	2,292	6,588	441	1,949	4,086	[illegible]6
1955	6,042	1,650	132	2,630	6,997	655	2,047	4,250	88.9
1956	6,554	1,749	147	2,776	7,282	668	2,118	4,296	91.7
1957	6,727	1,902	148	2,942	5,066	726	2,165	4,352	95.8
1958	6,738	2,078	176	2,935	7,821	771	2,244	4,566	98.4
1959	7,277	2,258	213	3,393	8,365	945	2,379	5,180	96.1
1960	7,320	2,725	241	4,224	8,846	1,089	2,586	5,418	96.4
1961	8,013	2,863	326	4,248	9,472	1,276	2,714	5,742	97.6
1962	8,997	3,270	378	4,633	9,878	1,480	2,848	6,142	100.0
1963	9,811	3,614	386	4,795	10,883	1,614	3,121	6,548	100.9

TABLE G-1 (Continued)

Year	GDP by Economic Sector								Consumer Price Index BK-TH Area
	MAN (03)	CON (04)	EWS (05)	TAC (06)	WRT (07)	BIK (08)	PAD[b] (10)	SES (11)	
1964	10,655	4,152	479	5,348	12,095	1,861	3,208	7,030	102.9
1965	12,355	4,612	609	5,609	12,824	2,136	3,458	7,771	103.8
1966	13,975	5,604	809	6,013	14,133	2,620	3,542	8,539	107.8
1967	15,157	6,669	982	6,524	15,877	3,068	3,827	9,397	112.0
1968	16,680	7,266	1,189	6,863	17,249	3,565	4,363	10,441	114.4
1969	18,456	7,599	1,428	7,638	18,819	4,124	4,765	11,216	116.8
1970	19,820	8,014	1,681	8,131	19,514	4,759	5,366	12,305	117.7

Sources: GDP data are made available by the Division of National Income Account; 1970 data are the estimated data by the Division of Planning, NEDB. The consumer price index is taken from the publication of the Department of Commercial Intelligence, Ministry of Economic Affairs.

[a]Million bahts.

[b]Public Administration and Defense.

APPENDIX H

MATRICES OF SIMPLE CORRELATION
(SS and NS)

Field	ln D	ln RW	ln RWO	Field	ln D	ln RW	ln RWO
01. CAA				04. ENN			
ln RW	-.27			ln RW	.82		
ln RWO	.57	.11		ln RWO	.73	.71	
ln RY_{BIR}	.80	-.07	.20	ln RY_{EWS}	.87	.94	.84
02. ECO				03. PHA			
ln RW	.25			ln RW	.56		
ln RWO	-.10	.11		ln RWO	.68	.90	
ln RY_{BIR}	.81	.20	-.07	ln RY_{MAN}	.77	.86	.88
08. LAW				10. ARC			
ln RW	.42			ln RW	.51		
ln RWO	.36	.53		ln RWO	.78	.74	
ln RY_{BIR}	.50	.05	.11	ln RY_{TAC}	.82	.70	.94
09. SSS				07. SCI			
ln RW	-.19			ln RW	.45		
ln RWO	-.27	.53		ln RWO	.82	.70	
ln RY_{BIR}	.91	.08	-.03	ln RY_{MAN}	.83	.72	.91
11. AAH							
ln RW	-.05						
ln RWO	.14	.79					
ln RY_{TAC}	.94	-.06	.14				

APPENDIX I

THE COMPUTATION OF THE TIME-SERIES EARNINGS-PROFILES

As we have seen from Appendix D the earnings data from question 32 of our questionnaire are tabulated in such a fashion that the data in the same rows represent the cross-section data of earnings of graduates of different age-cohort and different educational vintage in given years. The data in the diagonal lines represent earnings of graduates of the same years of work experience but who graduated from college in different years. The data in the columns represent time-series data of earnings of the graduates of the same educational vintage in different years. We take the last five columns of the time-series data of earnings of graduates to compute the time-series profiles of earnings for our further analysis. We take the last five because they are the longest series which we have and because we feel that the sample in each group is too small therefore it will be better to work with the average of the five groups for the sake of greater reliability. In order to obtain our averages, these data are first adjusted by the price indices then the earnings of all graduates of the same years of work experience are added together and divided by 5. These final series are the series of the averages of the real

earnings of graduates of various fields. These series are the ones which we shall use to compute the earnings profiles.

The time-series data of earnings, consumer price indices, and the average of real earnings of each group are in the tables below.

TABLE I-1

TIME-SERIES DATA OF EARNINGS OF COMMERCE AND ACCOUNTANCY (01)[a]

Year	5th Series	4th Series	3rd Series	2nd Series	1st Series
1945	20				
1946	48	36			
1947	69	52	48		
1948	73	72	65	78	
1949	92	96	90	87	114
1950	113	111	110	111	158
1951	118	120	135	126	192
1952	130	139	146	150	252
1953	152	148	160	165	261
1954	168	178	175	179	380
1955	194	206	199	197	361
1956	240	234	216	212	395
1957	288	247	238	232	433
1958	320	271	288	236	386
1959	339	293	395	338	404
1960	370	332	456	388	459
1961	403	357	505	407	476
1962	437	394	561	427	514
1963	472	417	610	460	534
1964	525	444	678	494	567
1965	574	471	727	520	632
1966	634	531	778	558	721
1967	654	607	842	616	731
1968	697	623	926	664	749
1969	725	625	1,063	767	808
1970	765	647	1,137	831	854
1971	808	683	1,225	892	949

[a]In current prices, in 100 baht.

TABLE I-2

TIME SERIES DATA OF EARNINGS OF ARTS AND HUMANITIES (11)[a]

Year	5th Series	4th Series	3rd Series	2nd Series	1st Series
1941	18				
1942	22	16			
1943	26	22	12		
1944	33	30	15	16	
1945	42	40	18	29	15
1946	58	55	22	52	54
1947	85	74	27	96	58
1948	117	101	34	113	63
1949	150	120	42	182	68
1950	192	144	49	188	73
1951	222	168	59	249	79
1952	264	228	88	282	85
1953	270	276	106	308	91
1954	306	324	125	308	95
1955	351	342	145	308	106
1956	450	360	221	308	115
1957	492	384	239	337	123
1958	504	420	257	351	133
1959	588	456	278	599	144
1960	642	504	229	644	155
1961	711	582	458	693	167
1962	786	672	484	746	180
1963	870	780	525	802	180
1964	917	813	555	863	179
1965	995	910	588	928	178
1966	1,125	1,050	679	999	177
1967	1,220	1,120	726	999	176
1968	1,400	1,360	752	1,074	187
1969	1,500	1,440	769	1,240	199
1970	1,553	1,425	790	1,298	211
1971	1,664	1,500	813	1,360	221

[a]In current prices, in 100 bahts.

TABLE I-3

TIME-SERIES DATA OF EARNINGS OF ENGINEERING (04)[a]

Year	5th Series	4th Series	3rd Series	2nd Series	1st Series
1941	20				
1942	31	19			
1943	40	21	41		
1944	52	59	65	23	
1945	73	63	67	27	85
1946	81	76	81	38	93
1947	97	90	104	53	112
1948	125	123	115	73	99
1949	150	151	176	99	132
1950	184	374	219	138	153
1951	212	384	258	155	210
1952	288	398	295	180	272
1953	310	421	338	205	295
1954	435	445	379	283	365
1955	571	456	421	271	424
1956	445	480	472	295	453
1957	463	516	566	325	490
1958	545	423	604	364	558
1959	591	567	678	390	581
1960	626	532	683	430	621
1961	678	573	702	443	676
1962	727	582	700	468	736
1963	758	617	802	516	865
1964	807	643	893	552	837
1965	853	699	969	593	986
1966	942	727	1,048	640	1,060
1967	971	756	1,167	697	1,102
1968	1,087	991	1,164	739	1,179
1969	1,113	1,017	1,292	805	970
1970	1,185	1,045	1,387	862	1,015
1971	1,314	1,070	1,525	889	1,054

[a]In current prices, in 100 bahts.

TABLE I-4

TIME-SERIES DATA OF EARNINGS OF PHARMACY (03)[a]

Year	5th Series	4th Series	3rd Series	2nd Series	1st Series
1944	14				
1945	17	67			
1946	17	71	69		
1947	17	196	81	73	
1948	19	211	103	73	102
1949	42	231	123	74	102
1950	72	256	135	77	144
1951	84	269	168	77	156
1952	96	283	201	87	168
1953	96	298	228	96	168
1954	120	311	264	103	180
1955	120	332	291	111	192
1956	180	354	338	120	192
1957	240	363	347	156	228
1958	300	373	347	177	264
1959	336	383	356	198	300
1960	360	416	402	238	408
1961	420	426	477	218	444
1962	444	437	501	311	444
1963	480	449	537	495	444
1964	540	462	580	357	477
1965	600	476	644	395	536
1966	780	521	662	418	569
1967	840	567	701	465	603
1968	960	645	731	501	603
1969	960	664	803	526	603
1970	1,080	685	873	555	639
1971	1,200	678	938	596	639

[a]In current prices, in 100 bahts.

TABLE I-5

TIME-SERIES DATA OF EARNINGS OF SCIENCE
(07)

Year	5th Series	4th Series	3rd Series	2nd Series	1st Series
1942	13				
1943	17	13			
1944	23	18	13		
1945	30	25	19	19	
1946	39	33	27	26	25
1947	52	46	39	36	33
1948	68	62	56	56	58
1949	90	86	81	77	74
1950	188	145	120	89	87
1951	156	145	133	123	112
1952	156	150	143	136	128
1953	180	168	155	148	141
1954	246	207	167	163	157
1955	282	231	180	176	173
1956	318	256	194	192	191
1957	343	276	209	211	213
1958	343	284	225	230	235
1959	432	338	243	252	261
1960	606	434	262	275	288
1961	606	444	282	301	320
1962	606	455	304	330	356
1963	606	467	328	361	394
1964	639	497	354	396	438
1965	677	529	381	433	485
1966	718	565	411	475	539
1967	807	625	443	521	599
1968	807	643	478	572	666
1969	807	661	515	628	741
1970	856	706	555	690	825
1971	856	728	600	759	981

[a]In current prices, in 100 bahts.

TABLE I-6

TIME-SERIES DATA OF EARNINGS OF HIGH SCHOOL GRADUATES (H)[a]

Year	5th Series	4th Series	3rd Series	2nd Series	1st Series
1932	5				
1933	5	8			
1934	6	11	15		
1935	7	9	15	4	
1936	9	12	23	5	7
1937	11	14	26	7	10
1938	14	61	41	8	56
1939	17	93	56	12	86
1940	20	104	72	14	96
1941	25	65	87	16	55
1942	30	46	102	19	36
1943	37	51	102	27	38
1944	153	126	159	38	56
1945	235	176	168	54	81
1946	127	126	174	76	93
1947	82	113	180	108	132
1948	101	132	180	143	153
1949	123	135	192	102	164
1950	150	155	204	116	242
1951	150	133	110	121	283
1952	186	156	116	136	333
1953	186	161	122	148	425
1954	186	200	128	298	517
1955	234	213	134	240	610
1956	234	220	240	170	702
1957	300	279	243	272	794
1958	300	291	300	263	886
1959	300	289	312	244	979
1960	300	454	318	365	724
1961	300	462	324	486	792
1962	300	457	360	608	847
1963	300	474	360	729	924
1964	342	512	390	850	1,001
1965	342	519	420	972	698

TABLE I-6 (Continued)

Year	5th Series	4th Series	3rd Series	2nd Series	1st Series
1966	702	677	432	872	776
1967	702	708	446	982	807
1968	462	593	452	994	872
1969	259	498	465	1,006	878
1970	259	504	480	1,018	825
1971	259	511	492	1,031	891

[a]In current prices, in 100 bahts.

TABLE I-7

CONSUMER PRICE INDEX OF THAILAND[a]

Year	Price Index	Year	Price Index
1932	12.18[b]	1952	69.30
1933	15.03[b]	1953	76.29
1934	17.88[b]	1954	76.46
1935	20.73[b]	1955	79.85
1936	23.59[b]	1956	84.49
1937	26.43[b]	1957	89.84
1938	29.28[b]	1958	95.07
1939	32.14[b]	1959	90.50
1940	34.99[b]	1960	89.74
1941	37.84[b]	1961	96.33
1942	40.69[b]	1962	100.00
1943	43.54[b]	1963	100.14
1944	46.40[b]	1964	99.08
1945	49.25	1965	103.70
1946	52.09	1966	107.70
1947	56.55	1967	112.00
1948	56.53	1968	114.34
1949	54.29	1969	117.33
1950	56.06	1970	117.54
1951	62.26	1971	123.38

Source: Department of Commercial Intelligence, Ministry of Economic Affairs, Bangkok, Thailand.

[a]1962 price = 100.

[b]Estimated figures.

TABLE I-8

AVERAGE OF REAL EARNINGS OF GRADUATES CLASSIFIED BY FIELD[a]

Year	CAA (01)	AAH (11)	ENN (04)	PHA (03)	SCI (07)	High School Graduates (H)
1932						45
1933						45
1934						78
1935						95
1936						108
19[illegible]						122
1938						136
1939						143
1940						133
1941		36	83			132
1942		60	100		35	164
1943		73	125		45	215
1944		95	133	122	64	295
1945	109	123	170	126	86	318
1946	149	153	195	191	108	282
1947	185	174	259	204	138	279
1948	214	208	306	207	169	193
1949	228	231	401	230	204	287
1950	264	254	423	242	235	304
1951	257	272	452	243	220	356
1952	265	286	468	248	234	356
1953	283	292	483	259	239	312
1954	280	301	530	285	265	406
1955	296	332	588	294	290	436
1956	351	413	572	331	304	396
1957	394	438	578	376	318	443
1958	421	445	631	385	339	468
1959	446	523	661	417	395	541
1960	457	557	671	464	448	568
1961	505	595	721	457	456	531
1962	541	637	753	477	506	565
1963	558	668	784	498	489	550
1964	582	698	822	512	517	557
1965	614	738	802	528	514	595

TABLE I-8 (Continued)

Year	CAA	AAH	ENN	PHA	SCI	High School Graduates
	(01)	(11)	(04)	(03)	(07)	(H)
1966	664	788	820	527	576	648
1967	702	843	884	592	611	626
1968	728[b]	-	916[b]	636[b]	647[b]	564[b]
1969	740[b]	-	937[b]	649[b]	660[b]	524[b]
1970	765[b]	-	966[b]	679[b]	694[b]	518[b]
1971	787[b]	-	999[b]	709[b]	713[b]	508[b]

[a]In 1962 prices, in 100 bahts.

[b]Estimated figures.

After computing the series of average real earnings, we run regressions using the log linear and semi-log second degree polynomial forms. The criteria for selecting the best form are based on the value of the adjusted R^2 and the closeness of the predicted value of the intercept. If R^2's in the two forms are not much different from one to the other, the second criterion will carry more weight. The result is shown in Table I-9.

As our results indicate, the semi-log second degree polynominal forms are selected in almost all cases with the exception of 01. The summary of the selected regression results is in I-10 on the following page.

TABLE I-9

COMPARISON OF THE RESULTS OF DOUBLE LOG AND SEMI-LOG SECOND DEGREE POLYNOMIAL FORMS

Field	Double Log				Semi-Log Second Degree Polynomial			
	R^2	Actual RW	Predicted RW	Residual	R^2	Actual RW	Predicted RW	Residual
Social Sciences								
01. CAA	.9372	109	99	10	.9769	109	139	-30
11. AAH	.9799	36	17	19	.9745	36	52	-16
Natural Sciences								
04. ENN	.9873	83	94	11	.9753	83	93	-10
03. PHA	.9214	122	88	34	.9777	122	138	-16
07. SCI	.9840	35	20	15	.9647	35	48	-13
High School Graduates								
H	.7284	48	45	3	.9636	45	55	-10

TABLE I-10

SUMMARY OF THE RESULTS OF THE SELECTED REGRESSION OF THE TIME-SERIES EARNINGS-PROFILES

Field				R^2	SE	DW	F	N
Social Sciences								
$\ln RW_{t,SAA}$	= 4.4596 (55.8310)	+ .6237 ln t (19.7526)		.9374	.1355	.1640	390.1582	27
$\ln RW_{t,AAH}$	= 3.9584 (54.7297)	+ .1936.t (15.0327)	- .0035.t^2 (-7.3644)	.9745	.1347	.4218	496.9802	27
Natural Sciences								
$\ln RW_{t,ENN}$	= 4.5334 (79.0990)	+ .1744.t (19.7271)	- .0034.t^2 (-11.8029)	.9753	.1133	.3318	592.7173	31
$\ln RW_{t,PHA}$	= 4.9297 (125.0438)	+ .0877.t (12.9791)	- .0010.t^2 (-4.3019)	.9777	.0746	1.0733	593.8252	28
$\ln RW_{t,SCI}$	= 3.8834 (49.1351)	+ .1855.t (14.7019)	- .0034.t^2 (-8.0086)	.9647	.1540	.2398	397.6528	30
High School Graduates								
$\ln RW_{t,H}$	= 4.0152 (63.6284)	+ .1378.t (18.4106)	- .0021.t^2 (-11.0587)	.9636	.1397	.7907	516.8725	40

Note: Additional information reported in this table is the predicted value of an intercept. The rest are the same as in Table 9.

APPENDIX J

SUMMARY OF THE REGRESSION COEFFICIENTS OF THE DEMAND FROM THE NON-PRIVATE SECTOR

Field	$\ln a_1$	a_2	R	SE	DW	F
Social Sciences						
01. CAA	-5.2189 (-1.5152)	1.3107 (3.0232)	.3114	.6152	1.3044	9.1396
11. AAH	-8.6873 (-6.4707)	1.7594 (10.4119)	.8565	.3237	2.2825	80.6599
Natural Sciences						
04. ENN	-12.0263 (-6.6356)	1.7594 (10.4119)	.8565	.2398	.9480	108.4063
03. PHA	-3.4472 (-1.4216)	.9262 (3.0524)	.3160	.4306	1.9292	9.3170
07. SCI	-15.6741 (-10.6169)	2.5551 (13.7506)	.9127	.2637	.7713	189.0768

Note: The value in parenthesis is the t value. The regression covers the period 1952-1970, which provides 19 observations for all groups. R = adjusted R^2, SE = standard error of estimation. DW = Durbin-Watson statistic and F = F-value. OLS is used for all the above regressions.

$$\ln DNP = \ln a_1 + a_2 . \ln PAD$$

where:

DNP = the demand for new graduates from the non-private sector.

PAD = expenditures on public administration and defense.

The values of PAD during 1979-1983 are estimated from the average of the estimated values of PAD from their linear and the log-linear trends in the same way that estimates were made for MAN, EWS, BIR and TAC.

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