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THE ECONOMY AND THE FUNCTION OF PRODUCTION IN EDUCATION

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SUMMARY

Education has a high-priority function in the production of human resources since the human capital is the key factor in the development of the peoples. The production function presents the relation established between the amount of input and intervening factors to produce a certain good, considering its quality. The economists put attention in the way in which the education institutions select the entrances and the way in which they use the specific inputs to obtain a certain product. The questioning that is made today to education is that there has been lost the function of production as a specific function, especially in the high school, where the one observes the greater deficiencies. In order to analyze the quality of the education system and the profile of human resources, the economists use certain parameters consisting of econometric estimations in which different variables are confronted. In order to guarantee that the production function is adequate or that it responds to the demands of the society one requires to determine clear and precise objectives, select the inputs and the strategies that will make possible the concretion of the productive process that will give as a final result or exit a qualified product with certain skills, abilities and knowledge; that is to say, with competences

which qualify it to be inserted in the productive sector with effectiveness and efficiency.

KEY WORDS: Education; Economy; Production Function.

INTRODUCCIÒN

Present times are characterized as much by permanent changes at socio-economy and at cultural level. The ideology that marks the new model of organization and development is globalization, which heightens freedom of commerce, free flow of different production factors, promoting the use of the new technologies and the dynamics of new styles of work.

In order to insert to us in an active way in the globalized world, it is necessary that the education system reviews its structures, its curricular contents, the methods of works with an attitude of permanent innovation. It should try to surpass the territorial and national geographical borders, taking advantage of the intercommunication systems that allow us to insert ourselves in the universal scope of the scientific and technological research, contributing to the productive development as sustenance of the economy and the well-being of society. This supposes the necessity to prepare human resources with high quality, without neglecting the axiological aspect in the formation. The challenges that globalization imposes to the education demand a re-planning of their production function in the social, cultural and economy world. From this glance it is considered necessary to reframe the relationship of education with the productive sector.

The cracking of the relationship between the education institutions and the organizations of the productive environment is due to the progressive loss of the function of production in education, which brought with it the loss of credibility of the education system and its social relevance facing the inefficiency of human formation of capital, that responds to the demands of the labor world. To this one must add, the lack of qualification of the educatiors.

To count on competent human resources contributes to a production of better quality and major profitability, that is the reason for the importance of reviewing this function in the education

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establishments.

DEVELOPMENT

I. Production Function

A production function allows an analysis of inputs and results, it searches to describe the more optimal level of production and it is interested, in addition, by the analysis of the best options to obtain a maximum possible product level, using determined inputs; thus the production function is a very useful instrument since it allows to describe the levels of greater efficiency and to observe impacts of possible changes in the inputs or technological changes.

The enterprises can choose different production possibilities, according to their technical capability, technology availability and inputs and, the combinations that are applied in the process obviously will determine a result that will be the most optimal possible one. The production function simplifies this problem when describing the maximum possible results as a function of different input sets.

The economy-theoretical vision of the production function applied to education requires modifications, because in education one acts with human beings in contrast to the economy perspective, that uses other inputs.

The education process can be assimilated to the productive process of any good or service: there are factors and inputs that combined in different ways, give rise to different amounts and qualities of a final or finished product. The learning process as a productive process has particular characteristics and limitations that are necessary to be consider: as much as the definition of the finished product as the reach and contribution of the inputs present characterization difficulties.

A function of production in education consists of the relationship between the amount of entrances, and, the amount and the quality of exits rendered by the productive process.

In order to know these results statistical studies are done by means of econometric measurements of the results obtained by the students. In the inputs used the characteristics of

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the student, of the families, the sociocultural context are clear like also of the school inputs: the teachers, school organization, building infrastructure, didactic and technological equipment.

In the final product it is necessary to recognize the quality of the formation of the graduate with certain skills acquired throughout the education process. These skills can be evaluated in different ways, but the system has concentrated the accomplishment of standard tests on some school subjects. The results of these measurements are those that define the quality of the system, but this method does not consider all the elements or the impact of all the factors or variables that take part in the education process and which should be incorporated to carry out a really integral evaluation of the results.

Agreeing with studies realized by Hanushek (1978), in this type of research the degradation level appears concerning the student, taking as variables the results of the academic profitability in the different subjects in which the measurement tests are applied. In such cases, averages per school units or zones are obtained, that although they offer fixed amounts of curricular contents to each and every one of the students, the advantage is not egalitarian or even due to the difference observed between one student and another.

So it is so that there can exist characteristic of the finished product different from the cognitive one called school performance; for example to maintain certain level of attendance and presentation and motivation, that not necessarily is related to the academic performance which they obtain, but means levels of progress acquired by the student during their formative process that will be useful to him in the future life as a worker.

On the other hand, some researchers maintain that a greater level of expenses, more teacher wages, more facilities, better administration or better incentives would have to generate better academic performance at student and teacher level; nevertheless the results obtained in the econometric estimations demonstrate that not always these data are give so significant results. The first great limitation of the analysis is that only some of the inputs are modifiable or manageable on behalf of the school.

In every education system a series of regulations exists that limit or restrict the potential degree of administration of the resources used in the school or in the class, for example the

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minimum curricular contents themselves, the use of methodologies or education strategies and the election of the school by the families. An important element that it is put to one side is the effect of the ability of the teacher. Other limitations come from the technological restrictions and lack of specification from the production function for each orientation or modality.

Inputs in the production process

In order to define the functional specification of the inputs, in education the task turns out to be more complex due to the great variety of inputs that are due to be considered, but if we had to define as fixed factors of a conceptual model, in economy terms we would consider the capital and the work, that in the case of education these would be equivalent to a: group of students per class or classroom and the group of teachers respectively.

In this type of inputs, students and teachers, are explicit elements but they have a low explanatory level in a production function in education; because in these measurements they are not have sufficient amount of data to specify with more precision the causes of the obtained results.

The deficient or little availability of data limits the generalization of the production function. This functional form relates the school results concerning the student, with groups of variables, or inputs, with which one establishes theoretically, a direct relation like the family, class mates, school inputs and innate ability of the students.

The evidences contributed by the educators suggest the school profitability depends on a series of factors: genetic, socio-economic, teacher quality, school conditions and the characteristics of the group of students. If the production function is well-known, it is possible to predict what will happen if the amount of resources is modified and it is also possible to analyze what actions could be taken facing the expectation of changes. The problem is that this function is not known, consequently it must be inferred through estimations that use information from the students and their schools. This relation usually is examined using the function of education production, called input-product relationship, in which one measures the result obtained by the student in standard evaluations.

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Considerations on the empirical application of the measurement models

The majority of the researchers have based the measurement of results on standardized examinations of knowledge, however, these have their own limitations in the sense that being education a service that develops fixed amounts of programmatic contents for each level, grade or course, the advantage of the result is differentiated due to the different characteristics presented by the students.

In this order of ideas the main difficulties presented by the application of these models of measurement presents are:

- The majority of the studies on function of production in education are done with cross section data in time.
- In these studies one does not consider the capacity of initial learning and its relationship in the progresses obtained at the moment in which the measurements are realized, therefore the impact of the results is limited.
- The measurement of the relevant inputs presents errors margins, because of the lack of practice in the registry of data on the different school activities and the impact of the incidence of each from the intervening variables.
- Little attention is given to the cumulative effects generated by the inputs in the dynamics of the education process and its effect through time.
- There are certain inputs that are not measurable in their impact in the results of the quality of the final product; like the economy characteristic of the family and its antecedents as socio economy partners.

Although the result of the standardized examinations does not distinguish abilities, nor specific interests of the students, which does not have to be neglected is the relationship with the pedagogical objectives that are handled in a certain education systems, i.e., which evaluate the profit of the objectives presented in each school unit for each grade, course or level.

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Econometric problems

The econometric problem in the function of production in education considers when the inclusion of an excellent variable is omitted that affects in a significant way the estimated results; as are the innate abilities of the students. Although this variable is considered in the theoretical exposition, actually one does not have initial measurements, therefore there will always be an error margin in the results obtained by each student.

Due to the absence of a factor (or variable) important in the model, the incidence or impact oo this one on the variable dependant, will be assumed by the variables that are in the model and which have close relation with the variable absent; erroneously explaining the behavior of this one last one. The amount of this slant would be given by the correlation between the school achievements and the omitted variable.

Another important problem arises from the measuring errors in the variables. Generally in researches in education one had solely the measurement in a period of time. A typical example is the historical registries in the schools that frequently present measurement errors; and, even though the measurement error has zero average, the coefficients could be slanted.

For the case of the family antecedents the incidence of this slant is less severe, since this information hardly changes in the short term and its collection is simpler. The severity of the presented problems differs significantly in the empirical field, which explains the divergences in the findings and conclusions.

II. Design and interpretation of the production functions of education

In general terms we say that the function of production in education is the result of the estimation of a linear model of the educational results based on dependant and independent variables such as the size of section, cost per student, availability of facilities (libraries, laboratories, etc.). Following this order of ideas, the suggested methodology to obtain a suitable econometric estimation of a production function can consist in the application of surveys of evaluation or self-evaluation at student, educational and family level, which allow the consideration of all the variables that are important in an education measurement.

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The school administrators use their capacity of management in order to select the modalities that the education, agreed system offers to the expectations of a certain production, based on the students and education with he is going to fulfill the specific education process as a productive process.

In this sense the education offered in the high school level constitutes a controversial phenomenon for being recognized as high school. This identification takes away objectives of priority for the definition of the specific function of the productive process and, on the other hand this level appears as a very complex structure due to the variety of modalities to which one has to add the characteristics of the geographic context and cultural partner, where the school is located, the demands of society in general, the expectations of the families in particular, the innate abilities of the students and the profile and quality of the professors. Following Graciela Frigerio (1992): “The average high school - secondary, as we know it today, is a socio-historical partner product, that, differentiates from other existing social and education institutions by its specificity and is due to its specificity and results in a redefinition process of the institutional spaces in which the people are authors and mark their origin.” [Ferreyra, H., 2009, P 25.] (1)

This recognition is a historical reality since the level of the secondary school, not being obligatory, constituted in a level of preparation for the entrance of the superior studies and some modalities that defined their function of production in a very specific way as were the normal schools that trained professionals for teaching, the commercial schools that later formed the human capital that required the work field in an organization enterprise and later in trade union with legally regulated systems of work and the technical schools that are going to categorize the formation of the craftsman and the technician responding in this way to the incipient demands of a labor world technical and competitive.

The economists use as statistical data base to analyze the amount and quality of the exits in relation to the entrances throughout a determined productive process established by the direction of a modality chosen particularly in the high schools as a production plan.

So that an efficiency level of in the production be reached, like any enterprise, the school organizations must have well know and clearly defined objectives as far as the production that it

wishes to reach. It must have a permanent control on the production process and a responsible team with capacity for leadership and authority in the decision making that in addition, demonstrate capacity to select the entrances that the school institution uses and the exits that they produce.

In any model that is used to realize a statistic analysis one must consider four basic components (Carnoy, 2006).

- Dependant variable: represents the exit of the production function. The value of this variable is determined by values of interdependent variables.
- Independent variables: its impact cannot be measured.
- Error margin: all function of production can include allowable error when not being able to predict accurately the amount and the quality of the results.
- Parameters: are the means of analysis of the amount of entrance in relation to the amount of the final product.

Besides it we must consider the entrances and exits referred beforehand. To such aims the entrances of education production are classified basically into three groups (Martin Carnoy, 2006):

- The school and the class
- The family and the pupils
- The socio-cultural context
- The school and the class: The entrance school includes: the dimensions of the building infrastructure of the school, amount of didactic and technological resources available, amount students per classroom and the leadership and the authority of the headmasters. The entrance class, that characterizes the productive process includes: amount and quality of the educational personnel, amount of time of education or real instructive time and school material available for each curricular space.
- The degree of autonomy to select the amount of each of these entrances will be

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used in the productive process, it varies in each school. From the point of view of the economists this variable is very important since the possibilities of success of the students who have assimilated previous knowledge in a more solid way, they are better predisposed to maintain the continuity of the learning in a process of greater complexity of scientific or technological contents than those students who approve the courses with the minimum promotion qualifications, who are those that present later difficulties due to lack a good previous knowledge bases.

- The family and the pupils: In this second category of entrances the characteristics of the students and their families are analyzed. The economists usually use measures of the socio-economy level, cultural partner and levels of academic formation of the families as a factor that influences in the process of education production. The entrances represented by the pupils normally includes: the previous knowledge of the student, the age, the gender and the ethnic origin. Nevertheless, one has to consider that the state schools have very little margin of flexibility on the selection of these entrances in their productive process, due to the obligation that is incumbent to the State as responsible organism to offer the education service to all the population in school age.
- The socio-cultural context: The entrances represented by the social context are those that have determined the surroundings in which the school is located, that exerts great influence on the quality of the process and the quality of the production function. The amplitude of the education process of production causes that it is very difficult to be able to anticipate and identify all the entrances of a plan of production of a school. The differences in the processes of education production between the schools located in urban, suburban and rural areas are another line of research in the literature of the function of production in education.

Taking into account the exit and according to Martin Carnoy (2006), it is recommendable to consider three basic questions to select the same:

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- To clearly and precisely identify the education production of the unit: It is a high-priority step that presents complexities, because one not always can choose all the entrances, and, in addition, in the process of education production there take part multiple elements and resources of varied quality to make specific the productive process, that not always depends solely on the decisions of the headmasters. However in the enterprises this complication does not occur, because to define an exit, products are chosen of first and second selection, the objective is defined to obtain that quality of production, one structures the productive process with a suitable and rigorous selection of entrances, i.e. human resources properly specialized for each function, material resources and necessary financial resources. This precision in the education scope becomes difficult. In this framework it is desirable that the education authorities have a defined good objective as an objective of effectiveness of the system, although many studies have excluded the private schools considering that the education policies basically constitute a commitment as State policies. In the analysis of the function of education production, carried out by the economists, they have discovered that in the schools there is more than one production objective and thus, some of them receive more attention than others on behalf of the personnel. In that case they recommend planning different functions of education production.
- To classify the data that better help to identify the production target: For this second step education can use different elements of the productive process among which the qualifications stand out that determine the academic profitability of the students in those subjects that have close entailments with the production aim; selection of the subjects that constitute the orientation foundation for a production function; the performance of the teachers, and the availability of resources necessary to reach the objectives.
- Examine which are the data available that represent the production target: As data

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available the school generally counts on the data that are the qualifications of the students, which can be complemented with internal integrating evaluations such as the IFEI (Final Instance of Integrating Evaluation) and external like the national operative evaluation. Also, another data that can represent the production target is the evaluation of teacher performance.

The added value in the function of education production

The added value in a function of education production is the formation of the human capital as economy value that generates the long term education and that benefits not only the addressees of the formative action, but it generates indirect effects that constitute a benefit for all the social system as a whole.

In the phases of quantitative growth of the education system, the increase in the cost is directly bound to the growth of essential infrastructures and to the formation of the personnel who is to respond to the demands of the system.

In Argentina, as from the end of the 90s, the social inefficiency of the education system is felt, unlike that which was the impact in the 50s and 60s with the strong social mobility, result of the formation of the human capital. Although in the course of the 90s the Federal Law of Education was sanctioned, that included all the levels of the education system, the expected result was not reached due to the lack of a suitable monitoring and control of the education planning and of a rational programming of the expenses that allowed to know the real costs of the education sector for each one of the levels of education.

Due to the lack of research on the incidence of the factors it is difficult to determine the difference of costs between a school and another to reach certain results.

In order to solve the problems above-mentioned, it is necessary to establish the relation between the used variables, the intervening factors and the reached results, from the approach of the function of the production. Reason why to make decisions and to orient the education policies, as State policies, a more precise study of the relation of some factors or precise variables is required, like the socio-economy level of the families from where the students come

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and the school performance.

Another study would determine the necessity to associate school inputs with profitability; teacher performance with profitability; and to see which of these factors is the one that demonstrates a greater incidence in the performance of the students.

III. The production function in education and its relationship with employment

Analysis of profitability and cost-benefit

Establishing a relationship between the functions of production of the education and the expectations of the economists when they realize an analysis of profile of human resources to enter the labor market, the cost-benefit and profitability analysis is used to determine the recommendations that the enterprise environment considers that must be implemented in the schools in order to guarantee the exit at the end item with a minimum of qualification to respond to the demands not only of knowledge and modern technologies, but to the possibility of knowing how to transfer the knowledge and those competences to the future labor performance.

The economists compare the costs of the necessary entrances (students, personnel, material resources, didactic financial) with the amount of exits (amount and quality of the formation of the graduates) generated by means of the calculations of one of these two indices. Generally the more analyzed index is the one of profitability, that is the cost of a certain program (curriculum or program of qualification) divided by its profitability; i.e., the amount of individuals that constitute themselves in beneficiaries of this certain program.

The profitability analysis compares the cost with the investment of the State as of the families to obtain a certain product, i.e., the quality of the graduates.

The analysis cost-benefit compares the investment on each student and the potential benefits that he must generate once he is presented as a product, that should constitute as an agent of other productions capitalizing the investment assigned for its productive formation.

The main advantage of the analysis of profitability, interpreted by the economists, is that it puts the accent in the quality of the immediate education exit, considering that this quality, in the production function, must be worked during the whole productive process or the education road

of a student. There are also disadvantages that they have to do with time of duration of that process, in which one has to analyze the cost-benefit.

Direct and indirect influences of education on the development

The econometric studies of economy development, have accentuated the attention during the last decades of the XX century, in the effects that the education has on the production function. The Neoclassical school that dominated the economy thought up till the beginning of the XX century, presents two basic contributions regarding the relation economy growth and education, that spread in the 50s and 60s.

The development of the theory of human capital during the Sixties took place as a result of the introduction of this concept on behalf of Fisher. Given the great settling of this theory during the Sixties, the papers are numerous that were developed under their matter, but it will be the contributions of Schultz and Becker, those that will constitute the basic pillars in which this theory is maintained.

According to Teodoro Schultz (1963) “the economy value of the education is based on the idea that the people must harness their capacities as producers and consumers by means of their investment themselves and that schooling is the most important investment in human capital” [Carnoy, M., 2006, 23 P.] (2)

This theory, considers the education of the individual as a form of investment, that will suppose a rent to him that he would not obtain if it did not have this capital. So it is then an investment on the individual himself and from that derives his qualification as human capital, in it are consider the education investments as a form to improve the innate capacities of the people, and produces an increase in his productivity. This increase of the profitability of the workers is accompanied by an increase in their wages.

In the 70s and 80s interesting econometric researches with international data of type cross-section were carried out, to measure the influence of the education on the growth of GIP, of productivity, and technology.

The difficulties for the obtaining of comparative statistical data have caused that very few

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studies were carried out until the last decade of the XX century, in which the greater availability of the statistical data and an increasing interest by the international comparisons, has caused that the studies today are more numerous. The fact that some studies provided non-conclusive or contradictory results demonstrates the difficulty to model the important effect of the education.

Another factor that impacts in the effects of the education is the population demographic growth is another factor that impacts on the effects of education, considering that the families of better socio-cultural level can maintain a birth control in order to assure better education possibilities for their children, which does not happen in those marginal sectors of the society.

Estimation of the production function and employment models

From the point of view of the analyzed models, the production function explains the GIP only in the case that the used physical capital agrees with the stock of physical capital available, i. e., when investment is the main development motor.

In case of total use of the capital stock, the production function explains the GIP and the equation of desired use can be deduced from the equation that relates the marginal productivity of the work to the wage. In this case the production function is a dynamic model, because it has effect of propagation of the impact of an increase of the investment on the growth of many successive periods. It is a dynamic model since the increases of the GIP imply as well an increase of the investment that will contribute to increase the future GIP.

The real GIP per inhabitant depends to a great extent on the physical stock of capital peer inhabitant, and it depends as much on the capacity of investment as on the moderation in the growth of the population. The countries with high rates of employment, per thousand of inhabitants are frequently, those that also have high wages per worker, because both variables are related to the GIP per inhabitant and the average productivity of the work.

It is the case of four countries the USA, Mexico, Japan and Turkey that in the period 1965-2000 have been outstanding in different ways by creating employment. In the cases of Mexico and Turkey a very important growth of its GIP and the creation of employment, even if important it needs to be substantially enlarged, because it has low employment rates, non agricultural for

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each thousand inhabitants. In the case of the USA, its high rate of growth of the GIP, its still low average population density per surface unit, and the moderation of its birth rates has allowed a certain level of aperture to immigration to occupy the new jobs that its economy dynamism has been able to create. Japan has undergone an economy growth of the industry and the other non-agrarian sectors during second half of the XX century, and has had an important growth of the employment due to its policy to propitiate high occupation rates of its active population.

CONCLUSION

Although there exist strong controversies about the contribution of the factors that take part in the productive process, one must recognize that the most important element in all research, referred to the function of production in education and its relation with the education investment is the student, who is the co-producer of his own formation.

The profitability reached in the education road depends on the interaction of numerous factors, among which one consideres: the past experiences that serve as support for the construction of new learning.

The development of innate abilities to which one can add the sociocultural influence that can be exerted by the family group and the geographic and socio-cultural context in which the school is located, in the formation of each individual as a finished product to be inserted actively to the world of work of the culture, the scientific research and to be the agent of development of sustainable economy for itself and for society.

In this sense a meticulous study of the allocation of the resources to the education sector and of the advantage of the same from each school unit is required, by means of a permanent monitoring, in which the productive process is carried out until obtaining the exit of the product wished based on the defined objectives, without it turns out to be of difficult concretion to diminish the existing breach between the formation of the human capital and the demands of the present day society.

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