

RESEARCH ARTICLE

Education and Income: A Comparative Study about Returns on Schooling in the State of Goiás and the Federal District

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Abstract

The purpose of the present study is to analyze the role of education in determining individuals' salaries, using information from the State of Goiás and the Federal District as an example. This work starts with the hypothesis that higher levels of education contribute to more income for the individual. In addition to schooling, various other socioeconomic variables were included in the model, such as sex, color, and union status, in order to reduce distortions that could affect the model. The sample was selected from the 2009 PNAD (National Survey by Household Sample) and consists of a total of 10,371 individuals that declared to have income, 6,359 being from the State of Goiás and 4,312 from the Federal District. Thus, the returns to income were estimated based on the Mincer wage equation of the salaries. The results indicate that, in both units of the federation, the impact of education on income increases with the level of schooling and prevails over other variables included in the model.

Keywords: *Education economics. Human capital, Return to income.*

Introduction

One of the great challenges of Economics is trying to explain which factors determine the economic growth of a society. As such, diverse models were created as attempts to understand the dynamic referred to. The first known model, called Harrod-Doma, stressed three important basic variables for growth which were: the rate of investment, the savings rate and the product-capital relationship. Later, Solow presented a model whose precept is that production depends on the variables, capital, work, and technology. The latter was and continues to be one of the most important models of economic theory [1].

The Theory of Human Capital emerged in the 70s, which proposed that education should be considered an investment, which would cause a significant impact on economic growth [2]. This theory was of great importance, particularly in developing countries.

Since then, the role of education in the economic growth of a society has been the object of debate. There is a strong positive association between education and growth of aggregate income. One of the possible relationships has as a base the assumption that by improving the quality of the work force, an economy becomes better able to

efficiently absorb, reproduce, and develop diverse technologies, thus improving its performance and productivity. As such, with the marginal increase in productivity, there is an increase in an individual's income, as well as growth of the firm.

There are also some models based on *spillovers* (positive externalities) that propose that the capacity of growth of an economy can be strengthened by positive externalities through the accumulation of human capital, whose primary component is education. Barros and Mendonça [3] pointed out that the great difficulty in assessing the impact of education is not that it is not limited to the lives of those who educate themselves, but also provides large positive externalities to those who are around them. Also, these investments should be assessed by quantity and quality and should be stratified by the level in which they occur: elementary school, junior and senior high school, technical schools, and higher education.

In any event, there is still not a consensus about what the contribution of education to the economic development of a nation is. In this sense, other questions are raised: is it relevant and justifiable for governments to stimulate not only market participation in education, as well as

provide public education for the society? And what level of schooling maximizes the development process? These and other questions are the object of the study of Economics of Education.

Currently, there is interest in the study of the relationship between schooling and the market, in an attempt to understand the differentials in earnings for individuals with more schooling [4]. It is important to understand the dynamic of the incentive of schooling in the individual in order to understand, in a macroeconomic sense, the contribution of education in economic development.

The hypothesis tested in the present research is that schooling presents a greater contribution for growth of an individual's salary than other variables. The assumptions are that: 1) The higher the schooling of an individual, the greater his income; and 2) Schooling is an individual choice and generates externalities that promote an environment favorable to production.

In the presented context, there is the following questioning: what is the role of schooling in the income of individuals in the Federal District and the State of Goiás? What levels of schooling maximize the earnings of these individuals? What other types of variables affect this relationship?

For academia, research is relevant because it helps to fill the gap in this type of study in the framework of the Federal District and the State of Goiás. For society, knowing the role of education in the economy is important because it constitutes a subsidy for the taking of decisions about the allocation of existing resources for education. Thus, the principal goal of the present study was to analyze the differentials of increases caused by education on income, as well as the influence of other variables, namely: experience, sex, color, and union situation, on the income of the citizens of the Federal District and the State of Goiás.

As such, the article was structured in five parts, among which the first is about the problem and its importance and historical aspects. In this section the goals and relevance of the work are set forward.

Literature Review

The term "economic growth" is defined as the continuous increase in the economic production of a country over time. For Kuznets (cited in Galeano 2007) [1], the increase in product should be given in global terms and *per capita*. When there is

growth, accompanied by changes in production structures, there is economic development.

Solow [5] developed a long-term economic model, which still today constitutes one of the most used economic theories. His goal was to show that, in the long run, a market economy could grow in a sustained and permanent manner, even without direct intervention of the State in the economy. Solow's model stood out for, among other things, including technology as a variable, in other words in the long term balance, the *per capita* product and the *per capita* capital will only grow if there are technological advances in an economy.

In the Solow model, the principal sources of growth are the alterations in technology and the increase in the work force. The model referred to is represented by two equations, one being a production equation (1), and the other an equation for the accumulation of capital (2), which are:

$$Y_t = F(K_t, A_t, L_t) \quad (1)$$

$$K_t = s_k \cdot F(K_t, A_t, L_t) - d \cdot K_t \quad (2)$$

The first function is related to income, in a determined period, with the factors production of capital (K), work (L), and technology (A). Thus, the term $A_t \cdot L_t$ is denominated "effective work", because it adjusts the productivity of work to technology.

The second equation shows the product, in turn, is divided between consumption and investment. In a closed economy, without government intervention, the investment would be equal to savings, exemplified in models such as S_k . The model also considers the constant d as the depreciation of capital.

In the Cobb-Douglas production function, $= K_t^\alpha \cdot (A_t \cdot L_t)^{1-\alpha}$, α is a constant value between 0 and 1, income is a function of capital and effective work, considering their productivity. Thus, there is an increase in productivity when technology improves.

In the Solow model, the equation for the accumulation of capital, in terms of effective work (3), in which the investment is discounted from the *break-even point* (point in which earnings equal losses), is described in the following manner:

$$k_t = s_k \cdot f(k_t) - (n + g + d) \cdot k_t \quad (3)$$

However, Solow's works [5] pointed to residue, which until then could not be explained by any existing models. There were two possible explanations for the existence of said residue: either technical progress or another factor that wasn't being considered in Solow's studies, and for the second hypothesis, education seemed to be a strong candidate to explain the referenced situation (FILHO; PESSÔA, 2010).

Mankiw *et al.* [7] included human capital in Solow's model, in an attempt to adjust the model to eliminate the residue. Those authors added the term H to the model, referring to the stock of human capital. In the following equation, however the coefficients α and β determine the relationship of physical and human capital with the product.

$$Y_t = K_t^\alpha \cdot H_t^\beta (A_t \cdot L_t)^{1 - \alpha - \beta} \quad (4)$$

Thus, a qualified worker contributes to production not only with work but also with human capital. The function of accumulation of fixed and human capital can be described in the following manner:

$$k_t = s_k \cdot y_t - (n + g + d) \cdot k_t; h_t = s_h \cdot y_t - (n + g + d) \cdot h_t \quad (5)$$

Nonetheless, the idea that something existed which linked economic growth to education dates back to Adam Smith, who held that the creation of wealth was associated to the division of labor. The division of labor assumes specialization. And specialization, in turn, provides for improvement through practice and the search of efficiency in production.

The area of research known as the "Economics of Education" gained force starting in the 1950s, when the researchers started to study more specifically the role of education in economic growth. Filho and Pessoa [6] infer that the key questions for the study of the role of economics in education are: understanding the role of education in economic growth, evaluating if it exists and what the return on investment in education will be; understanding the context of education in the labor market; and, analyzing the role of education in inequalities in income.

Researchers in the area to consider education as an investment. His works, starting from the 1960, culminated in the Theory of Human Capital, for which he was awarded the Nobel prize in 1979. The referenced Theory arose with the intention of explaining gains in productivity generated by the human factor in production.

Investment in education was a type of capital known as human capital. 'Human capital,' even without being able to be sold, is a source of income and future satisfaction [8], and positively affects productivity, adding economic value to the productive process. The essential characteristic of this type of capital is that it is related to the individual. Wessels [9] conceptualizes human capital as a group of abilities developed by a worker, in school or at work. Mankiw [7] considers expertise acquired in childhood education, junior and senior high and higher education, in addition to specific programs for vocational training. Dornbusch and Fischer [10] believe that among the existing sources of economic growth, human capital is one of the most crucial. These authors consider developing economies as having difficulties in accumulating production factors and human and physical capital due to the low levels of income presented. In this sense, perhaps the low human capital available in countries considered to be poor is not able to efficiently take advantage of the other existing productive resources.

Becker [11] also considers education to be an investment. In his vision, rational individuals opt to educate themselves by comparing future prospective earnings *versus* the costs of the referenced education (including opportunity costs), specifically the opportunity cost from giving up the salary that could be received in the time spent with the education and the direct costs of the education, such as monthly payments, necessary materials, transportation, among others, always expecting to compensate said cost with an increase in income provided by the increase in schooling.

The Theory of Human Capital has as a basis the assumption that the acquisition of knowledge develops human capital, making it more valuable in the market, and providing the individual with a higher income because of the increase in productivity. The increase in individual income is caused as well by the increase in the firm's income, which, in the aggregate, influences economic growth.

Education can be viewed as consumption, investment or both. When education's aim is a proposed improvement in aspects of effectiveness, efficiency, and productivity at work, it will be understood as an investment. In this sense, education targets future earnings, which contrasts with the approach that education is consumption good – consumption aims for an immediate benefit. Cunha's [8] position is that if

education is not consumed with its use, it should be treated as an investment.

Cunha [8] recalls that Schultz started the discussion, proposing treating education as an investment in the human being, since this fact because part of him. As such, he developed a research project with the goal of estimating the resources that enter into education at the primary, secondary, and higher levels.

In his studies, Schultz [8] divides the costs into two types: the first are the costs that are provided by the school – the services of the teachers, the library, and the school administrators, among others, and the second, would be the opportunity costs or *tradeoffs* of the students at the moment they give up receiving income from any other source to stay in school. The earnings given up, in the form of time and opportunity cost, are responsible for more than half of the resources involved in the educational process. This author concludes that such students are not, however, consuming education, but investing the resources waived in their development, in the hope of future benefit.

Schultz points out that the contribution of human capital in the wealth of nations is large. The problem is that economists don't feel comfortable confronting moral and philosophical questions. Comparing the human being to a capital good seems offensive to a society that fought to abolish slavery. Such ideas appear contrary to values rooted in current human culture.

According to Weisbrod (*apud* Cunha, 2007) [8], there are five benefits that education gives individuals, those being: financial return, financial option return (which is about the possibility of more formal education and the aggregate benefit), options of non-monetary opportunity (such as an increase in the variety of employment choices), adaptability possibilities (more educated individuals tend to adapt more easily to technological changes) and the benefit of not using the market (people with a higher educational level often do not need to turn to the market to carry out a specific activity).

Becker [11] investigated a series of empirical phenomena, which until then had been given individual explanations, such as: a) earnings, in general, increase at a decreasing rate, with a positive relationship to the level of qualification of the individual; b) the unemployment rates tend to be lower in more qualified individuals; c) younger people change jobs more frequently and receive more training and teaching than older

individuals; d) the distribution of wages is positively related among qualified individuals; and e) more capable individuals receive more training. Becker's position is that worker productivity can be increased by general training, specific training, and formal schooling.

Becker [11] concludes that an individual's productivity grows by learning new abilities, which necessarily incurs costs, which at a minimum are: time, the cost of teaching and the material used. He views education and training as the most important investments in human capital.

Education, for an economy, provides two types of returns, namely, social and private. The social return, concerns the improvement of life provided by positive externalities arising from education. Barbosa Filho and Pessoa [6] view education as increasing the proximity between people, the political awareness, help in the reduction of crime, in addition to improving the behavior of individuals and facilitating the collective implementation of desirable norms.

The return addressed in the present study is private return, which consists in the wage returns of each individual in light of their schooling.

Mincer [12] formulated a salary equation with components including individual education and work experience. According to Cunha [8], Mincer developed an equation, called the "Mincer Equation," on the hypothesis that income behaves in a linear form in relation to the years of formal education, but in a quadratic form in relation to experience, being that the more schooling the individual obtains, the more income he will receive. However, in relation to years of experience, the effect has a peak, and after the peak, the individual would decline, possibly due to his aging. The Mincer Equation can be represented as follows:

$$\ln E_t = \ln E_0 + rs + \beta_1 t + \beta_2 t^2 + \varepsilon \quad (6)$$

Where:

$\ln E_t$ = natural logarithm of salary or income E during the t period;

$\ln E_0$ = natural logarithm of initial salary or income, without schooling or experience;

rs = "s" corresponds to years of schooling and "r" is its coefficient, which equals the rate of return on 1 year of schooling;

t = years of work experience; and

ε = stochastic error of influences that weren't computed in the model but which affect the income of the worker.

As such, it is possible to observe that the possibility of other factors influencing income was not discarded. However, the focus given by Mincer was the schooling and work experience of an individual. Cunha [8] emphasizes that Mincer proposes that what is really relevant is the amount of experience and not the age of the worker, as an income determinant.

Thus, currently, the prevailing idea is that education is an investment which is positively reflected in productivity, and the market acknowledges this fact. It is more and more common for companies and organizations to promote the education of their collaborators with training and development programs, which would not occur if the investment did not generate increases in productivity or compensatory returns.

Criticisms of the Theory of Human Capital

The belief that the increase of income given by the increment of schooling was a sign of increase in the productivity of a worker generated various criticisms. There were adepts of theories that proposed that a third variable had a strong impact on an individual's income: innate capability. According to supporters of the Theory of Innate Ability, the Theory of Signs, and the Screening Theory, the worker seeks to, in the best of hypotheses, perfect himself and educate himself to develop innate abilities, and not to obtain them.

As discussed by Cunha [8], the Theory of Innate Ability assured that the innate ability of a worker is what is responsible for the increase in productivity. More intelligent individuals would tend to spend longer in school, fail less, and, thus be more successful in academic life. In this sense, intelligence would be a determinant in both the individual's academic success and his economic success, in other words, it would be reflected both in academia and in work performance. Moreover, numerous studies correlate an individual's intelligence to diverse economic and social phenomena, such as educational talent, unemployment, mortality, poverty, and criminality.

The Theory of Signs, on one hand, attempts to explain the relationship between education and income, not as causality, but as a sign. For the defenders of this theory, education signals to the market that individual "X" is possibly more productive than individual "Y". In a certain sense, this discards the direct relationship between education and income, since said signaling indicates only the possibility of higher production.

As such, schooling would not influence a worker's production. For the Theory of Signs, other personal characteristics, such as willpower, talent, and intelligence are what would have a productive impact [8].

Gronau [13] views schooling not as producing abilities, but only orienting the market in the selection of capable employees. To him, the more capable an individual, the more efficient he would be in his schooling, in other words, he will school himself to indicate higher ability, because the market will have difficulties evaluating productivity of a worker at the time of hiring. Thus, more intelligent and productive individuals, in order to notify the market of said ability, will educate themselves in a differentiated manner from other workers.

In addition, the Theory of Signs questioned the increase of income based on schooling, in the sense that perhaps an average increase in schooling among the workers of a region could have an effect contrary to a rise in income. In a hypothetical situation, the increase in number of university graduates could cause greater demands in hiring by companies, forcing the individuals who study more to receive the same salary that before required lower qualification. It would be as if the forces of supply and demand of educated professionals adjusted themselves to the increase in schooling as a whole, decreasing the market equilibrium price (individual income of the worker). It is obvious that for this hypothesis the increase in productivity is not allowed, otherwise the forces would balance each other out.

In the same line that education would have as its main attribute the signaling of innate abilities to the market, there is the Credentialist Theory, that doesn't allow any tie between education, productivity, and salaries. Followers of this theory view education as having the goal of certification for the market that the individual has habits and characteristics recognized as being expensive, such as: respect, punctuality, professional ethics, and notions of hierarchy, among others; these are characteristics which would be valued in the capitalist system, but would not interfere in productivity.

Vaizey [14] defends that education does not always guaranty economic growth. Proof of this is in countries such as Egypt, India, and Pakistan, which suffer from what is known as intellectual unemployment, namely that have a large number of citizens with higher education who are unemployed. In reality, according to the author, there is no reason to construct a quality school

system if the market in that country is not willing to absorb qualified labor. However, he affirms that a minimal level of education is necessary so that economic growth is not compromised.

In summary, the presented theories ended for not denying the principal conclusions of the Theory of Human Capital; they merely did not recognize school as a creator of ability, but as a sign of existing ability.

In fact, in the 1980s and 1990s, various works tested such theoretical trends, in attempts to analyze which of them better adjusted itself to the data. Barbosa Filho and Pessôa [6] deemed the results of such studies as indicating that each additional year in schooling added a 10% increase in income. The theory that education only indicated innate abilities explained only 20%. The other 80% was explained by the Theory of Human Capital. Thus, in the worst of scenarios, each additional year of education added 8% to a worker's income.

Cost and Benefit of Education Investments

Ehrenberg and Smith [15] point out that to calculate the benefits of an investment, it is necessary to progressively discount the value of the future benefit, since the agent seeks to anticipate that consumption, given that the present is certain but the future isn't. For Benefit B, with r being the rate of discount (or opportunity cost), there is the evaluation of the present value, according to the following equation:

$$\text{Present Value} = \frac{B_1}{1+r} + \frac{B_2}{(1+r)^2} + \frac{B_3}{(1+r)^3} + \dots + \frac{B_T}{(1+r)^T} \quad (7)$$

Thus, the individual that opts to complete higher education often gives up receiving income during the period he educates himself, besides having expenses to educate himself, such as: monthly payments, necessary materials, transportation, among others, but he gets larger benefits in the future because he is more qualified.

$$\frac{B_1}{1+r} + \frac{B_2}{(1+r)^2} + \frac{B_3}{(1+r)^3} + \dots + \frac{B_T}{(1+r)^T} \geq C \quad (8)$$

It is possible to evaluate whether the benefits of education compensate the costs using the method of Internal Rate of Return (IRR), in which the evaluation is up to what point the opportunity cost would still make the return on the investment lucrative, or compensatory, for the investor, in this case, the student.

$$Y = X \frac{1 - \left[\frac{1}{(1+r)^n} \right]}{r} \quad (9)$$

Where:

Y = total investment

X = annual payment

r = interest rate (or opportunity cost);

n = years.

Thus, the internal rates of return can be compared to other available investments, in order to assess whether education is or is not a good investment option for an individual.

However, Ehrenberg and Smith [15] stress that at the time of deciding to pursue higher studies, few students analyze the costs and benefits mentioned. Thus, the demand for education is affected by certain factors, such as: orientation to the present, age, and the costs and differentials of earnings.

People who are oriented to the present opt to invest in something whose return is faster. The higher the opportunity cost of studying, the lower the number of people who will be interested in doing it. However, the comparison that people orientated to the future are more likely to attend college is hard to make. What is known is that people who attend college make other decisions about the future throughout the course of their lives, such as, for example, adopting healthy life habits (not consuming cigarettes, regularly exercising, and the adoption of healthy eating habits). What could cause the relationship between good social indicators and education is that they are long-term investment options, in most cases.

Age influences in the choice of higher education because younger people will make use of the benefits for more time. As such, younger people have a higher likelihood of investing in education than older ones.

Costs, in turn, directly influence the choice of individuals to educate themselves. It is expected that if the lost earnings and the direct costs of keeping oneself in college are higher, there will be declines observed in entrance to Higher Education. Ehrenberg and Smith [15] also stress that the opportunity costs of university attendance for older individuals are higher due to the salary increment received from experience.

Finally, demand for education is positively related to the prediction for increase in future earnings, in other words, it is affected by the expected gains differential.

The Demand for Education and the Difference in Earnings

The demand and the offer for college-educated workers shows an increase in the salary paid to workers with college educations, which would serve as an incentive for more people to educate themselves to this level of schooling.

On the other hand, if more people were willing to graduate in university-level courses, for whatever salary, there could be cases of increase in government subsidies to students or if the actual income of the families increased [15]. There would be a decrease in the value of salaries, in contrast to the increase in number of students with Higher Education. Over time, the reduction in salaries would discourage entrance into higher education.

It happens that the response to change, in both offer and demand, is not immediate, since the option for education is generally given for the medium to long term. An individual who entered the university and saw the average salary fall would be reluctant to abandon the course in hopes that the salary levels would again return to the ideal value.

Ehrenberg and Smith [15] demonstrated that the relationship between education and earnings in general presents four essential characteristics, being: 1) average earnings increase with the level of education; 2) the increase in earnings due to schooling happens to the largest degree at the beginning of the working life; 3) the age/earnings profiles tend to spread, because earnings in later states of life are higher than in earlier ones; and 4) the age/earning profile of individual males to spread more than the profiles of women.

Average Earnings, Educational Level, and On-the-job Training

The fact that income increases with schooling is known. It is also known that earnings are also influenced both by salary rates and hours worked.

If the earnings/age profiles are compared, it is noted that the curves for individuals with higher schooling become more convex than those for individuals with less schooling. According to Ehrenberg and Smith [15], for university graduates, earnings rise quickly at the start of their working life, but tend to flatten out and fall with age. The Theory of Human Capital sees this as due to on-the-job training. The employer pays for the training during the employment, but, over time, dilutes this cost in the worker's earnings.

The same authors go on to state that, as expected by the Theory of Human Capital, the investments

in Human Capital occur, in the majority, when earnings differentials are higher, when the costs of initial investment are lower, or when the employer has the time to recover the investment. Another existing point in the Theory of Human Capital is that employees that invest more in formal education also invest in on-the-job training.

Results of Studies about the Return of Education in Salary

Barbosa Filho and Pessôa [6] demonstrated the calculation of education's IRR in the case of Brazil. According to Table 1, to follow, the returns on education are relatively high in Brazil.

Table 1: The Internal Rate of Return of complete cycles with thirty years of work (in %)

Schooling	1981	1985	1990	1996	2001	2004
4	17,4	23,7	16,5	16	12,1	9,8
8	13,1	11	13,3	10,4	12,4	14,8
11	20,2	21,5	29,7	14,4	14,3	13,9
15	16,9	15,5	15,1	12,9	14,5	13,8

Source: Barbosa Filho and Pessôa (2008a) [6].

Sachida, Loureiro, and Mendonça [4] estimated the wage returns on education considering different sources of bias which could distort the results. Through the different estimation methods, they found evidence that each year of study reflects a return on income of between 12.9% and 16%. In addition, in their studies, they show that there is a point known as the *breaking point*, at which individuals below this point have a low propensity to invest in education, considering a small return. On the other hand, those that are above this point, tend to invest in education due to an increased return.

In Resende and Wylie's work [16] education's returns on income in Brazil are also analyzed. Using the information from the Survey on Standard of Living (PPVIBGE), during the period from 1996-1997, the conclusion was reached that the return of schooling on income is between 15.9% and 17.4% for individuals of the male sex and 12.6% to 13.5% for individuals of the female sex.

The role of the quality of education on schooling and income in Brazil in the 1990s. The results suggested that quality had a fundamental role in this relationship acting as an incremental factor in earned income. On the other hand, it was shown that exogenous factors, such as regional socioeconomic differences, negatively impact in the increase of a worker's earned income.

Economic Data from the Federal District and the State of Goiás

One of the main indicators for the analysis of the economic performance of a region is the regional Gross Domestic Product (GDP). Through this indicator, it is possible to measure the income generated in the economy by different actors, over a given period. Mankiw [7] affirms that the GDP is not a perfect indicator of well-being, but that countries with higher GDPs can invest in aspects that improve well-being, such as, for example, education, leisure, and health.

The GDP of the Federal District in 2010 was R\$ 149,906 billion, placing eighth among the other regional Brazilian economies. The State of Goiás, in turn, presented a GDP of R\$ 97,576 billions of reais, placing ninth among the Federal Regions (FRs). When the analysis is of the GDP *per capita*, in other words, the GDP divided by the population of the region, the Federal District has the highest value, R\$ 40,696, almost double that of the second place, belonging to the State of São Paulo, R\$22,667. The state of Goiás has a value of R\$16,251, representing the twelfth place among federal entities.

The Human Development Index (HDI), measured in 2010, for the Federal District was 0.824, and for the state of Goiás, it was 0.735, placing the two entities in the first and eight positions, respectively, in the general classification among the twenty-seven federal regions. The HDI is an index that evaluates human development through factors including longevity, education, and the income of its inhabitants [17]. A good HDI also reflects the economic development of a society.

The economy of the Federal District is predominantly sustained by the service sector. In 2010, the service sector represented 93.2% of the GDP, where more than half (54.4%) refers to management, health, and (public) education services. These percentages have been stable since 2003. In the Federal District, a significant part of the workforce is linked, directly or indirectly to the public sector.

In the State of Goiás, the services sector is also a large contributor to the GDP, making up 59.3%. The main difference is that industrial activity in the state of Goiás also made a significant contribution to the GDP with 26.6%.

The Federal District and the State of Goiás also differentiated themselves from the rest of the country in the schooling of their inhabitants, since they had higher educational indexes than those

from other parts of the country, from elementary education to High Education.

In general, education in the Federal District and in the State of Goiás had quantitative indexes that were relatively better than the Brazilian average. The rate of frequência líquida to establishments of Higher Education, of the resident population between 18 and 24 years is 25.6% in the Federal District and 18.1% in the State of Goiás. The Brazilian average is 14.6% .

Table 2: Rate of frequência líquida to educational establishments of the resident population from 6 to 24 years old, by age group and educational level (%)

FR	6 to 14 years, in Elementary and Middle School	15 to 17 years in High School	18 to 24 years, in Higher Education, except for Master's and Doctoral Studies
Federal District	91,5	61,6	25,6
Goiás	92,2	57,1	18,1
Média Nacional	91,9	51,6	14,6
National Average			

Source: IBGE (2011). Adapted by the author.

The economy of the FRs referred to is, in a certain way, linked. The Integrated Region of Development of the Federal District and its Surrounding Areas (Região Integrada de Desenvolvimento do Distrito Federal e Entorno-RIDE) is an integrated region of economic development, formed by the Federal District and some municipalities of the states of Minas Gerais and Goiás, which share infrastructure, local incentives and growth and development policies. This can contribute to the similarity of diverse economic and social indicators between the Federal District and the State of Goiás.

Methodology

The econometric model is based on the idea formulated in the Mincer equation of earnings where salaries are an exponential function of schooling, of experience, and of other socioeconomic and personal characteristics. The methodological proposal led to the realization of a regression analysis in order to evaluate whether there is a statistical relationship between the dependent variable and the independent variables, especially those linked to schooling of an individual.

In accordance with this perspective, it was sought to define a regressive model of income using the

Method of Ordinary Least Squares-OLS, which according to the specialized literature, contemplates on one hand the income of an individual, and, on the other, variables which explain the income behavior.

The linear regression of the function was carried out, of the Cobb-Douglas type, as seen in the following equation.

$$RealSal = f \left(\begin{matrix} \text{elementary and junior high, senior high, university, post_grad,} \\ \text{exper, exper}^2, \text{union, white, male} \end{matrix} \right) \quad (10)$$

Where:

Elementary and junior high = 1 if the person completed elementary and junior high, otherwise 0;

High school = 1 if the person completed high school, otherwise 0;

University = 1 if the person completed the university, otherwise 0;

Post_grad = 1 if the person completed post-grad studies, otherwise 0;

Exper = Experience = Age – Education – 6 years;

Exper2 = Experience Squared;

Union = 1 if the person is affiliated with a union, otherwise 0;

Male = 1 if the person is of the male sex, otherwise 0; and

White = 1 if the person is white, otherwise 0.

Said equation, logarithmized, presents itself as follows:

$$\begin{aligned} \ln Sal_{real} = & \beta_0 + \beta_1 \ln \text{elementary and junior high} + \\ & \beta_2 \ln \text{senior high} + \beta_3 \ln \text{university} + \beta_4 \ln \text{post grad} \\ & + \beta_5 \ln \text{Exper} + \beta_6 \ln \text{Exper}^2 + \beta_7 \ln \text{Union} + \beta_8 \ln \text{White} \\ & + \beta_9 \ln \text{Male} + \epsilon \end{aligned} \quad (11)$$

Where ϵ represents a stochastic error.

The variables not directly associated to an individual's schooling, which are: experience, experience squared, union situation, sex, and color, were included in the model in an attempt to adjust possible distortions in the result caused by these same variables.

Material

The data base used to calculate the differences in earnings based on schooling as well as other variables considered for the present work was from the 2009 National Survey by Sample of Households (PNAD), carried out by the Brazilian Institute of Geography and Statistics (IBGE), in which socioeconomic and demographic characteristics are investigated, such as sex, age,

color, education, work, among others. The selected sample was of 10,761 individuals who declared to receive any income coming from work, 6,359 being from the State of Goiás and 4,312 from the Federal District.

This data base is considered to be a Transversal Cut. According to Gujarti and Porter [18,19], the data obtained in a transversal cut is characterized as having been collected at the same point in time.

In order to process the model, the statistical software Stata was used, which has interesting operational characteristics and allows for more complex statistical analyses such as variance analysis, multiple linear regression, among others, applied in the present case.

Hypotheses

In agreement with the studied theory, it is expected that higher levels of schooling provide higher returns on income, according to equations 12, 13, 14, and 15.

$$\begin{aligned} * \frac{\partial S}{\partial \text{elementary and junior high}} > 0 \quad (12) & \quad * \frac{\partial S}{\partial \text{high school}} > 0 \quad (13) \\ * \frac{\partial S}{\partial \text{university}} > 0 \quad (14) & \quad * \frac{\partial S}{\partial \text{post_grad}} > 0 \quad (15) \end{aligned}$$

It is expected that the reflection of work experience on income would be positive, however, that over time, it would fall, and even reflect negatively, because more experience also indicates older age of an individual. It is known that older individuals tend to be more expensive for the market, which sometimes opts to hire young but well-qualified individuals at a lower cost, instead of older and more experienced, however more expensive individuals.

$$* \frac{\partial S}{\partial \text{exper}} > 0 \quad (16) \quad * \frac{\partial S}{\partial \text{exper}^2} > 0 \quad (17)$$

Also, as shown in equation 18, it is expected that the relationship of an individual with a union would reflect positively on income. Being affiliated with a union is a sign that the individual acts socially to maintain his employment and the income of his working class, and, by fighting for a collective purpose, is simultaneously defending his personal income. Gouveia [20] analyzed the relationship between income and the fact of an individual being in a union. The results of the study indicated that union members receive a 68% higher income than non-union members when there is a direct comparison among the groups, and 12% for estimates made by OLS.

$$* \frac{\partial S}{\partial \text{indic}} > 0 \quad (18)$$

$$* \frac{\partial S}{\partial \text{union}} > 0 \quad (18)$$

And finally, the fact of being white and of masculine sex should give positive returns in individuals' income. This is because the regions studied have cultural and social aspects, characteristic of the Brazilian society, that place a premium on the presence of people of the male sex and white color in the job market.

$$* \frac{\partial S}{\partial \text{branca}} > 0 \quad (19)$$

$$* \frac{\partial S}{\partial \text{hom}} > 0 \quad (20)$$

$$* \frac{\partial S}{\partial \text{white}} > 0 \quad (19)$$

$$* \frac{\partial S}{\partial \text{male}} > 0 \quad (20)$$

Analysis and Discussion of the Results

In this section, we seek to quantify and evaluate the effects of the variables that influence the behavior of education on the income of the individual in the State of Goiás and the Federal District. The variables proved relevant to explain the variations in income. The best adjustment was obtained using the model in the logarithmic form.

Table 3 shows the descriptive statistics of variables used in the econometric model. These estimates were performed on a total sample of 6,359 individuals that are active in the labor market, in other words that are employed in the State of Goiás.

Table 1: Descriptive statistics of the variables used in determining the returns to income in the State of Goiás -2009.

Variable	Average	Standard Deviation
Actualsal	4,610	0.792
Elementary and junior high	0.348	0.476
High school	0.389	0.487
University	0.174	0.379
Post grad	0.010	0.098
Exper	20.111	12.500
Union	0.124	0.329
White	0.405	0.491
Male	0.474	0.499
Observations	6,359	

Source: PNAD 2009. Prepared by the author.

The averages of the variables elementary and junior high, high school, university, and post grad represent the proportion of individuals with each

level of schooling, in other words, that have the Diploma from each phase of learning. Of the individuals that were employed in 2009, in the sample of the State of Goiás, 34.8% had only completed elementary and junior high, 38.9% high school, 17.4% university, and 1% were specialized at the post-graduate level. The average salary in the sample for the State of Goiás was R\$ 4,610, and the average experience declared was 20.1 years.

In regards to the data referring to other socioeconomic variables in the model, 47.4% declared themselves to be male, 40.5% declared themselves to be white, and 12.4% affirmed to be affiliated with a union. Table 4, in the same way the first case was analyzed, shows the descriptive statistics of the variables used in the econometric model for the Federal District. These estimates were made for a total sample of 4,312 individuals that are active in the labor market.

Table 2: Descriptive statistics of the variables used in determining the returns to income in the Federal District- 2009.

Variable	Average	Standard Deviation
Actualsal	5,175	1.024
Elementary and junior high	0.231	0.421
High school	0.382	0.486
University	0.310	0.463
Post grad	0.034	0.182
Exper	18.376	11.614
Union	0.264	0.441
White	0.421	0.494
Male	0.511	0.500
Observations	4,312	

Source: PNAD 2009. Prepared by the author.

In the case of the Federal District, in the sample, 23.1% only completed elementary and junior high, 38.2% completed high school, 31% completed senior high, and 3.4% specialized at the post-graduate level. The average salary of the sample for the Federal District was R\$5,175, and the average declared experience was 18.3 years.

In regards to data referring to other socioeconomic variables in the model, 51.1% of the sample declared themselves to be male, 41.1% declared themselves to be white, and 26.4% affirmed to be affiliated with some union.

Among the different functional forms used to specify the econometric models, the one that had the best statistical results was the multiple linear form. In Table 5, there are the estimated results

from the econometric models for the two federal units researched and the results of the performed

validation tests.

Table 5: Results of the regressions for the State of Goiás and for the Federal District, 2009

Variable	State of Goiás			Federal District		
	Estimated Coefficient	Standard Error	Test t	Estimated Coefficient	Standard Error	Test t
Elementary and junior high	.2075203*	.0402966	5.15	.2349658*	.0588461	3.99
High school	.596085*	.0439895	13.55	.8156405*	.0621876	13.12
University	1.346483*	.0512937	26.25	2.023985*	.0648488	31.21
Post grad	1.909938*	.1082125	17.65	2.490081*	.0847991	29.36
Exper	.0353471*	.0026266	13.46	.0452137*	.0033813	13.37
exper2	-.0004416*	.0000603	-7.33	-.0004654*	.000082	-5.68
Union	.2092325*	.0259745	8.06	.2423984*	.0259051	9.36
White	.09997*	.0174375	5.73	.1269976*	.0220161	5.77
Male	.3310345*	.0167675	19.74	.2820937*	.0207208	13.61
_cons	3.337933*	.0478566	69.75	3.219041*	.0636686	50.56
	State of Goiás			Federal District		
	Validation Tests					
Observations	6359			4312		
R ²	0.3019			0.5769		
F global	245.39			700.16		

Significance Level * 1%

Source: PNAD 2009. Prepared by the author.

The coefficient of the R² determination indicates that 30.19% of the variations which took place in income in the State of Goiás and 57.69% in the Federal District were explained by the predetermined variables in the model. The values of the global F test, in both cases, also pointed to the model's coherence. Also, all the signs of the partial regression coefficients of these variables are coherent with the theory studied and with the empirical knowledge. The coefficients were calculated to significance level of 1%.

Also for the sample it was verified that there is a low grade of collinearity among variables, both for the state of Goiás and for the Federal District. The degree of correlation for the variables was expressed by Tables 6 and 7. Gujarti and Porter [19] remind us that one of the ways to detect the existence of multicollinearity among the variables is by evaluating whether the correlation coefficients two by two, among the variables, don't exceed 0.8. In the case that this occurs, multicollinearity is a serious problem. As evaluated, this phenomenon only appears where the variables experience and experience squared were inserted into the model to avoid distortions.

Since the estimates were made from a logarithmic model, the parameters represent the estimates of income elasticity. As such, since the coefficient for

Table 3: Analysis of the correlation of the variables for the State of Goiás, 2009

	salreal	grau_1º	grau_2º	grau_3º	pos_grad	exper	exper2	sindic	branca	hom
salreal	1.0000									
grau_1º	-0.2242	1.0000								
grau_2º	-0.0002	-0.6172	1.0000							
grau_3º	0.3838	-0.3059	-0.3079	1.0000						
pos_grad	0.1528	-0.0646	-0.0650	-0.0322	1.0000					
exper	0.0272	0.1649	-0.3724	-0.1748	-0.0069	1.0000				
exper2	-0.0091	0.0811	-0.3480	-0.1726	-0.0158	0.9627	1.0000			
sindic	0.1947	-0.1146	0.0134	0.1562	0.0520	0.0103	-0.0020	1.0000		
branca	0.1542	-0.0960	0.0242	0.1384	0.0518	0.0043	-0.0028	0.0260	1.0000	
hom	0.1299	0.1032	-0.0468	-0.1335	-0.0365	0.0459	0.0522	0.0238	-0.0185	1.0000

Source: PNAD 2009. Prepared by the author.

Table 4: Analysis of data correlation for the Federal District, 2009

	salreal	grau_1º	grau_2º	grau_3º	pos_grad	exper	exper2	sindic	branca	hom
salreal	1.0000									
grau_1º	-0.3849	1.0000								
grau_2º	-0.2230	-0.4725	1.0000							
grau_3º	0.5798	-0.3570	-0.5004	1.0000						
pos_grad	0.2672	-0.0999	-0.1400	-0.1058	1.0000					
exper	0.0753	0.2134	-0.2112	-0.1795	0.0160	1.0000				
exper2	0.0296	0.1658	-0.2038	-0.1842	-0.0029	0.9597	1.0000			
sindic	0.3258	-0.2180	-0.0297	0.2478	0.0602	0.0224	-0.0014	1.0000		
branca	0.2394	-0.1447	-0.0949	0.2154	0.1142	-0.0221	-0.0234	0.0682	1.0000	
hom	0.0727	0.0886	-0.0132	-0.0854	0.0009	0.0307	0.0270	0.0057	-0.0358	1.0000

Source: PNAD 2009. Prepared by the.

the variable which indicates post-graduate level schooling, for example, was 1.9 for the State of Goiás and 2.4 in the Federal District, it suggests that an increase in 1% in the level of individuals with post-graduate level schooling reflects 1.9% and 2.4% in the income levels of these individuals, in these states respectively. In the Federal District, it is possible that the effect of schooling is higher due to the large number of federal civil servants, in the composition of the labor market, whose public careers, or a good part of them, offer salary increases for higher levels of schooling. In addition, the entrance into federal careers has a required level of schooling as a requisite for each case.

The variables experience and experience squared were included in the model with the intent of evaluating the paradox between professional experience *versus* the worker's age in the job market. The results were as expected, however the negative pressure in income caused by the increase in age (experience squared) of the worker was almost imperceptible. Experience positively affects earnings. For everyone 1.0% increment in the experience variable in the studied group, there is an increase in 0.33% of salary in the State of Goiás and 0.45% in the Federal District. However, in regards to experience squared, the returns were in significantly negative. The results indicate that age reduces gains from experience, but that in the analyzed cases the impact is virtually nothing.

As expected, the data indicates that being union affiliated positively affects salary. The data shows that an increase in 1.0% in the base of unionized individuals from the sample reflects in a 0.2% increase in the level of salaries in the State of Goiás and 0.24% in the Federal District. It is possible that the difference verified between the two entities is due to peculiarities in the labor market in the Federal District, predominantly rooted in the public sector and which is characterized by higher levels of unionization. Job stability, typical of public careers, is the strike mechanism widely used by the unions representing these careers, pressuring the salary levels upward.

The question of color (or race) exemplified in the model with a *dummie* to differentiate between people that declare themselves to be white or not, was reflected in the research results as expected. Apparently, those people considered to be white present positive differentials in salary. However, in both entities researched, it presented low return. Theoretically, other variables, among

them schooling, reflect themselves to a greater extent in an individual's income than skin color. This data suggests that an increase of 1.0% in the base of individuals that declare themselves to be white increments the salary level by 0.1% in Goiás and 0.12% in the Federal District.

The last *dummy* variable inserted into the model, the sex of the individual, also showed an influence in salary. The results of the model indicated that an increase in 1.0% in the level of male individuals reflects in a 0.33% increase in salaries of these individuals, in the State of Goiás and 0.28% in the Federal District. The explanation as to why this would lower in the Federal District is that in the public sector there are few procurement processes which restrict female participation. In the private sector, predominant in the State of Goiás, the selection and remunerative processes, for the most part, have subjective criteria and basically depend on the employer. In the public sector, the selection and remuneration systems have a higher level of impartiality. In public careers, the established salaries are determined by law, and the employer cannot pay different salaries for the same function, regardless of sex.

It is also cultural that different functions that require physical ability for their performance are, in private industry, directed towards individuals of the male sex, since these individuals have greater physical capacity for execution of this type of task.

Conclusion

As mentioned, the present work seeks to investigate the return to income caused by schooling of individuals in the State of Goiás and the Federal District, by employing the regression technique, called the Method of Ordinary Minimum Squares, an econometrical multilinear regression technique to estimate the behavior of the dependent variable (income) due to explanatory variables (especially education).

The methodological option was due to the fact that researchers in this field of study, in general, face already determined circumstances in which the studied phenomena take place. As such, studying them is an observational task, in other words, it is a task where it is impossible to experimentally reproduce the phenomena. Thus, the research remains restricted to the analytical instrumental point of view.

The results obtained indicate that, within the studied variables, those linked to schooling are

those that cause the largest returns to income. In addition, it was identified that the higher the level of schooling, the higher the return provided.

It is worth pointing out that regression analysis does not indicate causation. A statistical relationship between two or more variables, however strong it may be, does not establish a causal relationship between them. Actually, the causation conclusion should originate outside of statistics, basing itself, fundamentally on common sense or some already existing theory [21].

Generally speaking, in regards to both the perceptions and the results found, despite similarities of socioeconomic indicators between the State of Goiás and the Federal District, the latter seems to present better return indexes of education on income. The explanation for this fact could be related to the large number of workers in the public sector, characteristic of the Federal District. A good part of these public careers currently provide for promotions based on education and qualification. Such promotions

work as incentives for individuals to educate themselves.

Finally, it is important to emphasize that more studies are needed about the question of educational returns on individuals' incomes. As such, the present study can be considered a step for more detailed future analyses.

As a suggestion for future works, it is suggested that the average costs of education be analyzed in these same states, in order to evaluate the average time for return on investments made for educating oneself.

It is also suggested that the returns on income for individuals with post-graduate studies, differentiated by level, *latu sensu* (specialization and MBA), and *strictu sensu* (Masters and Doctorate) be studied. The studies indicated that the largest returns of education on income are found at the post-graduate level [22-26].

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