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IMPLICATIONS OF PRIVATE DEMAND FOR EDUCATION  
ON MANPOWER PLANNING

by

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Some basic information is needed in formulating education policy or in manpower planning. Among these are data on actual shortages or excesses of supply of labor over a period of time and the adjustment of supply and demand for labor towards equilibrium. Contrary to the usual assumptions of manpower planning that market forces do not work, it is argued in this paper that indeed the market behaves as though it tends toward equilibrium. A theoretical and empirical knowledge of the demand and the supply functions for particular types of labor and the speed of adjustment toward equilibrium are of crucial importance to policy or in planning. An understanding of these functions and the time lags involved in adjustment would indicate the specific variables that policy makers can influence and so point to the choice of tools of policy. The problem is both theoretical and empirical.

To see how the market <sup>for education and labor</sup> behaves would involve an analysis of the decision makers: the students who demand education as an investment, the educational institutions which supply the facilities, and the firms who employ the educated manpower.

In Part I of this paper, the individual demand function for education is analysed, looking at it as an investment function. Then the aggregate supply function of educated labor

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\*I would like to express my appreciation to Dean A. Worcester, Jr. and Leon A. Mears for their very helpful comments.

is derived from the aggregation of the micro decisions of individuals. The nature of the supply function of educated labor with professional degrees is discussed with reference to differences in personality and general academic ability of the population. The approach used in treating personality and ability differences is the same as that adopted in my other paper.<sup>1</sup>

Part II deals with the implications on the demand for education, hence on the supply function of educated manpower, of imperfections in the capital market and of the structure of educational institutions as an industry. It is to be noted that this paper is a theoretical one and intends to point to the relevance of these aspects of the market on policy and not to pass any judgment on the performance of the educational institutions.

The conclusion in Part III would point to the empirical research that need to be undertaken along the lines suggested by the paper. The analysis seems to apply well to Philippine conditions where the capital market is very imperfect and educational institutions are operated like private industry.

Part I - Nature of the Supply Function of Educated Labor

The important difficulties involved in formulating an investment theory of education are related to differences in

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<sup>1</sup>See Edita A. Tan, "The Supply of Professional Degrees in the United States", Discussion Paper No. 68-35 (IEDR: University of the Philippines, December 19, 1968).

personality and ability, and to imperfections in the capital market. These definitely influence the choice of level and specialization that prepare an individual for a career in the corresponding professions. The treatment of these factors in this paper follows that in my other paper. In this study, people are grouped by occupational interest and aptitude. The investment alternatives of an individual with a given occupational interest and aptitude are specified to be specialization in any field falling under the grouping of fields that coincides with his own interest-aptitude. The grouping of fields is taken from a number of works by occupational psychologists.<sup>2</sup>

Occupational psychologists find a pattern of interest and aptitude in each group of professions. Persons engaged in professions belonging to a group possess a common dominant interest-aptitude different from the interest-aptitude observed in other groups of occupations. Because of these differences in interest-aptitude patterns in various groupings of professions the professional fields as a whole will not have equal appeal to a student of given personal characteristics.

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<sup>2</sup>Ann Roe, *The Psychology of Occupations*, (John Wiley and Sons, Inc., New York, 1956), p. 86.

James Davis, *Career Aspiration* (National Opinion Research Center, University of Chicago Press).

Dael Wolfle, *America's Resources for Specialized Talent* (Harper and Row).

He is likely to choose a field of specialization from a group of professions whose interest-aptitude pattern matches his own. His education choice is limited to the professions in the group rather than to all professions.

On the other hand, students are not of equal general academic ability and the academic requirement of different fields of study varies. In the works of Dael Wolfle and James Davis<sup>3</sup> the distribution of the total population (in the United States) by ability approximates a normal distribution. It is observed that the higher the level of education or degree, the higher the average AGCT score (Army General Classification Test) or API (Average Proficiency Index). For each level of degree the ability index differs by field also. It may be concluded that the academic requirement of different levels and field of education limits further the number of alternatives, and to an increasing extent of those with lower ability. Within each group of fields, the brighter the student, the greater the number of alternatives he faces.

The formal training preparatory to entry into each professional field of a given level is considered an investment alternative. And the fields of study corresponding to the professional fields within the group are the relevant investment alternatives of the students who have the required interest-aptitude and general academic ability. The choice

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<sup>3</sup>*Ibid.*

of level and specialization out of a given set of alternatives is treated as an investment decision. As such it is argued that the student would choose that alternative which would maximize the net present value of returns of his investment. Symbolically this may be expressed in the following:

$$\checkmark I_{i,n} = f (PV_{i,n}, PV_{j,n}, \dots, PV_{m,n})$$

where I is investment, PV is net present value of returns, and the subscripts stand for fields in each Group G, at each level, n.

Fields with positive rates of return<sup>4</sup> would attract students such that assuming a diminishing marginal productivity of educated labor, equilibrium will be approached at which the present values will be equal or the rate of return equal to zero.

The aggregate result of the individual decisions would give us the aggregate supply function of educated manpower of level n, in Group G. This supply function is of the long-run where the response to the rate of return is effective over the required investment period, if information on the market is perfect, and longer if information spreads slowly. Symbolically, the supply function is as follows:

$$\checkmark N_i = f (PV_i)$$

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<sup>4</sup>Fisher's rate of return to alternative investments.

where  $N$  is the supply of labor. The higher the present value in field  $i$ , the larger the number that will be educated in this field relative to other fields in the Group.

It is shown that the supply function drawn is for each group of professions with its corresponding dominant interest pattern. The investment alternatives facing a student of given personality are defined according to his personality. Students of similar basic characteristics are the source of supply of educated manpower for the group of alternative fields. For each group of field, the slope of the supply curve would indicate the rate of shifting between fields as a consequence of differences in positive net present values. For any time period population and its distribution by basic personal characteristics are given, a supply curve may be drawn, but it may have two vertical portions as in Chart 1. In this period, there is a finite number of individuals in the population who have the required academic ability and the inclination for each group of fields. In the short-run there is a fixed number of educated people with specialization and level of education for each group. The initial vertical portion of the supply curve is the short-run supply curve, and the terminal vertical portion the long-run constraint on the source of supply for the group of field and level of education.



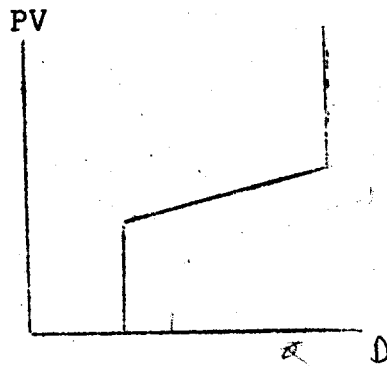


Chart 1

Disequilibrium in a group of professions denoted by differences in net present value between fields in the group will call for adjustment in the form of movement along the supply curve. But shifts in the supply curves for various groups are likely to occur through time, partly as a market adjustment, and partly as a response to changes in population and/or in the number of people qualified to pursue a given education.

Given everything else constant, an increase in population or of the number qualified for college education would increase the absolute number of potential students in each group, hence an outward shift in the supply curve for each group. As national income increases, the number able to go to school at each level increases. A higher proportion of high school graduates would mean an increase in the number who are qualified for college work.

Adjustment in the labor market as a whole may be in the form of shifts in the supply curves of various groups.

Assuming that equilibria are achieved in each group but the equilibrium net present values in the groups of professions vary widely as in Chart 2a to Chart 2c. If a significant number of students enrolled in each group are marginal in terms of academic ability and interest-aptitude, their response to differences in present values observed among the groups of professions will lead to shifts in the supply curves. A leftward shift in the supply curve will occur in the group that earned a relatively small income, and a rightward shift in the supply curve of the group that had experienced a higher income. A wide and persistent difference in income among groups of fields might be used by parents as a factor of orienting their children toward more lucrative fields. The result would be the opposing shifts in the supply curves of the relevant groups - leftward for the group with lower income and rightward for the one with higher income. The resulting change in interest-aptitude is not likely to happen quickly. If it did the market for educated labor would not show so wide differences in income over long periods of time. There would only be one supply curve for each level of education where adjustment toward equilibrium would be a movement along the supply curve.

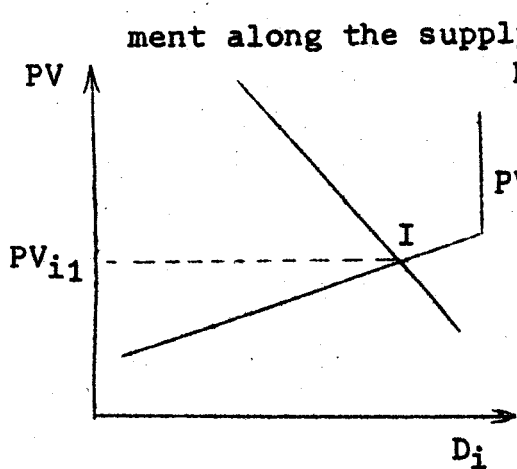


Chart 2a

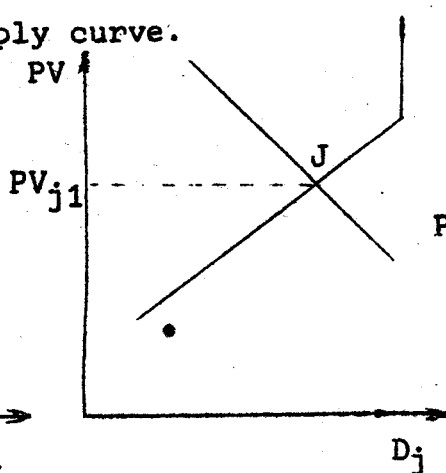


Chart 2b

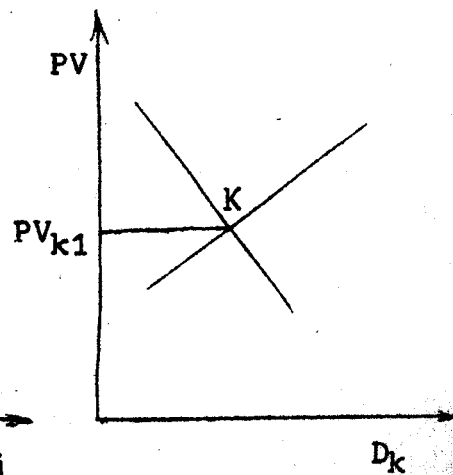


Chart 2c

The likelihood of attaining equality of rate of return in the labor market will depend in the number of marginal people in each group. A substantial number of marginal students would shift the supply curves until the demand and supply in each group intersect at the same present value. An insignificant number of marginal students would imply that each group of fields would adjust toward its own equilibrium point quite independently of other groups. Differences in present values among groups would persist over time as long as the distribution of the population by ability and personality remains the same.

The other aspect of the supply curve that merits our interest is the length of time lags in the adjustment toward equilibrium within a group and in the possible adjustment in the labor market as a whole. Under perfect conditions in the capital and labor markets, the time lag involved to reach equilibrium in a group should be about the investment period or the normal length of time to complete a level of education. The same lag should apply to shifts in supply curves coming from marginal students enrolled or to be enrolled in each group. The labor market adjustment involving shifts in supply curves due to other reasons would take a much longer time, possibly decades in some cases.

This section presented the general case of the supply curve of labor with higher education under perfect conditions

in the labor and capital markets. The implications on policy (of the analysis) will be brought out more clearly in the next section which deals with market conditions.

## Part II - Micro Decision of Educational Institutions

There is a need to understand the micro decision of educational institutions as the price that they charge for various types of education enters into the estimation of net returns. More significantly, the price they charge may determine who are able or not able to go to school in a situation of very imperfect capital market.

Ordinarily we cannot treat educational institutions as we would a firm because their motives are not exactly the same. In some societies, educational institutions are mostly non-profit organization which are established to serve the social good. In the Philippines, it is quite possible that many of them are motivated by profits more than by other objectives. However, there are also some publicly supported institutions and non-profit religious schools in the country.

Probably the best way to analyze the micro decision of educational institutions and its relevance to the labor market for educated manpower is to use the traditional Economics approach of analyzing price-output determination by market structure. Two micro models are analyzed:

- (a) a perfectly competitive or its equivalent non-

profit structure; and

(b) an oligopoly profit motivated industry.

(a). Price output determination under purely non-profit situation.

With the following assumptions:

1. Perfect information about demand for education of various types;
2. Adequate supply of teaching personnel;
3. Perfect capital market; and
4. Purely non-profit motive.

In the long-run schools would supply facilities for various fields at a price =  $MC=AC$ . The long-run supply curve of the industry drawn in Chart 3 assume  $P=MC=AC$ .

For any given period of time, there is a prevailing marginal gross returns to investment in education. As discussed in Part I, if students treat education as an investment, qualified students would invest as long as the net present value is positive and choose the level and field with the highest present value. The net present value decreases as the cost of investment increases of which the price charged by schools increases. Therefore, the lower the price the higher the net present value and the larger the number of students who will want to go to school. Hence the downward-sloping demand curve for degrees in Chart 3.

Under perfect market conditions, the institutions take an impassive role of simply responding to the demand of students for education of various forms. A most efficient allocation in society is obtained where the marginal cost equals to the price charged the students, equal to the present value of returns.

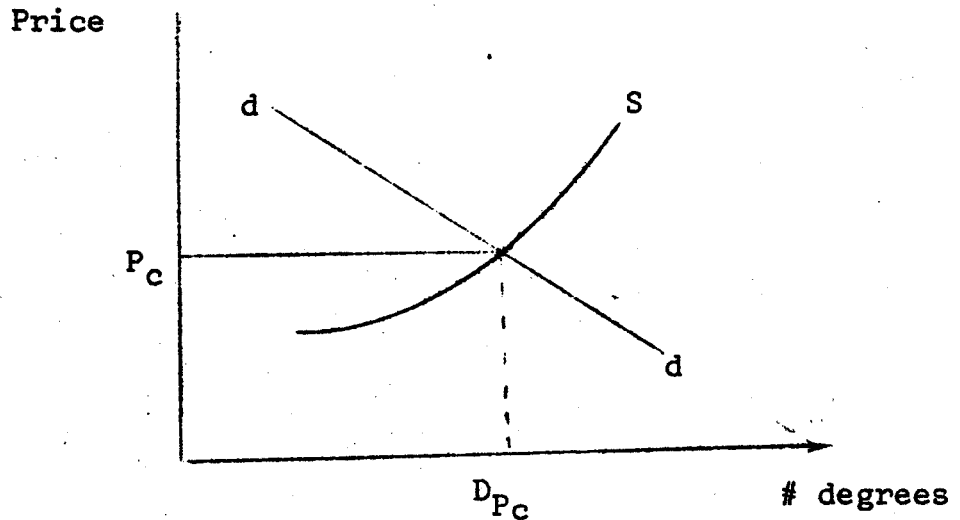


Chart 3

In the case where educational institutions are established for profit and that as an industry it is oligopolistic, the result will be very different from the first case. We need to analyze the interaction between the demand by students for education and the supply of education facilities.

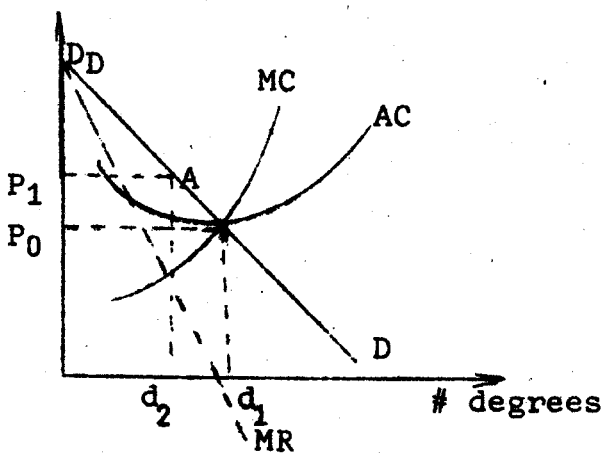


Chart 4a

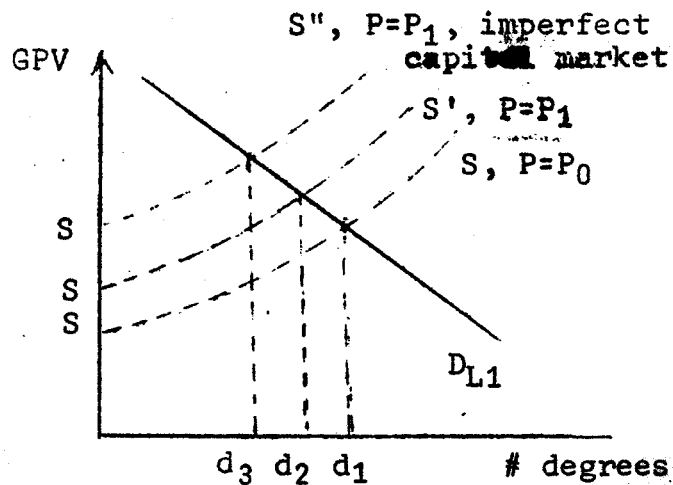


Chart 4b

Let us have the following assumptions for Case (b):

1. The educational institutions as an industry is oligopolistic;
2. The capital market is perfect;
3. Information of students as to their investment alternatives is perfect.

The total demand curve will be as in Chart 3. Assuming that University *i* is a typical oligopoly school which faces the demand and cost curves as in Chart 4a. The price and output which would maximize the university profits will be at point A.

The agreed price may not be exactly equal to  $P$ , but it will be higher than the equilibrium price,  $P_0$  in Case(a).

The problem is to show the relationship between the supply of degrees and the price output decision of educational institutions.

At every price set by the oligopoly schools, a supply curve of degrees may be drawn. The supply curve shifts upward, as the price charged by schools increases. The net Present Value decreases hence a smaller number of degrees at every gross PV.

If the market were purely competitive such that  $P=P_0$ , the labor market equilibrium will be at  $d_1$  on Chart 4b. If the supply curve shifts upward to  $SS'$  where  $P=P_1$ , the equilibrium in the labor market will be at  $d_2$ . Fewer

people will be educated than if the schools were non-profit and operated most efficiently at their minimum cost scale.

On the other hand, the assumption of perfect capital market is unrealistic and should be relaxed. What are its implications in the education and labor markets?

✓ A high proportion of degree holders come from the more educated and higher income families. This fact may mean that there is a heavy reliance on the family for support of one's education unless the student decides to be self-supporting by working part-time while in school. The more educated families which also have higher income are probably better informed about educational facilities and the relative cost-benefits of higher education at each level and field. Intuitively, ✓ we might say that occupational identification of children is related to their parents' education and socio-economic class. In fact, survey studies by James Davis and Dael Wolfle show that there is a significant and positive correlation between the parents' education and income and the number of school years completed by their children.

In my recent paper, the problem is treated by both minimizing its impact and including in the model variables that are likely to influence the investment choice because of the imperfection in the capital market. The treatment is discussed below:



1. The investment decision considered pertains to the choice of a field of specialization after the students have decided to pursue a given level of degree. This avoids the problem of the ability to finance the completion of a degree.

2. The paper hypothesize on how some of the variables which contribute to the relative imperfections in the capital market affect the investment choice. Stipends definitely reduce the private cost of education, and so increase the present value of investment. However, where the unavailability of funds prevents some students from going to school, stipends given in some fields will definitely attract students who would not otherwise be pursuing a degree in those fields. Therefore, a positive relation between stipends and investment by field is to be expected.

The treatment helps us in drawing a supply curve of those who can afford to go to school, but it does not give us the full implications of imperfections in the capital market on the labor market.

In this section, an attempt is made to analyze the effect of the absence of lending institutions to finance education.

Two demand curves are drawn in Chart 3.

Under perfect capital market, the demand curve for education is  $DD_1$ . People equate marginal streams of income,

discounted at the market rate to the cost of investment, or to price of education. The basic assumption for this demand curve is that there is unlimited capital that can be used to finance education.

If the latter is not the case, and instead, education is financed mainly by family savings, the demand curve will be to the left of  $DD_1$ , at  $DD_2$ . In addition to the effect of price on the net present value or on demand, the ability to finance education becomes an important determinant of demand for education. The position and slope of the demand curve will depend in part upon the level and distribution of the national income. As illustrated on Chart 4b the output will be smaller than if the capital market were perfect. Output will be  $d_1$  under perfect capital market and at  $d_2$ , under imperfect capital market.

If imperfections in the capital market is combined with monopoly element in the education institutions the number of degrees granted each year will even be smaller than  $d_2$ . In the extreme case of monopoly it will be at  $d_3$ , at price  $P_1$  or somewhere between  $d_2$  and  $d_3$ , and  $P_0$  and  $P_1$ , for oligopoly. The supply curve of degrees is shifted left-ward. In the two latter cases, the market will be farther from the optimum point where marginal cost is equal to average cost equal to marginal gross present value.

In general subsidy to education will shift the demand curve for education rightward towards the demand curve

when is the graph?

under perfect conditions in the capital market. Subsidy may be used as a specific tool of policy to change the number and distribution of students, by level of education, by field or even by groups of fields. Further implications of subsidy will be discussed below.

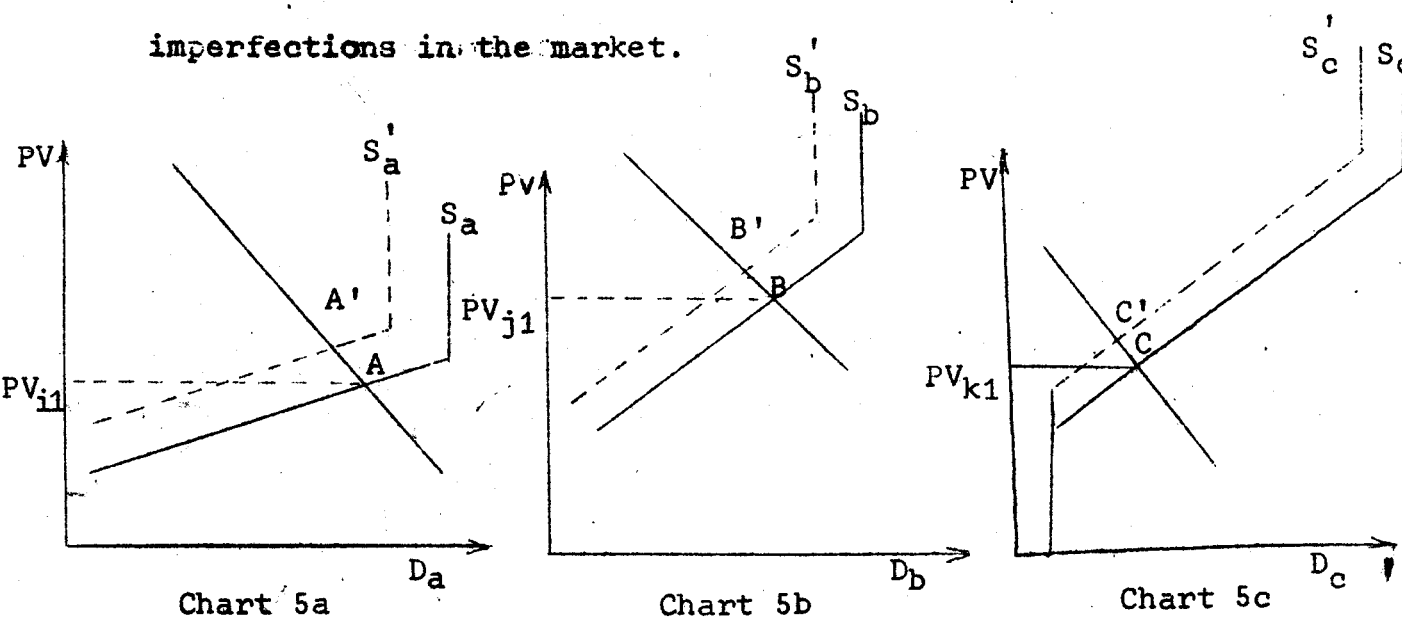
### Part III - Conclusion

In the preceding sections, the important aspects of the market for education and educated manpower were analyzed.

Under the very simple demand and supply analysis of a homogeneous labor force, equilibrium is clearly and easily achieved when the marginal disutility of work is equal to the marginal revenue product of labor, that is, the intersection of supply and demand curves. No lags in the adjustment are visualized.

Educated labor is not homogeneous and there is more than one supply curve. There is one supply function for each group of professions or fields of specialization classified by dominant interest-aptitude patterns and ability requirement. There are as many supply curves as there are groups of fields. On the other hand the supply curve itself is a horizontal aggregation of the individual investment demand functions for higher education. Therefore, all factors which affect the individual demand for education will also affect the supply curve of educated manpower.

For a given population, the distribution of this population by interest-aptitude and ability puts a constraint on the number that can be counted as the maximum potential source of manpower for each group of fields. At this maximum number, the supply curve turns vertical, but the actual limit and the position and slope of the supply curve depend on imperfections in the market as shown in this paper. The equilibrium points of the market for educated labor as a whole and for each group would be determined by the supply curves, given the demand curves for labor for each group of fields, hence by imperfections in the market.



As we have seen above, an imperfect capital market for education and monopolistic structure of educational institutions would shift the supply curves upward from S<sub>a</sub> to S'<sub>a</sub>, S<sub>b</sub> to S'<sub>b</sub>, and S<sub>c</sub> to S'<sub>c</sub>, giving new equilibrium points at A', B', and C'.

The stability of these equilibrium points will depend on the number of marginal students in each group, and those who are not in the education force. The readiness of the marginal students to move from fields in one group to those in another group would determine whether or not there could be an adjustment towards equality of equilibrium of net present value in the market, assuming no shifts in demand during the period considered. On the other hand, it is quite reasonable to expect that a significant number of students who are qualified for each level of education are left out of the market. <sup>un-</sup>Through better information <sup>(?)</sup> about education alternatives and subsidy, they may be drawn toward the level and fields where the returns are highest.

The long-run adjustment will be a combination of movement along each supply curve and shifts in the supply curves. The adjustment toward a group equilibrium or towards a market equilibrium requires time. The shortest time lag necessary to move towards a group equilibrium point is the investment period equal to the formal schooling normally required for a degree and specialization. Any factor that prevents an immediate response to differences in net present value in a group would lengthen the time lag. Therefore, the time lag of adjustment depends very much on market information and available investment funds.

The time lag of adjustment in terms of shifts in the supply curve is an empirical question. It depends so much on the degree of imperfection in the capital and education market. Under conditions of perfect capital market and competitive education industry, shifts in the supply curves would only arise from a movement of marginal students from one group into another. In an imperfect capital market, shifts in the supply curves may be effected by drawing individuals who are not in school or are not intending to go to school because of lack of information or of funds to finance education.

The other aspect of the market for educated manpower which should be considered by planners is information on possible shifts in demand curves for various professions. With the lag in supply of degrees, a cobweb effect, or a persistent shortage or excess in some fields may be experienced as demand curves shift. Projections of demand are necessary information to the estimation of expected future stream of income in each field to which students respond. A miscalculation due to unexpected shifts in demand would result in a shortage or excess of supply of labor.

In brief the paper tried to demonstrate the necessity of studying the conditions in the capital and education markets and how they influence the micro decisions of students. It also pointed to the inherent nature of the supply curve of educated manpower where ability and personality factors enter

into the choice of level of education and fields of specialization. There is a limit to the number that can be drawn into any group of fields. Such limit puts a constraint on the adjustment toward one equilibrium return for each level of education.

Finally, the paper argues that planning or policy must be based on the empirical application of the theory of micro decisions of all units involved under different market conditions: the individual who demands education and the institution that provide the facilities.