

# The Difficulties In Measure The Impact Of Education On Economic Development: A Review Of Used Methods

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**Abstract.** The nowadays economy and ways to produce is a result of transformations and the most recent is the advance of technology due the increment of human capital in the productive methods. The investment in people is where the innovations come and, in order to do that, the countries and the companies value the education and specialization of the individual improving their abilities and skills. The presence of research universities creates an impact in regional and national economies, so to analyze this impact is important to certify the advance of the whole society. The studies have shown advantages and disadvantages in the methods used which reveals a difficulty in the measurement of the benefits of investing in people. This work objective is to review the methods used to measure the impact of education in economic development.

**Keywords.** Human Capital, Education Impact, Higher Education, Investment, Universities.

## 1. Introduction

In economic studies, the main purpose is to evaluate the performance of markets in economic development and economic growth in the face of the changes in society. It is common to evaluate the economic impact of a political decision or a structured investment in tangible and countable ways. But the economic impacts are not provided only by tangible investments, actually the innovations itself are intangible and the human capital presents as an important source of upgrade for the markets.

This work intends to analyze and find the gaps that make the studies related to verifying and measuring the economic impact of the human capital on society harder. To do that, it is necessary to emphasize the importance of human capital by highlighting its intangible character and detach the methods used to measure how the education investments influence the economy.

## 2. The Concepts and Used Methods

Even though the concept of human capital was already known since Adam Smith and other economists, the expression was introduced only in 1961 by Theodore W. Schultz [1] as the improvement of individuals skills and abilities in order to increase the growth rate of the countries. The theory is based on the principle that the

economic development comes from innovations and, as long as the innovations come from human minds, exploring the potentials of highly qualified employees will increase the growth rates not only of a company isolated but a nation's economy. Highly educated and healthy workers who have access and power of choosing their career will be more successful and creative at their innovations, so it is extremely important to notice the investment in human beings as a form of capital. In Schultz's first published article about the investment in human capital, he says that "although it is obvious that people acquire useful skills and knowledge, it is not obvious that these skills and knowledge are a form of capital" [1]. So, the author points out that the productivity per worker becomes more relevant when there is investment in human beings.

"The observed growth in productivity per unit of labor is simply a consequence of holding the unit of labor constant over time although in fact this unit of labor has been increasing as a result of a steadily growing amount of human capital per worker. As I read our record, the human capital component has become very large as a consequence of human investment." [1]

At first, the studies about human capital surrounded the potential of company's investment and their employees' income trying to trace a multiplier effect to quantify the benefits of human capital investments on productivity and, even now, it can

only be traced in isolated cases, but not generalized to the whole theory. The growth rates of a country's economy can be observed and measured, but to verify how much of this growth comes from the education and specialization of the workers, in other words, the direct and indirect impacts of the education, is complicated and to measure it is harder.

The changes in the production methods have been noticed over the centuries and in the last decades these changes from industrial to knowledge based methods have been pushed by technological innovations. The main differences between the latest transitions are sustainability, automation, global integration and the fundamental resource is the human capital unlike the industrial economy which considers physical capital as the main resource.

This knowledge based society changed the manner of producing everything. Not a high scaled standardization production anymore, but an economy focused on technology with computer-controlled machinery doing the hard work and the internet increasing the velocity of communication and also a great source of information. Also, when the value of labor is based on education level, knowledge and talent of the individuals, it reflects in better income to the more qualified workers and this concept precedes the definition of human capital itself, as shown by Jacob Mincer [2]

“When income recipients are classified by educational background, that is, by years of schooling as defined in the census, the expected increase in income dispersion with level of training appears [...]”. [2]

The phenomenon is not exclusive to developed or developing countries; it is an idea that spreads around the world as soon as the increasing returns to scale provided by human capital are shown. So, the globalized world is a consequence of this valuation on knowledge based production method or, at least, this new way to produce created a beneficent environment for this globalization.

Looking at the corporate world, the human capital is often evaluated together with other forms of capital. An interesting definition, presented by Thomas A. Stewart [3], is the “intellectual capital”, a composition of Human, Structural and Customer capitals that provides a competitive advantage of the company in front of the competition. Even though it is difficult to identify and evaluate effectively each one of these forms of capital, once discovered and explored, it can be a very useful tool for any kind of business.

Another important research about organization management is called “Working knowledge: how organizations manage what they know” by Thomas H. Davenport and Laurence Prusak [4]. In this work, the authors bring how important it is for the organizations to effectively manage their intellectual

capital.

These latest mentioned works, on the two paragraphs above, were published in approximate years, 1999 and 2000 respectively, therefore they are much more recent than Schultz's first article and still trying to understand this intangible capital.

Around the same time, the concept of human capital influence in the companies was studied by Thomas O. Davenport [5] and brings that in this model of society (knowledge based) the contribution of the individual is greater than a simple worker. Workers with increasing decision-making power and control over their careers mean valuable capital. The assistance of these individuals is as investors-workers, due the knowledge property and the investment payback, as long as the corporations train their employees and treat them as an important part of the corporation and no longer as an inevitable cost. Seeing these highly educated workers as a company asset, emphasizes the added value of the work, which implies inventability, creativity and initiative for your companies.

There are many factors that influence the relationship between education and economic growth and human capital may be just one of them. The reflection of human capital investment in a region can be positive, as superior productivity and new companies and or negative, as general labor-cost and rental and housing expenditures increase. So many aspects to analyze and there is usually a low set of data available.

But how could anyone measure the infinite benefits of investing in people?

The input-output model of Leontief is recently one of the most used methods. The pioneer publication using Leontief's model for analyses of education in local economy was Caffrey and Isaacs's article [6] where “models to assess the impact of a college on the local economy are examined”. The authors describe the economic impact in local business, government decisions and between individuals using economic models beyond to present a suggestion to calculate it, in other words, how to apply econometrics. Despite the fact that the research is remarkably wide, it had to deal with the same problems faced by all other methods used currently.

Joshua Drucker and Harvey Goldstein [4] reviewed four different approaches for analyzing the impact of universities on regional economic development. The main task of their article was examining how the research universities in the United States have increasingly become involved in economic development and most importantly how to measure the impacts of higher education on regional economies. The numerous attempts made to assess the benefits of the institutions of higher education focus on estimating the direct and indirect impacts “use of growth accounting, regional input-output modeling, estimation of Keynesian multipliers, or

occasionally, a broader regional economic forecasting model” [4]. But checking the main methods is noticeable that each has advantages and drawbacks.

Using input-output information induced by the spending and regional investment activities of universities and the reflection of these investments on employment rates tend to ignore important aspects linked to the dynamic impacts, in other words, it fails to verify the induced effects of human capital as in attracting private-sector research and development and other technology based production activities. In fact, the universities tend to contribute in intellectual, social, cultural, and recreational fields, by attracting a concentration of highly educated and creative professionals and establishing a particular locational dynamic and these effects can not be analyzed in this method.

Using general models of production function to measure the influence of higher education, the authors gathered some Knowledge Production Function Studies made in the United States. These studies are basically endogenous growth models based on theoretical insights or a system of equations modeling a reduced set of available data. The problem to be discussed is that “they do not hold direct implications for the empirical questions regarding knowledge production and diffusion”.

In the cross-sectional method, which consists in selecting a sample from the full population and analyzing the empirical relation between the variables, most often using statistical regression, again a selection group of Cross-sectional Studies shows that, although the flexibility, the sampling issues and omitted variable bias are some of the significant disadvantages of this method. Meanwhile, quasiexperimental research designs try to mimic the conditions for true experiments and it was only studied occasionally in regional research.

To this date, every model used has pros and cons, advantages and drawbacks that must be considered in the research in order to find a reliable correlation. The studies may guide decisions as to the worth of investing in people and, sometimes, it can discover that the correlation does not work as expected. In Brazil’s case, the recent crisis disturbed the results of human capital investments.

The Brazilian economy has had lots of high and low moments, especially in the last two decades. In the mid 2000’s the country was focused on growth rates by improving the trade balance, so it took the mark of a commodities-exporting economy, meanwhile, the investments in public universities also increased with lots of expected benefits. As mentioned above, the transformation power of higher education is notable in and outside the research field, thereby, it was planned to have better growth rates while the students specialized themselves, consequently, innovate in their area of interest and promote the technological economic development, but latam (short for Latin American) economies are not like

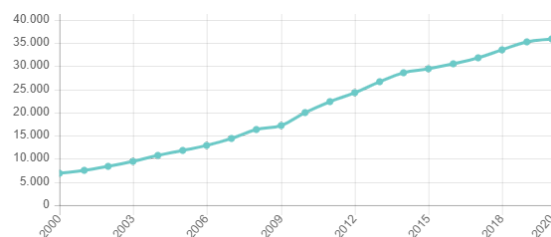
the rest of the world and do not respond as expected.

The average schooling years have changed recently from 6 years in 2000; 7,2 in 2009; 9,4 in 2016 and 10,1 years in 2022. It is notable that Brazil was trying to follow the rest of the world’s footsteps and had the opportunity to do so due to the trustful moment for the economy and the high interest of students in tertiary education in the last decades. In 1990, less than 10% of brazilians had bachelor degree, now this number raised to 23% between the ages 24 to 35 according data from brazilian’s free data source “SIDRA” [5] powered by Instituto Brasileiro de Geografia e Estatística (IBGE).

After the subprime crisis in 2008, the Brazilian exportations decreased significantly in 2009 and the political strategy was to instigate domestic demand and elevate the government expenses. The recession provoked at that time has been faced since then which made it difficult for qualified labor to enter the job market efficiently “Nube research shows that only 19.93% of graduated people already in the market are carrying out activities related to their professions” [7]. The Brazilian economy has not shown significant numbers in terms of innovation or economic growth in the last ten years, although the education level of the population has increased.

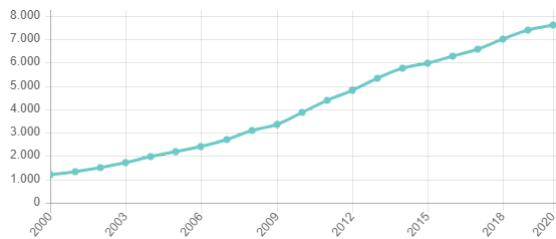
Even with the decrease in unlettered rate, from 11.5% in 2004 to 5.6% in 2022; the increase of average schooling years, as previously mentioned; and the quality of education, 99.4% of children between 6 and 14 years old at school and renowned universities; the effects of these investments are difficult to examine because in spite of the fact that the transformations in producing methods have happened but it did not reflect on the growth numbers.

In the following figures, the Gross Domestic Product (GDP) will be referred to as PIB (an acronym for Produto Interno Bruto).



**Fig. 1** - PIB per capita in brazilian reais. [6]

It is very important to interpret this rise in PIB per capita as a phenomenon with multiple reasons. Of course, the income for qualified workers is bigger than non-qualified ones but observing only the nominal values given in current prices, the adjustments for inflation are left out. This difference can be noticed in the two figures below.



**Fig. 2** - PIB in billion Brazilian reais. [6]



**Fig. 3** - PIB percentage changes in volume. [6]

The nominal value of PIB shown in figure 2 rose significantly in the twenty years observed, however, the variations perceived comparing year to year reveal a non-constancy and even some years with negative growth, 2009, 2015 and 2020 as example.

The observation about the recent economic behaviour in Brazil made it possible to verify that to manage effectively the investments presents positive returns, but in a crisis spectrum it can be not enough.

### 3. Conclusion

There are many factors that influence the relationship between education and economic growth, endogenous and exogenous, and human capital may be just one of them. The measurement of the impact of investing in people is limited by information availability, lack of applicable data, the quantitative estimates for the range of regional economic effects can not be isolated for this kind of study and in order to verify how the national growth was pushed by human capital the study is always going to show a not measurable correlation. The importance of human-capital creation through the universities tends to attract local economic development and the benefits of trained and highly capable individuals in the economy are way beyond what growth rates can provide.

Checking Brazil's example, the investments in human capital present positive returns, but the crisis spectrum obfuscates the expected economic growth. Certainly, investment in people results in more impact than economic methods can mathematically prove.

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