Higher Education and Economic Growth in the Latin American Emerging Markets

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Abstract

The aim of this article is to shed light on the connection between higher education and economic development in three emerging economies in Latin America (Argentina, Brazil, and Chile). The Granger pairwise causality test was used to determine the relationship between the two variables of GDP growth and higher education enrollment. Using the 1960-1996 period, weak relationships were found between the two variables. There were, however, some differences among the countries. In Brazil, higher education enrollment was found to impact GDP growth and in the case of Chile, no causal relationship was found between these variables.

I. Introduction

The focus of this study is to examine three key emerging markets in Latin America: Argentina, Brazil, and Chile. These countries exemplify some of the common characteristics of emerging markets that include a political transition to democracy and an economic transition toward a market economy. Recent studies have shown that emerging economies in Latin America, Asia, and Europe are becoming increasingly important to the world economy. According to the U.S. Department of Commerce, the ten Big Emerging Markets (BEM) (e.g., Argentina, Brazil, China, Korea, Poland, etc.) currently represent more than 50% of the global population. Their GDP is a rapidly growing proportion of the world's (U.S. DOC Report, 1996).

As these emerging markets grow in importance to the old economy, it is essential to develop an understanding of some of the key elements in their ability to sustain economic growth. The focus of this report is on the existing relationship between the economy and higher education. This research is particularly important because the three countries under study are leaders economically and politically in Latin America. Brazil accounts for 45% of regional GDP, Argentina has the highest per capita income (over $9,000) and Chile is widely recognized as having the most open, stable and liberalized economy in the region (World Bank, 1996). As these countries stability and growth is important for Latin America, an understanding of the relationship between some of the key variables that will determine this success or failure is needed. Thus, the purpose of this study is to examine the interrelationship of specific identified variables (GDP growth and higher education enrollment).

The next section contains a review of the literature pertaining to this topic. Section III describes the countries being investigated. Section IV discusses the data and methodology. Section V provides the analysis and results and the last section presents the summary and conclusions.

II.   Review of Literature

Many researchers in academic institutions and international organizations affirm that education is important for economic and social progress in developing countries (Rondinelli, *et. al.,* 1995). Also, most would agree that the linkage between education and development is a two-way process. The human resources of a nation, not its capital or its material resources, is what ultimately determine the character and pace of its economic and social development. Most developing countries have been led to believe or have wanted to believe that it is the rapid expansion of educational opportunities that holds the basic key to national development. Latin American countries in particular focused on this aspect. Many of the early claims made on behalf of the importance of quantitative expansion of educational opportunities simply did not materialize. Claims such as; accelerated economic growth, improvement in all levels of living especially for the poor, wide spread and equal employment opportunities for all, acculturation of diverse ethnic or tribal groups and encouragement of modern attitudes all have been shown to be greatly exaggerated (Todaro, 1989). On the other hand, human capital theorists such as George Psacharopoulos (1985) have investigated the relationship between education in general and economic growth. These theorists assert that education, by increasing the human capital stock of individuals, improves productivity.

Focusing more specifically on higher education, there is no consensus among economists regarding the size of externalities or spillover benefits that it should presumably generate. There is a kind of cyclical pattern in their beliefs. In the 1960's, the standard view was that these externalities were significant. Later, they were supposed to be negligible, but at the end of the 1970's there was a shift back to favoring higher education (Maynard, 1981).

In the 1960's and 1970's economists working in development agencies began to view education as an investment in the economy. National plans began to emphasize the importance of education in creating the skills necessary for economic development. This line of thinking, relating education and the economy, continued into the 1980's and 1990's as international development institutions such as the World Bank began to focus their attention on education as a means to promote economic growth (Jones, 1993).

Traditionally, research by international agencies on the issues involved in the transition process has been on the separate issues of economic and political policies. Increasingly, they are turning to an examination of the various factors involved in the success or failure of countries as they relate to this transition process. Studies examining the various factors in the development of Brazil, for example, support the contention that the lack of a strong education system has hindered economic development and political stability (Birdsall, et. al., 1996).

Increasingly, studies have been undertaken trying to understand the relationship between higher education and the economy using quantitative methods. In a 1995 study by De Meulemeester and Rochat, the relationships between higher education and economic development in six industrialized countries (United Kingdom, Japan, Australia, Sweden, Italy, and France) were examined. Using co-integration and Granger causality tests, they found a significant relationship in four of the six countries examined (United Kingdom, Japan, Sweden and France). Their findings support the notion that higher

education, over an extended time period and under certain political and historical circumstances, does have a positive impact on economic growth. Also revealed in the study and supporting the contention of many social scientists is that this relationship is not mechanistic and cannot clearly be proven or disproved by using quantitative measures.

Research, which focuses on the relative contribution of various disciplines to economic growth, is emerging. The basic insight that can be drawn from this literature is that higher education can promote growth if there is a balance in favor of growth promoting disciplines (e.g., engineering, business, etc.) (OECD, 1996).

An education system has to be designed in accordance with the actual needs of the economy. Some specialists of development economics (Mingat and Tan, 1985; Colclough, 1989) have also defended such an idea. An economic and technological threshold has to be attained before the development of higher education can foster economic development. When resources are scarce, over-expansion of the educational system or some of its components (i.e., higher education versus primary education in less developed countries) can be adverse to growth. It is often the quality of fields of growth in higher education that are of most importance.

Additional research needs to be conducted to examine these factors in greater detail. By examining the relationship of the two variables of GDP growth and higher education enrollment, this research will contribute to the body of knowledge. The next section of the report provides political, economic and educational background information on Latin America during the time period under review.

III.   Background
A.   Political and Economic Developments in Latin America: 1960 - 1990's

From the 1960's until the end of the 1980's, military dictatorships were the predominant models of political leadership throughout Latin America. Economically, most countries followed a policy of import substitution as a method to promote economic growth from within. The economies were weak and foreign debt (due to the development of the infrastructure for an internal market) rose rapidly. The 1980's were a period of political and economic change in the region and it was also a period of economic stagnation. While the region was rich in natural resources, ineffective government policies did not use these resources to their full potential. Poor economic management, the slow transition process (e.g., poor economic planning) and the decline of world trade were some of the reasons for this period of economic difficulty. It was at this time that democracy returned to Latin America (1983 in Argentina, 1986 in Brazil). Chile was the last country to return to democracy (1990).

B.   Higher Education and the Economy in Latin America: 1960-1990's

Unlike their emerging economy counterparts in Southeast Asia and Central and Eastern Europe, education policies in most Latin American countries were not tied to economic growth. After WWII, governments in the region placed a greater emphasis on the expansion of the higher education system rather than being concerned with qualitative factors. As enrollment increased in all levels, the quality of education eroded (Birdsall and Jasperson, 1997). Until 1980, academic freedom was limited by restrictive military

leadership. The higher education system was based on the strong state control model of governance. The systems were a product of the federal government and were controlled and regulated in many countries in the region. The following was characteristic of the linkages among higher education institutions, the economy and government in Latin America:

- Most governments did not develop a comprehensive strategy, relating education to economic growth. The skills produced were not highly related to the work environment and did not prepare individuals to acquire technical proficiency. This resulted in a mismatch between the curriculum developed and what skills were needed in the economy.
- The government had an import oriented economic growth strategy. This economic strategy was less demanding on labor and skills and thus provided less of an economic return for education.
- Less emphasis was placed on education as a means of improving one's standing in life (e.g., heavy subsidization of the poor rather than providing opportunities).

Finally, a recent Inter-American Development Bank study whose focus was Latin America and the Market indicated that the way to a fairer society hinged, in part, on more efficient spending on education. The continuing inequality produced by previous educational and other governmental polices indicates that a change must be made (Economist, 11/21-27/1998).

C.   *Recent policy changes in Argentina, Brazil and Chile: 1990 - present*

In Argentina, the government has undertaken difficult-to-reverse reforms. These reforms include institutional changes notably in private investment, trade, deregulation, and the financial sector. The government, however, has not linked economic development to education. Institutions have been given extensive freedoms, but still rely on the government for the funding of their operations.

Illiteracy rate is declining and the investment in education as a percentage of GDP more than doubled from 1990 to 1995. But, because of inflation the investment has not been as significant, except for more recent years when inflation has been brought under control.

Argentina has increased the educational level of their population equaling other industrialized countries in the world. From the human capital perspective, if these policies continue the result would be a rise in economic growth in relation to the rising education level. Related to the education indicators are the fields of studies, which some researchers believe are qualitative indicators and directly connected to the level of economic activity. Data show that students are changing their fields of study, for example, education science and teacher training has declined dramatically from 17 to 2% of the total enrollment. Students in the early 1990's were attracted more to the areas of law, business, natural science, medicine and engineering. These changes are a possible reflection of governmental policies in terms of open market reforms and a transition to democracy. These trends have continued through the late 1990's (UNESCO, 1997).

Brazil's economic performance has been poor in comparison to its potential. Its average annual GDP growth was only 1.5% from 1980-1993 (World Bank, 1996). Since early 1994, Brazil has implemented a successful stabilization program, the Real Plan,

named after the currency introduced in mid-1994. The program was based on an initial fiscal adjustment, a nominal exchange rate anchor and tight monetary policy.

The education record of Brazil has not kept up with the changes in other aspects of society and many argue that it is one of the most important reasons that Brazil is not reaching its economic potential (Birdsall and Sabot, 1995). In fact, Gary Becker, Nobel Laureate, recently stated that Brazil would be unable to sustain economic growth if it continues to maintain its current policy direction.

The illiteracy rate remains high and the investment in education has decreased as a percentage of GDP. In comparison to Argentina, where the higher education enrollment is 35%, Brazil's is only 11%. Public higher education institutions are tuition free. Difficult entrance exams allow entry only to those who are best prepared at the secondary level. As a result, access is thus limited to primarily those who can afford to pay for the training needed to pass exams and gain entry to the elite public institutions. Enrollments in education science and teacher training, while predominant fields of study, are decreasing. It is important to note that there is a similar drop in engineering, a field that is critical for economic development. But, commercial and business administration remain unchanged (UNESCO, 1997).

The large disparities between the rich and poor in Brazilian society, replicated and reinforced through the education system, have continued to hinder Brazil's future. Their lack of a highly skilled labor force, a prerequisite for sustainable economic growth in the global economy, has been and continues to be a major blockage for Brazil to reach its potential.

<u>Chile</u> has undergone profound economic, social, and political change over the past decade, marked by productivity gains, high output growth, and a strong external position. Unemployment, about one-fourth of the labor force in the trough of the 1980's recession, has fallen to the range of 4.5 to 6.0% (UNESCO, 1997). Social policy emphasized investing in people. The 1990 transition from military rule to democratically elected government was remarkably smooth.

Social developments have also been impressive as key social indicators, including life expectancy, infant mortality, malnutrition, educational attainment and overall literacy are more in line with higher income countries than those in the developing world. About one-fourth of Chile's people live below the poverty line today, compared to almost one-half in the mid-1980s.

Chile still faces a number of important challenges. Output growth will need to be supported by significant increases in productivity growth for which a mobile, sophisticated, and creative workforce will be decisive. In meeting these challenges, Chile has turned to education as a means to develop the skill necessary in the transition. The government undertook major programs in primary education, job training, health infrastructure, and project funding for the poor. In 1990, social expenditures represented 61% of public expenditures; by 1995 this had risen to 70% (World Bank Report, 1998).

IDB data showed that from 1980-1995, inflation dropped from 26 to 8% as unemployment dropped from 16 to 7%. Also at this time, there was a dramatic increase in higher education enrollment from 12 to 27%. While enrollment levels have increased, the percentage of investment in education has decreased as a result of the privatization of education and an introduction of tuition fees for study.

IV. Data and Methodology

Country data for this study were obtained from several sources. Economic figures were gleaned mainly from the Inter-American Development Bank reference materials. Other data including political, social, educational and business were abstracted from the Economist Country Reports and the 1996 World Bank Report as well as those sources listed in the references. Data for the variables examined were obtained for the period 1960 through 1996, a time when these countries exhibited extreme political and economic volatility. This time period also includes shorter time frames for which more stable figures could be examined. For this study, higher education refers to all post-secondary education recorded.

The approach used in this study was to apply standard statistical techniques to analyze the relationships between higher education enrollment and economic development as measured by growth in GDP. The methodology used was the Granger Causality Test. Data were tested for the presence of a unit root in the series (i.e., these time series are non-stationary in levels, but stationary in first differences). Correlation between the variables were determined using stationary time series, including stationary in first differences. Since correlation does not necessarily imply causation, the causality test was applied. A brief discussion regarding the application of these techniques follows.

A. Trends, Spurious Regressions, and Transformations to Stationary

Time series is a set of data connected in time with a definite order given by the sequence in which the observation occurred. The mean and variance of the distribution from which observations are drawn are not constant and depend on the point in time at which the observation was made. In the series examined, GDP growth is stationary in all three cases (Argentina, Brazil, and Chile). In contrast, the series for higher education enrollment is mainly first "difference" stationary processes.

B. Testing for Stationary

A non-stationary series is one whose moments are not time-invariant. Such a series can be expressed by the following general equation:

$$X_t = â_1 + â_2 Xt + â_3\ X_{t-1} + å_t$$

The trend stationary process versus the "difference" stationary process can be described as follows: If $â_2 \neq 0$ and $/â_3/ < 1$ then a deterministic trend follows. The autoregressive component shows that there may be deviations, but in the end the series will return to the trend (mean). A series of this sort is known as a trend stationary process (TSP). A series is "de-trended" by first regressing the variable on a time series and then using the residuals from that regression in place of the variable. On the other hand, if $â_1 \neq 0$, $â_2 = 0$ and $â_3\ = 1$ the series follows a random walk.

The behavior of such a series is very different since it displays no tendency to return to trend. A random walk is known as a difference stationary process (DSP) since the first difference will be stationary, where the first difference is given by:

$$Ä X_t = X_t - X_{t-1}$$
$$= â_1 + å_t$$

C. Testing for Non-Stationary (Unit Roots)

This procedure is commonly called testing for a unit root as an I (1) process has a unit root. If it is found that we cannot reject the hypothesis that the variable is a unit root

(e.g., follows a random walk) then the variable is non-stationary and we must proceed with another test such as the Dickey Fuller Test.

To test for a unit root, one estimates an auto-regressive model, allowing for the possibility of an intercept and deterministic trend. The procedure is used to find the appropriate specification and corresponding value of coefficient on the lagged dependent variable. With regard to causality, we are interested in one of the equations that will help determine if higher education enrollment is an important issue in GDP growth. The approach of orthodox econometrics is to simultaneously develop models in order to specify the exogenous and endogenous variables a priori. The view is that exogenity cannot be tested and must be assumed.

D.   The Granger Causality Test

Modern econometrics, however, has evolved other definitions of exogenity, one of which involves the concept of Granger causality, the technique used here. Granger causality is not about causality in the normally accepted sense of the word; precedence would be a more appropriate term. The Granger approach to the question as to whether "X causes Y" is to determine how much of the current Y can be explained by past values of Y, and then, by adding lagged values of X, whether the explanation can be improved. Y is said to be Granger caused by X if X helps in the prediction of Y. Again, it is important to note that the statement "X Granger causes Y" does not imply that Y is the effect or a result of X.

The Granger test that X does not Granger cause Y, is proven by the F-test, that the X's may be excluded from the equation:

$$Yt = \hat{a}o + \sum_{i=1}^{k} \hat{a}_1 \, Y_{t-1} + \sum_{i=1}^{k} \tilde{a}_1 \, X_{t-1} + \mathring{a}_t \qquad (1)$$

Applying the test requires three steps:

1.   Estimate the unrestricted model given by equation (1)
2.   Estimate the restricted model by regressing Y on the lagged Y's.
3.   Test the restriction with the F-test.

The null hypothesis is that X does not Granger cause Y. When we reject the null hypothesis, the data suggests that X does Granger cause Y. This means that if changes in the X are to cause changes in Y, then the X change must come before (precede) the Y change. However, while it is true that if event X follows event Y, then X cannot have caused Y.

Using this approach, four outcomes are possible:

1.   No causal relationship between the two variables
2.   Unidirectional causality from X to Y
3.   Unidirectional causality from Y to X
4.   Bi-directional causality (X causes Y and Y causes X)

Analysis and Results

In the cases of Argentina, Brazil, and Chile, the time period used was 1960-1997. The relationship between selected variables was investigated to determine if the enrollment in higher education has some effect on GDP growth and how these variables interrelate. For 1960 -1982, the percentage change in GDP growth, in general, was

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positive in these three countries. But, 1982 - 1992 was a period of instability. This instability caused wide swings in GDP growth, and in some cases, it was negative. Since 1992, however, it appears that more economic and political stability has returned to all three countries and, in general, the GDP growth is positive. For the individual countries, a polynomial GDP growth trend was developed.

As shown in Figure 1, Argentina's economy, on average, appears to have "bottomed out" in the early 1980's; since that time average GDP percentage growth rate is on the upswing.

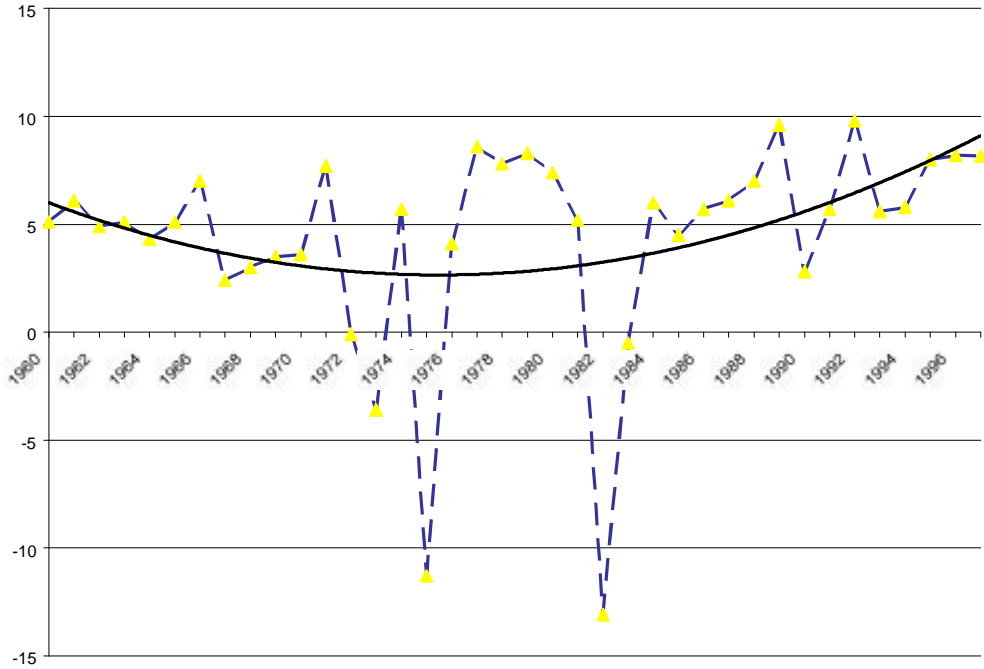**Figure 1: Argentina's GDP growth rate 1960-1996**
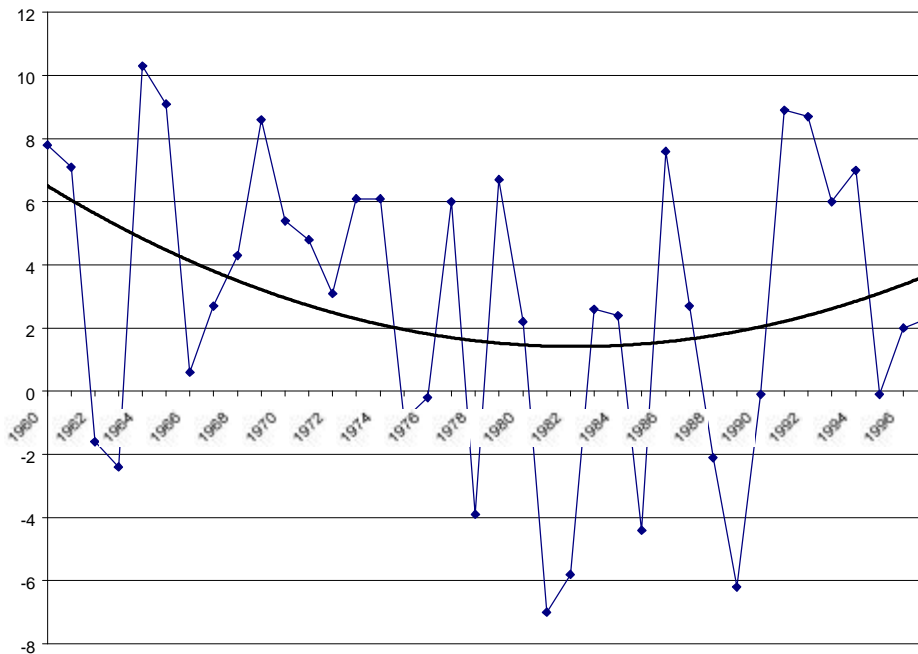
The trend line for Brazil, as shown in Figure 2, continues to be downward sloping indicating a precarious situation for the country.

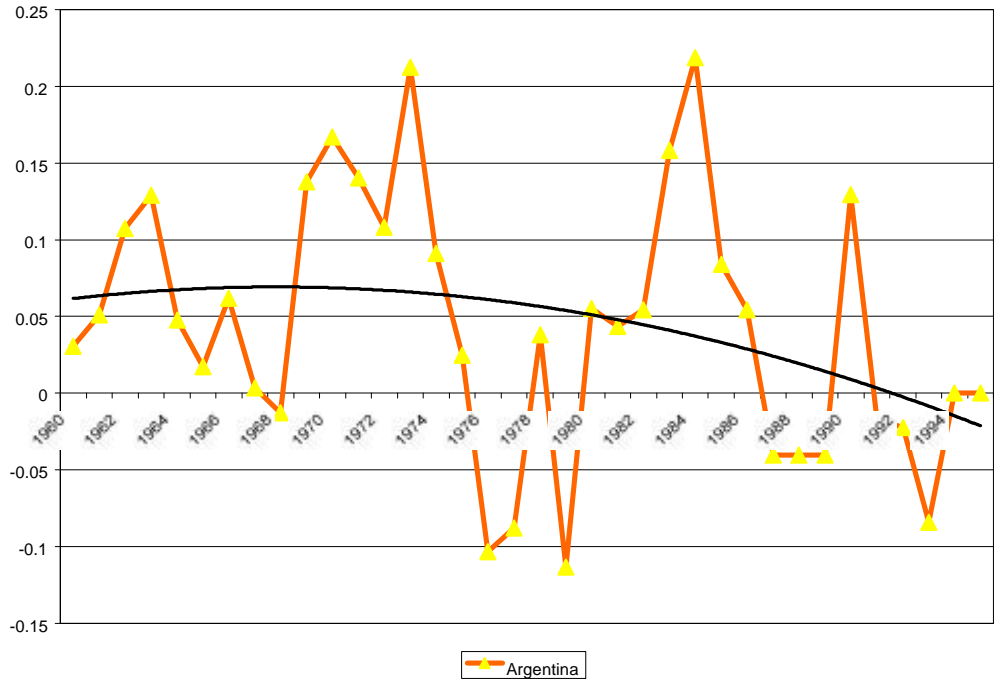**Figure 2: Brazil'GDP growth rate 1960-1996**

Figure 3: Chile's GDP growth rate 1960-1996

As indicated by Figure 3, Chile's GDP growth rate appears to have reached its low point in the early 1970's and, from that time, continues to be upward trending. Over the last 10 years it appears that Chile has taken the necessary steps to sustain positive economic growth.

Figures 4- 6 presents the higher education enrollment growth rate for each country. Examining Figure 4, the trend line for Argentina exhibits a downward bias.

**Figure 4: Argentina's higher education enrollment rate 1960-1996**

For Brazil, as shown in Figure 5, the growth rate is also downward sloping, but its rate appears more pronounced than Argentina.

Figure 5: Brazil's higher education enrollment rate 1960-1996

The trend line for Chile as shown in Figure 6 is relatively flat. In contrast to the other two countries, it appears to be slightly upward sloping.

Figure 6: Chile's higher education enrollment rate 1960-1996
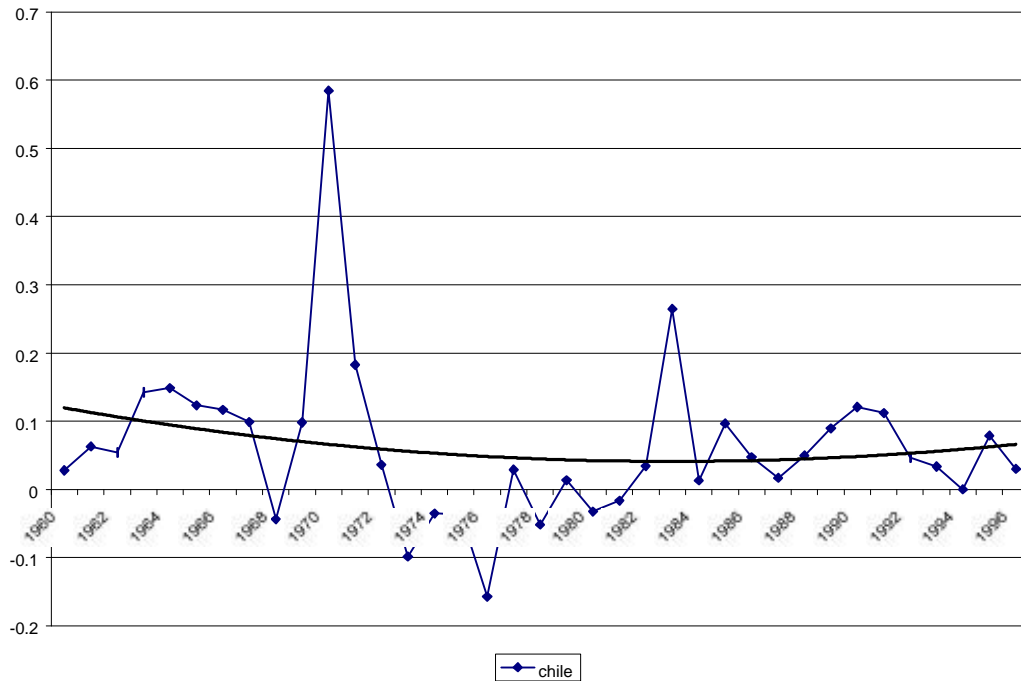
Clearly, Chile exhibits the highest fluctuations at least in the early years. Overall, during the last 10-years the three countries appear to have stabilized their higher education enrollment growth rates.

To better understand the relationship between the variables of GDP growth and higher education enrollment, a correlation analysis was performed for each country. Table 1 data shows that there is a weak correlation between the variables for Argentina. For example, there is almost no correlation between higher education enrollment (HEE) and GDP (0.017). In the case of Brazil, only a weak correlation between the variables was found. But, like Argentina and Brazil, Chile also exhibited a weak correlation between HEE and GDP. While this information is useful, it is necessary to further analyze the data for causality.

TABLE 1– CORRELATION MATRIX, 1960 – 1996, ARGENTINA, BRAZIL, AND CHILE: GDP GROWTH AND HIGHER EDUCATION ENROLLMENT

ARGENTINA

	GDP Growth	Higher Education Enrollment
GDP Growth	1.000	0.017
Higher Education Enrollment	0.017	1.000

BRAZIL

	GPD Growth	Higher Education Enrollment
GDP Growth	1.000	0.291
Higher Education Enrollment	0.291	1.000

CHILE

	GDP Growth	Higher Education Enrollment
GDP Growth	1.000	0.155
Higher Education Enrollment	0.155	1.000

Based on the theoretical material presented in the methodology, the causality data is presented in Table 2. The results are based on a two-period lag time using the F-statistic to either accept or reject the Null hypothesis (X does not Granger Cause Y).

TABLE 2 – PAIRWISE GRANGER CAUSALITY TESTS, 1960 – 1996

Null Hypothesis	Argentina	Brazil	Chile
Two period lag			
GDP Growth Does Not Cause HEE	**0.229**	**0.173**	**0.096**
HEE Does Not Cause GDP Growth	**0.892**	**2.770**	**0.572**
Three period lag			
GDP Growth Does Not Cause HEE	**0.220**	**0.169**	**0.10**
HEE Does Not Cause GDP Growth	**0.925**	**2.520**	**0.400**

F table = 1.84

For Brazil, the analysis indicated that HEE causes GDP growth (2.770). Surprisingly, all of the hypotheses are accepted for the case of Chile. GDP growth does not cause HEE in any of the three countries (all F-statistics are below 1.84).

In each of the countries, no correlation was found between GDP growth and the independent variable of higher education enrollment. Also, for each country, no causal relationship was found between the variables of higher education enrollment and GDP growth. It appears that supply and demand is not matched for these countries. As indicated by Ross and Birdsell in relation to Argentina (1997) weak demand for educated labor may explain why they tended to under-perform with respect to growth.

VI. **Summary and Conclusion**

The purpose of this research was to determine the linkages between higher education and economic development as represented by GDP growth rate. Three Latin American countries were examined: Argentina, Brazil and Chile. To undertake this project data were collected for the period from 1960-1997. The variables were tested for correlation and then explicitly tested for causality.

The results of this research indicated that the relationships between higher education and economic development are not linearly mechanistic. For Brazil, it was found that higher education enrollment caused GDP growth. No causal relationship between all the variables was found for Chile. Each country exhibited similarities and distinct differences.

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In Argentina, it was found that their higher education enrollment growth rate is declining. In should be noted that attendance at public institutions is tuition free and enrollment is based upon successfully passing secondary school examinations.

Brazil's GDP growth rate, higher education enrollment rates are all on the decline. Brazil's education policies make it difficult for lower income students to enroll in public higher education institutions. Entrance exams are highly competitive and require good preparation at the secondary level. Often the best preparatory education is obtained at private secondary schools. Thus, students who can afford to attend these institutions are better prepared to pass the exams to necessary for entering the more prestigious public institutions. As a result, if students of lower socioeconomic status would like to attend higher education they often must do so at a private institution which is costly. Brazil's higher education policy may unknowingly be designed to restrict enrollment.

The figures in this report indicate that in Chile, GDP growth rate is increasing the. Higher education enrollment growth rates, on the other hand, do not appear to have changed much during the last ten years. This research indicates no causality between the two variables but, from a qualitative standpoint, there is a stronger correlation between these variables than Argentina and Brazil.

The attempt of the research was to determine if higher education impacted GDP growth. While there was a causal relationship found in Brazil, the other two countries did not show this relationship. The implication of the finding that there is a causal relationship for Brazil may mean that if Brazil would improve its higher education enrollment rates, it would improve its GDP growth rates.

More importantly, as noted in the review of literature, education can promote economic growth if its content (the curriculum) is designed toward to increase productivity. It is also vital that the social, political and economic structures be linked so those graduating can actually make use of their knowledge and skills.

These linkages should be examined in greater depth in future research. Also, in future studies, researchers need to examine other aspects of economic growth and levels of education (from both a quantitative and qualitative perspective) to further explore the limits and possibilities for linking higher education to the economy.

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