

# ECONOMIC GROWTH IN PARAGUAY\*

**Carlos G. Fernández Valdovinos**  
**Gerencia de Estudios Económicos,**  
**Banco Central de Paraguay**

**Alexander Monge Naranjo**  
**Department of Economics,**  
**Northwestern University**

**August, 2002**

## Abstract.

This paper explores the economic growth in Paraguay from 1962 to the present, discussing in detail the different episodes as policies and growth results were very different depending on the period. We argue that the weakest performance of the Paraguayan economy was in terms of the accumulation of human capital and, more astonishingly, in the behavior of total factor productivity (TFP). In fact, using a wide variety of methodologies, we find that TFP continuously declined after mid 1970s.

The paper also explores the relationship of growth with social indicators, especially poverty, and argues for more aggressive government policies in promoting the accumulation of human capital. Those policies would be likely to improve the country not only in terms of poverty but also in its growth performance.

Given the dramatic fluctuations to which Paraguay was exposed, we also include an analysis of the business cycles in Paraguay during the different periods, including its co-movements with its main trading partners. We observe that the importance of Brazilian fluctuations has increased dramatically in the recent years.

---

\* We are very thankful to Rodolfo Manuelli and Victor Elias for their detailed comments and to Bernardo Darío Rojas Páez for research assistance. The authors are solely responsible for the contents of this paper. Specially, they do not necessarily represent the opinions of the Banco Central de Paraguay.

## 1. Introduction.

This paper studies the growth behavior of Paraguay, a small economy in South America that is among the least developed in the American continent. According to the index of human capital development, Paraguay lags significantly behind most of its neighbors. The current conditions of Paraguay, which are the likely outcome of a long history of unsustainable macroeconomic imbalances, policy reversals, bad policies and political repression and turmoil, can be ascertained by looking at the current statistics on poverty. The 1999's Household Survey<sup>1</sup> reveals that poverty in the urban regions of the country reached 26.7%. This means that around 810,000 individuals in these areas can barely finance their daily food expenditures. Moreover, around 6.1% of the urban population are into the "extreme poverty" class, i.e. 184,000 people cannot cover expenditures for basic food. The situation is even more dramatic in the rural sector: 42% of total families fell below the poverty line, of which 26.5% were below the extreme poverty line. Even by Latin American standards, the development conditions in Paraguay are dire.

Isolated by nature, with a small and unskilled population, lacking mineral resources, punished by devastating wars and surrounded by highly unstable neighbors, Paraguay is a natural candidate to be among the least developed countries in Latin America. As of 2000, its GDP per capita was only 50% of the Latin American average and, when compared with its MERCOSUR partners, it was only 34%. Worse of all, the Paraguayan economic growth performance has been historically less than satisfactory. The average annual growth rate between 1950 and 2000 was only 1.7%. If we exclude the seventies, when much of the construction of the Itaipú project was done, the average drops to only 0.5% per year<sup>2</sup>. The "lost decade" of the eighties, which was suffered by all the continent, left Paraguay with a yearly GDP per capita growth rate of only 0.2%. But contrary to the average Latin American country, in Paraguay that period was followed by an even worse decade: in the nineties the average annual growth rate in GDP per capita was negative, -1.7%. Current per capita GDP levels are equal to those in 1976.

Without any doubt, the meager growth rates displayed by the Paraguayan economy lie at the center of all other major problems. To put things in perspective, for example, between 1990 and 1995, per capita Chilean GDP grew in average 5.3% per year while in Paraguay the average annual growth rate was only 0.5%. Moreover, expressed in 1990 dollars, average GDP per capita in Latin America was USD 2604 in 1995 and only USD 1466 in Paraguay<sup>3</sup>. Thus, starting from its 1995 level, it will take a little more than 11 years for Paraguay to reach the Latin American average GDP if it could grow at the Chilean rates. Instead, with its own growth rates, it would take 192 years to attain the same goal. This example

---

<sup>1</sup> The survey is elaborated by the Dirección General de Estadísticas Encuestas y Censos (DGEEC).

<sup>2</sup> During the seventies, per capita GDP grew in average at a record rate of 6.2% per year. Growth rate in per capita GDP reached even 8.6% in 1978.

illustrates an obvious point: growth rates have cumulative effects over time and even small differences in the growth rates, when cumulated over a generation or more, have much huge consequences for standards of living. If anything, macroeconomists and other policy makers in the region must have growth policies as their first priority.

In this paper we examine the Paraguayan growth experience from early 1960s to these days. We study the different episodes, attempting to identify the main factors behind the growth exhibited by Paraguay in each episode. Studying the determinants of growth is of particular importance for a country like Paraguay that just recently recovered the most basic political rights and, with some vacillation, tries to consolidate democratic institutions. Up to now, those positive political events have not been accompanied by economic growth and poverty alleviation.

Over the different periods, Paraguay shows very different growth rates. The following table compares the growth performance of Paraguay between 1960 and 1995 relatively to MERCOSUR countries, Latin America countries and the world. It can be seen that the average growth performance of Paraguay's has not been impressive. Even though higher than the Latin America and MERCOSUR average, it was way below the mean of East Asia and OECD countries. Moreover, growth in Paraguay has been very erratic over time. The sixties were a middling decade, with Paraguay growing in tandem with the region. During the seventies, the construction of Itaipú, a huge hydroelectric project, allowed Paraguay to growth at the same high rates observed in East Asia, clearly outperforming the rest of Latin America. For the eighties this stimuli vanished and, as in other countries in the region, average per capita growth rate was negative. As it is well known, this period was characterized by external debt problems, stagnation and macroeconomic instability in the whole region. But in the nineties, Paraguay took apart from the continent. While Latin America observed a strong recovery, Paraguay experienced probably the worst growth episode in recent history: its average growth rate during this period was around 1/3 of the Latin America and 1/5 of its MERCOSUR partners.<sup>4</sup>

---

<sup>3</sup> These numbers are taken from the Inter American Development Bank.

<sup>4</sup> Following a banking crisis and an strong reduction in triangular trade, economic performance was even worst in the second part of the decade. Between 1995 and 1999, the economy contracted for four consecutive years, with an overall fall in real per capita GDP of 6.5 percent, one of the worst macroeconomic performance in all Latin America.

**TABLE 1: GDP Per Capita and Average GDP Per Capita Growth Rates**

	1960	1995	60-70	70-80	80-90	90-95	60-95
<b>Paraguay</b>	1,177	2,178	1.7	6.2	-1.7	0.5	1.8
<b>MERCOSUR*</b>	2,571	4,132	2.3	3.0	-1.2	2.5	1.5
<b>Latin America (21)</b>	2,319	3,429	2.3	2.3	-1.5	1.4	1.1
<b>Sub-Saharan Africa (17)</b>	784	1,061	2.1	1.1	-0.8	-1.9	0.5
<b>East Asia</b>	1,275	8,119	4.7	6.0	4.6	4.1	5.0
<b>OECD (22)</b>	5,592	13,364	4.3	2.5	2.1	1.1	2.7
<b>World (81)</b>	2,667	6,141	3.2	2.6	0.6	1.1	2.0

\* Includes Bolivia and Chile

Source: De Gregorio and Lee (1999).

The most striking conclusion from the growth accounting exercises is that total factor productivity has been falling over time. This result is robust to a variety of methods to measure capital and to decompose input contribution versus productivity. We also find that physical capital had a strong pull for growth in most of the periods, but it was more strongly during the 1970s and much more modest during the 1990s. We believe that those are the reflections of the construction of the large Itaipu dam in the 1970s and of the effect of the political uncertainties after 1989 when Stroessner was ousted out of power.

Over the entire sample period, it is clear that capital accumulation has outpaced output, so its accumulation does not seem to be the major deterrent of growth. The main problems appear in the accumulation of human capital and the overall productivity of factors. It seems safe to conclude that if Paraguay is to grow faster, more aggressive policies should focus on these problems. Any contribution would also have the benefit of fostering the accumulation of complementary factors, such as physical capital.

The remainder of the paper proceeds as follows. In the next section we provide an overview of the most important historical events during the second part of the past century. In the third section we examine the statistics on human capital and poverty and argue that Paraguay's performance in this front is very disappointing, even if compared with the countries of the region. In the fourth section we importance of factor accumulation and productivity in leading the growth of output. In the fifth section we argue that fiscal variables, inflation and some other economic variables have a strong co-movement with growth and hence are likely to influence it. The sixth section looks at the comovement of Paraguay with its main trading partners and argues that the importance of Brazil has increased dramatically in recent years. In the seventh section we include some final remarks. Finally, an appendix is included with a discussion of the major factors affecting the incentives to accumulate capital.

## **2. A Brief Historical Background.**

Paraguay has always been an economy concentrated in the production of agricultural goods. This characteristic and the small size and openness of the country, made it very sensitive to world events that affected the international market for agricultural products. Those events have translated into sharp and long lasting fluctuations that have also triggered other macro instabilities, such as fiscal and exchange crisis and high inflation rates. The purpose of this section is to briefly review the main characteristics of the different sub-periods from 1940 to the present.

### **2.1. The Forties, Fifties and Sixties.**

The forties and fifties were periods of important institutional changes and severe fluctuations. The period started with World War II, which mostly benefited Paraguay in the form of a sharply increased in the demand for its agriculture products, leading to relatively high growth rates of the entire economy<sup>5</sup>. Indeed, between 1938 and 1946, average GDP grew 2.5% per year and exports grew at an annual rate of 8.2%. But world supply conditions and the higher demand of domestic output were also reflected in rising domestic prices. Between 1939 and 1944 the cost of living increased 300% for higher income groups and 50% for the poor. In the institutional front, as in most countries in Latin America, this is the period when Paraguay established its national currency and founded its Central Bank. Effectively, in November 1943 the Guaraní became the country's monetary unit, with an initial exchange rate of G. 3.07 per US dollar.

But what appeared to be the beginning of a new and better era for the country came to a sudden end. Effectively, the cessation of world hostilities in 1945 brought about a long lasting and drastic drop in demand for agricultural products. Additionally, a cruel civil war erupted in 1946. The consequences were dire. For instance, output in 1947 dropped by 13%. The problems caused by low export demand and social unrest that disrupted production not only continued in the early fifties, but also they were further exacerbated by imprudent financial policies. In an attempt to encourage production, credit policies became expansive, fueling inflation and draining foreign reserves. Inflation accelerated reaching 160% in 1952 and more distortions were introduced in the economy as a system of multiple exchange rate and exchange rate controls gradually developed. With the aid of an IMF mission, the government was later able to bring inflation under control and to stabilize the currency at an exchange rate pegged to the US

---

<sup>5</sup> During this period, the volume of tobacco exports tripled, vegetable oil increased more than six times, wood multiplied five times, meat exports doubled while cotton increased 50%.

dollar (G. 126 per dollar)<sup>6</sup>. Growth recovered in the latter half of the fifties with commerce and construction as the most dynamic activities.

During the fifties foreign aid was ample and basic physical infrastructure was gradually expanded. In this respect, it is important to highlight the treaties signed with Brazil. In January 1956, Paraguay signed an agreement with this country whereby Brazil offered to finance the studies and to consign the loans necessary for the construction of a hydroelectric plant in the Acaray River, located close to the area where transport projects were being advanced. This treaty is the first one of its type. The other, which we will review in detail below, was the construction of Itaipú and it led the country to a large period of growth.

**TABLE 2: Sectoral Composition of GDP (%)**

Sectors	1951/60	1961/70	1971/80	1981/90	1991/00
<b>Agriculture</b>	38.1	34.5	29.3	26.2	26.8
<b>Mining</b>	0.1	0.1	0.2	0.4	0.5
<b>Manufactures</b>	16.7	17.1	17.7	16.5	14.7
<b>Construction</b>	1.5	2.2	3.5	6.2	5.4
<b>Electricity, Gas, Water</b>	n.a.	0.6	1.4	2.6	5.2
<b>Transport and Comm.</b>	n.a.	4.2	4.2	4.4	4.9
<b>Commerce and Finance</b>	26.0	25.8	26.3	26.7	24.9
<b>Government</b>	4.3	4.4	4.5	4.4	5.3
<b>Misc. Services</b>	13.3	11.1	12.9	12.6	12.3

**Source:** Central Bank of Paraguay.

As stated above, agriculture has been the main activity in Paraguay since colonial times. The forties and fifties were not the exceptions. In 1960 agriculture still accounted for almost 39% of GDP and employed 55% of the economically active population. Manufactures contributed 17.3% to the GDP, employing 15% of the work force. Over 75% of the value-added in manufactures was originated in agro industries. During the first half of the sixties, agriculture continued to be the main stimulus to economic growth. Agricultural growth, in turn, reflected migration to the eastern part of the country, including Brazilian immigration, and the expansion of transport links with Brazil and the internal road network.

The second half of the decade was very different. Public sector works and commerce started leading the rhythm of growth<sup>7</sup>. The government started to carry out important programs, especially road construction,

<sup>6</sup> Between 1952 and 1955 the average inflation rate was 53% per year. After the implementation of the stabilization plan, the increase in the price level was reduced to 12.2% per year between 1956 and 1960.

<sup>7</sup> For example, during this period construction was increasing at annual rates well above GDP's, while electricity and water growth began to exceed GDP's.

hydropower development, expansion of port facilities, construction of water services for Asuncion and even the construction of a cement plant. As a consequence, public investment averaged 5.3% of GDP in 1966-70, which is double the rate of the previous five years. The increased investment was partly financed externally but mostly from higher public savings originated from increases in taxes. Among public investment, energy ventures to take advantage of the country's hydroelectric potential were the most striking. Besides the construction of the Acaray plant, Paraguay and Brazil signed in June 1966 the Acta Final, the basis for the Itaipú treaty which was finally signed in 1973.

Commerce was another growing sector. It expanded by more than 6% per year during the period. The main basis for this sector were tourists from Argentina and Brazil. They were being attracted by the lower costs of goods, driven by lower prices of non-tradables and the much lower taxes that Paraguay imposed on imported goods, compared to the protectionist policies of richer Argentina and Brazil.

With savings and investment hovering around 12-13% of GDP, the average growth rate of real GDP in the 1960s was 4.2% per year, while population was growing at 2.5%. After the financial chaos of the 1947-54 period, stability was restored and in the sixties the country experienced price stability with the cost of living rising at an average of 2% per year. Additionally, during the decade there was a total exchange rate stability as the country stuck to the same pegged exchange of G. 126 per dollar.

## **2.2. The Seventies and the Itaipú Phenomenon.**

The seventies produced unusual prosperity for Paraguay. During this period, GDP growth accelerated dramatically to an average of nearly 9% per year, doubling the average performance from the previous decade<sup>8</sup>. The driving force behind this growth came from two sectors: agriculture and construction. The former was the result of the expansion of the agricultural frontier and the latter a consequence of the surge of construction on various infrastructure projects, culminating in the building of Itaipú (jointly with Brazil), the world's largest hydroelectric project.

---

<sup>8</sup> In particular, the yearly real growth rate of the GDP averaged over 11% in the 1977-1980 period.

**TABLE 3: Annual Average Growth Rate of Components of GDP (%)**

Sectors	1951/60	1961/70	1971/80	1981/90	1991/00
<b>Agriculture</b>	1.8	3.0	6.7	4.0	1.7
<b>Mining</b>	n.a.	57.5.	28.4	4.9	2.7
<b>Industry</b>	1.9	6.5	8.3	2.2	0.8
<b>Construction</b>	7.5	7.4	20.3	0.7	2.8
<b>Electricity, Gas, Water</b>	n.a.	11.3	17.5	7.9	10.2
<b>Transport and Comm.</b>	n.a.	37.3	9.7	3.7	4.1
<b>Commerce and Finance</b>	3.5	4.8	9.0	2.8	-0.5
<b>Government</b>	3.3	7.8	4.3	5.0	5.4
<b>GDP</b>	2.9	4.8	8.8	3.1	2.0

Source: Central Bank of Paraguay.

Starting in early 1970s the government accelerated efforts to expand the agricultural frontier. Heavy investment in infrastructure began during those years and they opened up the eastern frontier of the country to development. During the seventies new lands in this fertile region were brought under cultivation through establishment of numerous settlements there<sup>9 10</sup>. These settlements were the main reason for agricultural growth, a sector that reached an average growth rate of 6.9% per year during the decade. Due to expanding world demand and favorable international prices, the frontier lands were mainly used to produce export crops, mostly cotton and soybeans, which came to dominate the country's exports. As a result, cotton rose from supplying only 1.1% of total exports in 1960 to 44% in 1985, while soybeans, which did not appear on export lists at all in 1960, attained a share of over 16% in 1981<sup>11</sup>. It should be noted that livestock and quebracho extracts, Paraguay's traditional exports, declined dramatically during the same period.

The highway to Brazil and the development of the lands in the frontier region substantially reduced Paraguay's traditional dependence on Argentina as its trade route. This was reflected by the dramatic increase in trade with Brazil in detriment with the trade with other countries, especially the United States. For example, in 1960 only 0.2% of Paraguay's exports went to Brazil and 0.8% of import come from there. By 1981 the respective percentage were 18.3% and 25.9%. Another impact of the expanding agricultural frontier was reflected on the regional distribution of the population. While only 18.3% of the population lived in the eastern frontier region in 1962, 27.3% lived there 20 years later. Also, about

<sup>9</sup> By the end of 1976, almost 90,000 land titles had been issued, covering about 4 million ha.

<sup>10</sup> Paraguayan colonists were joined by large numbers of Brazilian and Japanese farmers, who came to the area in response to a number of economic stimuli: low land prices, low taxes, and favorable international prices for the agricultural products.

<sup>11</sup> The importance of soybeans exports, as percentage of total exports, further increase during the eighties and nineties.

40.5% of the population lived in the minifundia region in 1962, compared to 34.2% in 1982<sup>12</sup>. It is very important to note that because of this, and unlike most other LDCs, Paraguay did not experience a marked urban-rural migration, but instead a rural-rural movement, out of the traditional minifundia regions to the newly opened lands.

**TABLE 4: Employment by Sector of Production (%)**

<b>Sectors</b>	<b>1950</b>	<b>1962</b>	<b>1972</b>	<b>1982</b>	<b>1992</b>	<b>1999</b>
<b>Agriculture</b>	55.4	54.7	47.9	42.9	35.6	30.4
<b>Industry</b>	16.1	15.1	14.0	12.0	12.5	12.3
<b>Construction</b>	3.0	3.3	3.9	6.7	7.2	5.2
<b>Transport and Comm.</b>	2.3	2.5	2.8	2.9	3.3	4.3
<b>Commerce and Finance</b>	7.1	7.1	8.0	9.3	13.9	24.8
<b>Services</b>	16.0	17.3	23.4	26.2	27.5	23.0

**Source:** Population Censuses and Household Surveys. Different years.

The other major source of growth in the seventies was the construction of Itaipú, the largest hydroelectric dam in the world. The works, which were carry out mainly between 1973 and 1983, cost more than four times Paraguay's GDP and were financed externally trough the Itaipú Binational Entity. The debt was guaranteed by Brazil<sup>13</sup>. It has been estimated that between 1977 and 1980 around USD 250 million (6% of its GDP) were spent in Paraguay each year.

The capital inflow originated by the Itaipu project and the easy credit conditions in the international markets of the time translated in large increases of liquidity and a tremendous credit expansion, while at the same time it put downward pressures on the real exchange rate. Internally, investment construction benefited most from the easier credit policies, growing at an average annual rate of 23% between 1973 and 1981. The dramatic increase in construction stemmed from a large expansion in private investment that represented less than 10% of GDP in the sixties and over 20% at the end of the seventies<sup>14</sup>. At the same time, public investment remained at about 5% of GDP.

However, linkages to other sectors of the economy were weak. The exception was the service sector, especially commercial and financial activities. For example, in 1972 there were only six banks in Asunción. By 1981 there were 20. As a consequence, commerce and finance grew at annual rates of over 10% in the 1976-80 period and this sector accounted for 26% of GDP by 1981.

<sup>12</sup> The minifundia region is defined as the four Departments surrounding Asunción, that is Cordillera, Guairá, Paraguari and Central.

<sup>13</sup> Most of this spending is not shown in Paraguay's national accounts since for this purposes Paraguay does not consider binational enterprises as being located within the national territory.

Public finances remained strongly during this period and huge increases occurred in foreign reserves, which grew from less than USD 20 million at the beginning of the seventies to USD 800 million in 1981. While Itaipú construction created a substantial increase in effective demand, an increase in the supply of domestic consumer goods was not immediately forthcoming and the excess demand was only partially met by increased imports. Additionally the country, as well as the world, experienced steep hikes in oil prices during this period. All these situations, combined with the increased market liquidity, resulted in strong inflationary pressures: by the late 1970s Paraguay experienced again double-digit inflation, which reached 28.2% in 1979<sup>15</sup>.

### **2.3. The Lost Decade of the Eighties.**

As for most countries in Latin America, for Paraguay the 1980s were years of macroeconomic instability and stagnation. Much of the investments carried out with the transitory resources flowing into the country during Itaipú's construction were not invested prudently and, thus, did not provide a buffer for the coming letdown. Not surprisingly, the economic boom of the seventies ended in 1981, after which the country suffered a recession period that lasted 2 years. Real GDP declined by 1% in 1982 and by 2% in 1983, while unemployment soar from 3.5% in 1981, to 7% in 1982 and to 12% in 1983. The economy's absolute contraction stopped in 1984, however growth remained at less than 2.5% per year for the next three years, well below the 3% population increase per annum. In 1987 and 1988 recovery took place, with growth even exceeding 6% thanks to the agricultural sector. However this was not enough to outset the poor performance of the earlier years. By 1990, GDP per capita was 1.7% lower than in 1980.

Incidentally, the sectors that suffered most in the post-Itaipú era were those that had grown most rapidly in the 1970's boom. For example, although commerce and finance was 17% higher in 1989 than in 1981, this sector average growth rate per year was below that of GDP's during the eighties. The construction sector was severely affected also, contracting more than 6% in 1982 and sustaining negative growth rates in each of the subsequent years until 1986. As a consequence, construction activity in 1989 was still more than 7% below that of 1981. There were hopes that Yacyretá (a second hydroelectric project planned with Argentina) could counter this trend, but several problems resulted in a number of postponements of the project. Others sectors did not perform well either as manufacturing output moved at about the same pace as global GDP. Basic services – electricity, water and sewage and transport – expanded faster than the

---

<sup>14</sup> Many private sector investments later proved to be over dimensioned, construction investment certainly was greatly exaggerated.

<sup>15</sup> These rates of inflation were comparatively low for Latin America standards, a fact mainly explained by the extreme openness of the economy and by the overvaluation of the local currency.

economy, but growth also declined substantially compared to earlier years. Even though it averages 8.5% in 1987-89, the agricultural sector growth was still half the rate observed during the previous decade<sup>16</sup>.

A second factor contributing to the country's stagnation was the world recession that particularly affected Argentina and Brazil, Paraguay's largest trading partners. These countries were themselves caught up in a period of structural adjustment that forced them to reduce imports sharply and to devalue their respective currency and, accordingly, Paraguayan exports began to decline. Worldwide recession also caused a decline in the international prices of the main export's products. For example, soybeans prices decrease 2.6% in 1981 and 5.4% in 1982, while cotton prices decrease 11.4% in 1981 and 16.7% in 1982<sup>17</sup>.

**TABLE 5: Registered Export Commodity Composition (%)**

<b>Products</b>	<b>1960</b>	<b>1970</b>	<b>1980</b>	<b>1990</b>	<b>2000</b>
<b>Wood Products</b>	18.7	19.7	21.4	3.9	8.6
<b>Livestock and meat</b>	26.5	23.8	0.3	13.9	8.1
<b>Tobacco</b>	5.9	9.0	3.3	0.6	0.4
<b>Cotton</b>	1.1	6.3	34.1	34.7	10.6
<b>Soybeans</b>	0.0	0.0	13.6	27.9	32.9
<b>Vegetable Oil</b>	5.7	10.9	5.5	1.4	4.8
<b>Quebracho extract</b>	10.9	3.0	1.4	0.6	0.0
<b>Others</b>	31.2	27.3	20.4	17.0	34.6

**Source:** Central Bank of Paraguay.

The increasing external imbalance and the substantial reduction in aggregated demand presented a very grim scenario for the Paraguayan economy. As a result, the government's macroeconomic policy was directed to avert the post-Itaipú recession through an investment and spending program. The government began then to speed up the disbursement of foreign loans it had contracted in previous years and it arranged new ones. Most of this increase in the external debt was due to public sector borrowing to finance infrastructure as well as some heavy industries, like steel and cement.

However, the outcome of these actions differed substantially from expectations: investments turned out to be unprofitable and over dimensioned for the domestic market. It targeted to sectors where regional markets already showed substantial excess capacity. On the other hand, foreign debt increased dramatically, rising from 15% of GDP in 1981 to 62% in 1987. In the mid-1980s, the government

<sup>16</sup> It could be observed however a significant restructuring of output. This was now more oriented to the domestic market with an impressive expansion in corn and wheat production.

<sup>17</sup> Baer and Breuer (1986).

stopped servicing much of its international debt. As a consequence, the country lost access to international markets and several creditors suspended the disbursement of already contracted loans.

In addition to the external borrowing, internal credit expanded quickly during this decade. Domestic credit to the public sector (including the Central Bank's deficit) increased sharply contributing to the rise in prices<sup>18</sup>. Inflation, which had gone from 14% in 1981 down to 6.8% in 1982, rose and doubled in 1983 and continued to rise in all the following years. The implications of higher inflation were amplified by the multiple exchange rate system instituted in 1982<sup>19</sup>. Exporters were forced to surrender part of their foreign exchange earnings to the Central Bank at below market prices; the Central Bank then sold foreign exchange to favored buyers at a still lower price. The system generated a large Central Bank deficit that had to be financed by inflationary monetary emission, distorted incentives against exports and gave opportunity for corruption and easy profits for private and public official, the more so as the domestic price level increased. The principal legal beneficiary of the multiple exchange rate system was the non-financial public sector. Although official figures suggest the non-financial public sector remained roughly constant throughout the eighties, the explicit and implicit subsidies from the Central Bank and exporters to the sector reached an equivalent of about 6% of GDP annually in 1986-88.

#### **2.4. The Worst Decade: the Nineties.**

As mentioned before, economic policy in the latter half of the 1970s did not prepare the country for post-Itaipú conditions and most of the transitory additional resources were spent as if they were permanent. On top of that, the slow-down was aggravated by poor macroeconomic policy and rent seeking practices during the eighties. In part the increased rent seeking practices were a sign of the crony authoritarian regime of Stroessner. That regime, one of the longest lasting in the recent history of Latin America, was weakening rapidly and it was toppled by the social unrest burst in February 1989. As expected after a dictatorship of 35 years, the country embarked into a pseudo-democratic period characterized by a wandering and unstable balance of power, that hopefully will converge to strong democratic institutions. Needless to say, the political uncertainty of the period could have affected the incentives to invest in the country. But, in general, many important changes in the appropriate directions have been observed during the post dictatorship period.

---

<sup>18</sup> For example, in 1978-84 domestic credit grew at an annual average rate of 26.5%.

<sup>19</sup> The exchange rate was fixed at G. 126 to the US dollar since 1961. In mid-1982 a system of multiple exchange rates was introduced, with rates ranging from 128 to 240 Guaraníes to the US dollar, with 160 being the dominant figure.

The authorities that took charge in 1989 substantially changed macroeconomic policy management. This began almost immediately with perhaps the most important reform: the unification of the multiple exchange rates. At the same time, all foreign exchange controls were removed and commercial banks were permitted to deal in foreign exchange. This measure eliminated significant distortions as well as Central Bank losses on foreign exchange transactions, eroding one of the major sources of inflation. Moreover, the Guaraní was allowed to float, which resulted in a 92% nominal and a 24% real depreciation.

**TABLE 6: Main Macroeconomic Indicators**

Indicators	1960	1970	1980	1990	2000
GDP Growth, % per year <sup>1/</sup>	2.9	4.8	8.8	3.1	2.0
Inflation, % per year <sup>1/</sup>	30.3	3.4	13.1	21.7	13.4
Exchange Rate, Gs/USD <sup>2/</sup>	131	133	136	1,230	3,507
Int. Reserves, US\$ Mill.	0.91	17.3	748.7	675.0	771.9
External Debt, US\$ Mill.	26.7	146.9	690.6	1,669.9	2,234.3
Registered Exports, US\$ Mill.	26.9	64.1	310.2	958.7	869.4
Registered Imports, US\$ Mill.	32.5	63.8	517.1	1,193.4	2,050.4
Fixed Investment, % GDP	7.4	12.16	26.8	21.9	18.3
Tax Revenues, % GDP	n.a.	10.3	8.1	9.2	10.3
Public Sector Deficit, % GDP <sup>1/</sup>	n.a.	n.a.	1.2	3.1	-0.9

<sup>1/</sup>Ten year averages: 51-60, 61-70, 71-80, 81-90, and 91-00.

<sup>2/</sup> Free market price. End of period.

**Source:** Central Bank of Paraguay and World Bank.

Thereafter, significant changes were made in public finances, international economic policy and financial sector policy<sup>20</sup>. In the area of public finances, the public sector deficit was initially reduced, financial management of the public enterprises tightened and public investment slowed. In December 1991 a new tax code was passed simplifying and modernizing the tax system. In particular, the new tax code placed greater reliance on indirect taxation, especially on the value added tax. Additionally, the elimination of the debt to Brazil and the buyback of much Paraguayan debt to commercial banks reduced the country's interest burden and its susceptibility to external interest rate shocks<sup>21</sup>. In the financial sector, interest rates were liberalized in 1990 and by 1991 they were completely freed. They were influenced only by the Central Bank via the discount rate. Also, selective credit controls were abolished almost completely and

<sup>20</sup> One of the main economic problem in previous periods was the large, but hidden, public deficit which attained around 8% of GDP in 1988 (including interest arrears and the public sector foreign exchange subsidy). The same year official figures showed only a 3.1% of GDP deficit.

<sup>21</sup> In 1989 Paraguay reduced its debt with Brazil by over USD 400 million through a swap for Brazilian debt that it purchased in the secondary market. In 1992, arrears to commercial bank creditors were reduced from over USD 200 millions to less than USD 3 millions, through the buyback of USD 172 millions of debt and the restructuring of most of the remaining debt.

reserve requirements reduced. With regards to trade policy, a new tariff code was passed in 1992, lowering and simplifying tariffs to bring them in line with the *de facto* openness of the economy<sup>22</sup>. Also, in 1991, Paraguay joined the common market, MERCOSUR, by signing the Treaty of Asunción along with Argentina, Brazil and Uruguay. Since then, the country has complied with its obligations to reduce tariffs to its MERCOSUR partners.

Nonetheless all the reforms taken, economic growth was far from outstanding during the first part of the decade. GDP grew in average at 3.2% per year between 1990 and 1995, barely keeping pace with that of the population. GDP continued heavily influenced by agricultural output, which were severely affected by weather conditions in 1990 and 1991, further deteriorating in 1992. The next year showed a good performance in the agricultural sector leading to a GDP growth rate above 4%. Regarding other sectors in the economy, they mostly grew around 3% per year in average with the exception of the basic services sector. This sector was the fastest expanded one with an annual growth rate above 7% in average, reflecting the rural electrification program established by the electricity company and the investment programs to increase water coverage in Asunción.

Inflation was usually kept under control during this period, except at the beginning of the decade. The liberalization of the exchange in 1989, the adjustments on the prices of public services and a high rate of monetary expansion explained by the accumulation of foreign reserves were the factors behind an inflation rate of above 40% in 1990<sup>23</sup>. Ever since, the exchange rate was used as a nominal anchor. Initially the government sought to accumulated international reserves and to protect export competitiveness, but then it began to worry more about inflation and less about exports, so that the management of the exchange rate gave priority to price stability. Consequently, the exchange rate was devalued at a rate below inflation and the local currency started to appreciate in real terms. At the end, inflation was gradually lowered from 44.1% in 1990 to 13.4% in 1995, but this policy was held only until the banking crisis in 1995.

On the whole, the initial reforms of the financial sector were undertaken in 1989 and 1990 and were aimed at introducing a market-based system of monetary management. The underdeveloped and heavily regulated financial sector was suddenly deregulated in an environment characterized by implicit deposit insurance and relatively good, but weakly enforced, prudential regulations. This was compounded with a slight appreciation of the real exchange rate during the nominal anchor period, which contributed to a rapid consumption increase that resulted in excessive risk taking by the financial institutions. As a result,

---

<sup>22</sup> External tariff rates went from a range of 3% to 86% prior to the reform, to 9.6% for manufactures, 6.9% for agriculture and 3.4% for mining and quarrying.

a full-fledged banking crisis erupted in 1995. A second round of bank failures followed this in 1997<sup>24</sup>. At the end a total of 13 domestic banks (about a third of the banking system) and a number of other financial institutions failed since 1995. The cumulative cost of the banking crisis during the period 1995-98 has been estimated at around 13% of GDP.

During the second part of the nineties, monetary conditions reflected the increasing financing needs of banks in distress. From the middle of 1995 to the end of 1997, the Central Bank was forced to absorb the costs of the crisis. In order to mitigate the inflationary impact of the credits awarded to troubled financial institutions, monetary growth was reduced. The exchange rate was defended by selling foreign reserves, as rehabilitation credits were sterilized. In December 1997, after reserves had declined by close to 40% from their peak in 1996, the Central Bank abandoned its support of the Guaraní, which depreciated by some 20%. The weakening of domestic economic activity kept inflation below the rate of depreciation and, in real effective terms, the Guaraní depreciated during these years<sup>25</sup>.

In the fiscal area, structural reforms and a comprehensive adjustment in 1990 led to a series of fiscal surpluses during the first half of the decade that helped reduce the country's debt burden. For several years prior to 1997, the non-financial public sector achieved surpluses averaging around 2% of GDP a year<sup>26</sup>. Beginning in 1997, however, the balance slipped into a deficit caused mainly by weakened tax collection, strong wage growth and the need to undertake long delayed maintenance investment. Public enterprises saw also their cash flow squeezed, as tariffs were not adjusted in line with costs. In addition, the social security system lost its surplus position after half of its assets were frozen in intervened banks and ceased to earn interest. The public sector deficit reached more than 5.5% of GDP in 2000, when spending surged, financed by a large injection of external debt<sup>27</sup>.

As mentioned before, economic growth was moderate in the early years of the nineties and accelerated briefly during a credit expansion in the mid-1990s. However, the banking crisis brought the expansion to a halt in 1996 and, since then, the Paraguayan economy has undergone a sustained contraction. As a result of the problems in the financial system, private sector credit contracted sharply and real interest

---

<sup>23</sup> From March 1989 until end 1991, the Central Bank accumulated more than USD 700 millions in foreign reserves, equivalent to about 20% of GDP. Most of these resources were later used to solve Paraguay's external debt problems.

<sup>24</sup> Many actors share the blame for the crisis: some bankers were inexperienced, a few were dishonest, some auditors were incompetent, the Superintendency was impotent and the public conveniently turned a blind eye, assuming the government would not leave them out in the cold if a fire erupted. (World Bank, 1999).

<sup>25</sup> Inflation initially picked up to 14.6% at the end of 1998, but was rapidly reduced to single digit inflation the following year.

<sup>26</sup> The surpluses were mainly explained by the increase in revenues. For example, the Central Government revenues increases from about 8% of GDP in the late 1980s to about 15% in 1997. Most of the increase in revenues was due to import taxes, imposed on triangular trade, and the introduction of a value added tax of 10% in 1992. Nevertheless, most of the revenue increases were spent on personnel, with these expenditures rising from 3% of GDP in 1990-92 to about 7% of GDP in 1997.

<sup>27</sup> Paraguay's public external debt has doubled over the last five years to about 32% of GDP. In 1999, the country obtained a loan from Taiwan amounting USD 400 millions, equivalent to 30% of the external debt at the moment. The resources were fully spent in 1999 and 2000 in a worthless attempt by the government to revert the economic stagnation.

rates rose to around 25%, while depositors increasingly shifted towards USD denominated assets. Additionally, the recession led to a sharp rise in non-performing loans and increased bank's reluctance to extend credits to the private sector. Increasing capital flight during recent years reflected a deep lack of confidence and compounded the shortage of credit in the financial sector. The steep decline in investment, falling terms of trade, slow growth among trading partners and a contraction of the re-export business combine to reduced real GDP first in per capita terms and, in 1998 and 2000, in absolute terms<sup>28</sup>. As a consequence, poverty has deepened – especially in rural areas – and the income distribution became more unequal.

### **3. Poverty, inequality and social indicators in Paraguay.**

In this section we provide a brief summary of poverty, income distribution, health and education environment in Paraguay, focusing in recent years. As stated in the introduction, poverty has increased over the last years, especially in rural areas. According to the World Bank (2001), between 1995 and 1999, the share of the population in poverty increased from 30.3 to 33.7 percent. At the same time, the share of the population in extreme poverty increased from 13.9 to 15.5 percent. This increase in poverty was largely due to the country's bad economic performance. A severe banking crisis, falling agricultural prices and other shocks have combined to produce the worst macroeconomic performance in all Latin America, with four recession years in a row and an overall contraction of per capita GDP of 6.5 percent. Over this period, the number of the extreme poor increased by 75,000 and the number of the poor by 180,000. The increase has been especially large in rural areas. The households living in smaller cities and specially those living in rural areas were more affected by the economic downturn than the households living in Asunción<sup>29</sup>. Today, although rural areas account for less than half the country's population, they account for almost 80 percent of the extreme poor and 57 percent of the poor.

---

<sup>28</sup> The average growth rate of real GDP was only 0.7% per year in the period 1996-2000.

<sup>29</sup> According to some studies, rural poverty may have been rising all the way back to 1980, even during relatively prosperous periods for the Paraguayan economy a whole, and even when urban poverty was declining. These previous studies suggest that, between 1983 and 1992, extreme poverty fell in Asunción whereas over similar period (1980-1992), it rose in the countryside.

**TABLE 7: Share of the population in poverty and extreme poverty**

	1995	1996	1997/98	1999
<b>Extreme poverty</b>				
<b>Country</b>	13.9	n.a.	17.3	15.5
<b>Urban Areas</b>	6.8	4.9	7.3	6.1
<b>Rural Areas</b>	21.4	n.a.	28.9	26.5
<b>Poverty</b>				
<b>Country</b>	30.3	n.a.	32.1	33.7
<b>Urban Areas</b>	23.7	21.2	23.1	26.7
<b>Rural Areas</b>	37.2	n.a.	42.5	42.0

Source: World Bank (2001).

Inequality has also increased during recent periods, contributing to high rates of poverty. Even though common wisdom held in the eighties that Paraguay had an equitable distribution of income (due to a relatively low level of inequality in the Metropolitan Area of Asunción), when national survey data became available, the country emerged as one with the highest income inequality in Latin America. Inequality at the national level, as measured by the Gini index, has increased further in the second half of the 1990s because of an increase in rural areas, while it remained stable in urban areas. Decompositions of inequality measures according to household characteristics suggest large differences in income by education level, geographic location, and economic activity. According to the World Bank (2001), geographical location, education and employment are found to account for at least one fifth of national inequality. Household size matters less. While these findings are not surprising (they have been observed in many other countries), the important message of these results is that the contribution of disparities in education to inequality in income has been apparently increasing over time.

**TABLE 8: Gini index of income inequality**

	1995	1996	1997/98	1999
<b>National</b>	0.581	n.a.	0.592	0.597
<b>Urban areas</b>	0.515	0.485	0.502	0.497
<b>Metropolitan Asunción</b>	0.476	0.476	0.451	0.472
<b>Rural Areas</b>	0.563	n.a.	0.609	0.664

Source: World Bank (2001).

While there has been virtually no increase in per capita GDP over the last two decades, Paraguay has shown progress in some non-monetary indicators. For example, the UNDP's Human Development Index (HDI) for Paraguay improved from 0.663 in 1975 to 0.738 in 1999, but it remains below the level

achieved by most other Latin America countries. The improvement in non-monetary indicators despite lackluster growth may be surprising, yet it could be due to higher public sector social spending and urbanization. However, Paraguay's progress in the HDI (an increase of 0.075 over 25 years), while similar to the improvements observed in Argentina and Uruguay, have been below those observed in countries more comparable to Paraguay such as Bolivia, Chile and Colombia.

**TABLE 9: Level and trend in the Human Development Index (HDI).**

	<b>Paraguay</b>	<b>Uruguay</b>	<b>Chile</b>	<b>Bolivia</b>	<b>Argentina</b>	<b>Colombia</b>
<b>1975</b>	0.663	0.755	0.700	0.512	0.784	0.657
<b>1980</b>	0.698	0.755	0.735	0.546	0.798	0.686
<b>1985</b>	0.704	0.779	0.752	0.572	0.804	0.700
<b>1990</b>	0.716	0.800	0.779	0.596	0.807	0.720
<b>1995</b>	0.733	0.813	0.809	0.628	0.829	0.746
<b>1999</b>	0.738	0.828	0.825	0.648	0.842	0.765

Source: World Bank (2001).

Paraguay has also made substantial progress in educating its labor force over the last two decades, but it still lags behind for enrollment in secondary education. As indicated in the following table, the number of years of schooling for the population aged 10 and over has doubled over the last two decades and the rate of illiteracy has been cut in half. However, the country still lags behind for enrollment in secondary education. This suggests that there is a low transition from primary to secondary school, which is one of the issues that the education reform has addressed by expanding the primary cycle to nine years instead of six. Regarding the quality of education, multilateral agencies found that education efficiency is low. The massive recruitment of primary school teachers, with low proportions of certified ones, to face the increasing demand for education during the nineties negatively affected the quality of the education system. In 1997, only 59.1 percent of teachers held the proper academic qualification to teach while 66.7 percent were certified to teach.

**TABLE 10: Trend in average years of schooling and net enrollment rates**

	<b>1980</b>	<b>1985</b>	<b>1990</b>	<b>1997</b>
<b>Years of schooling</b>	5.1	5.0	5.0	n.a.
<b>Illiteracy rate</b>	14.1	11.6	9.7	7.6
<b>Enrollment primary</b>	88.7	89.5	92.8	91.2
<b>Enrollment secondary</b>	n.a.	25.4	25.8	37.9

Source: World Bank (2001).

Finally, it must be mentioned that Paraguay's fertility rate (and consequently, its rate of population growth) is among the highest in Latin America. Fertility rates have decreased in the 1990s, but with a leveling off in recent years. The fertility rate has decreased from 4.6 in 1987-1990 to 4.3 in 1990-95, and has remained stable thereafter. However, fertility rates in rural areas are still 60 percent higher than in urban areas: for the same periods, fertility rates in rural areas diminished from 6.0 to 5.6, while in the urban area it declined from 3.6 to 3.2. Life expectancy increased from 65.6 years in 1970 to 70 years in 1995. Also, while there have been no increase in per capita GDP and probably no decrease in poverty over the last two decades, there has been a reduction over time in unmet basic needs<sup>30</sup>. The share of households with at least one unmet basic need has decreased by about 30 percentage points nationally and in urban and rural areas. For example, the share of household with at least one unmet basic need dropped from 86.9 percent in 1982 to 55.3 percent in 1997/98. Similarly, this share declined in the same period from 72.2 percent (99.5) to 44.7 percent (67.5) in the urban (rural) area.

#### **4. Accounting for Growth**

In this section we use a production function approach to determine the sources of growth in Paraguay during the period 1962-2000. The objective is to separate the roles of input accumulation and that of the increase in total factor productivity (TFP) in the growth of aggregate output. For reasons that will become apparent soon, we employ a variety of methodologies to make the decomposition.

First we explore the behavior of the relevant time series. Figure 1 displays the series of output, capital, employment, labor quality and cultivated land. All the series are expressed as a ratio of their original value in 1962, with the exception of cultivated land which, for data limitations, is expressed as a ratio of its value in 1966. While it is clear that all series have been increasing consistently over time, their behavior is very different. More importantly, as discussed before, the rate of growth of per capita output is upsettingly low.

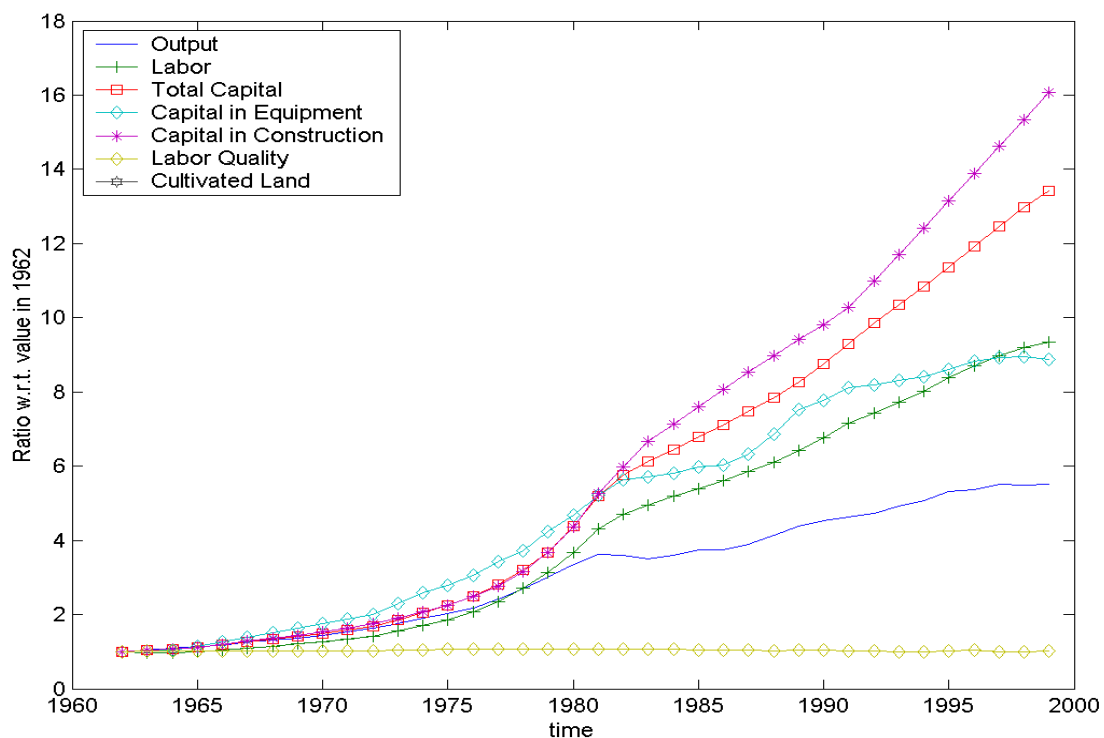
The series of capital is estimated using the traditional perpetual inventory method with a depreciation rate of 8% per year. We find that for almost any relevant value of the depreciation rate, the implied series of capital would grow much faster than aggregate output. Thus, we employ this rather high (but still reasonable) value for the depreciation rate to minimize the implication of a possibly artificial capital/output ratio on the growth accounting exercises. However, the qualitative conclusions are robust to the use of depreciation rates of 4% or 6%. Employing those rates would certainly change the numbers,

---

<sup>30</sup> Paraguay's index of unmet basic needs uses six indicators: water, sanitary installation, primary education, subsistence capacity, crowding and housing material.

but not dramatically. Indeed, we will make the case later that the rising capital/output ratio is simply a reflection of the poor behavior of total factor productivity.

**Figure 1: Basic Aggregate Time Series of the Paraguayan Economy**



We constructed the employment series based on the series on population and participation rates by gender from the World Bank dataset. Results do not change much if instead we simply use the series in the Summers Heston's Penn World Table. In the paper We also consider cultivated land as another input in production. The numbers of hectares are those recorded in Cabello et al (2000). We additionally investigate a series of employment corrected for labor quality. Such correction is based on data on the educational attainment of the labor force and differences in salaries and wages of different education groups. However, those corrections had negligible effects, which is consistent with the results on the poverty and education statistics discussed in the previous section.

Several features are evident from Figure 1. With the exception of human capital, all the series grow over time. But they differ greatly in their behavior over time and across different periods of time. For example, there is a high growth of output during the 1970s, a sharp recession in the early 1980s, a timid recovery during the early 1990s and a subsequent decline. Capital growth also slows down after the 1980s, but it is clear that the capital/output ratio has increased ever since.

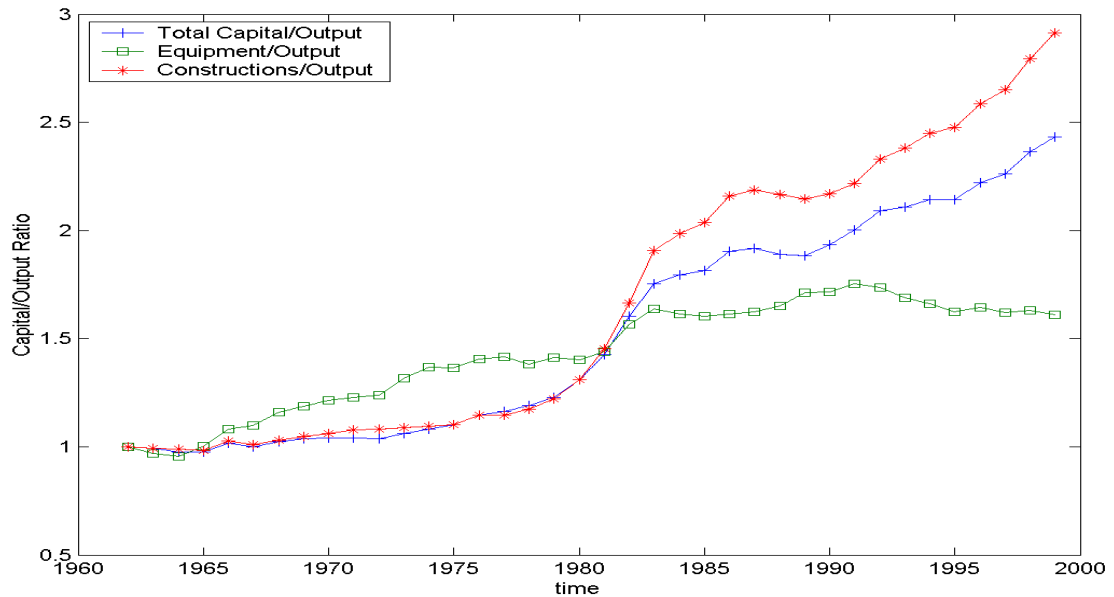
During the sample period, cultivated land grew significantly also. Indeed, between 1975 and 1980 it almost doubled. Yet, from 1980 to 1999 it grew only by an accumulated 20%, reflecting the fact that the country is reaching the limits of the potential cultivable land.

The most striking feature is the lack of growth in the quality of labor. It is natural that this index cannot grow at the same rate as other aggregate series. But the Paraguayan case is actually very disappointing as not only the country started with one of the lowest index of human capital in the region, but moreover, its improvements lagged behind with respect to other Latin American countries. There are theoretical and empirical reasons to believe that human capital is one of the most important factors behind growth. Thus, the lack of human capital accumulation becomes a prime suspect in the particular case of the meager growth rates of Paraguay.

Other noticeable feature that one observes in the data is the disparate growth in the stock of constructions. Many observers in the country believe that the over investment in housing is widespread in Paraguay. Given this, we will explore econometric specifications and growth accounting techniques that consider investment on equipment and on constructions as separate. Figure 2 reports the behavior of total capital, capital in equipment and capital in constructions (structures) with respect to GDP. The series are normalized to be equal to one at the beginning of the period. All those items grow at a faster pace than output, specially constructions after mid 1970s. As can be seen clearly from the figure, the stock of constructions/GDP rises sharply in the second part of the 1970s and also in the first part of the 1980s, reflecting in part the push from the Itaipú project. But the upward trend is also present in the stock of equipment/GDP. This ratio increases by more than 50% during the sample period.

The only way to revert these results is to use incredibly large depreciation rates. We believe, however, that these rising capital/output ratios are the reflection of a declining total factor productivity. We next discuss a battery of methods to decompose factor accumulation and show their results.

**Figure 2: Capital Output Ratio Using Different Measures of Capital**



#### **4.1 Input accumulation and total factor productivity.**

Given the time series of output and different inputs, the natural question is, what is the quantitative contribution of each input in output growth and how much is attributable to an overall increase in productivity?. We will examine several different methodologies to do this accounting exercise. First, we use simple econometric methods to estimate a production function. Then, we use the point estimates and the residuals of the regression to compute the contribution of each factor and that of the TFP. In the second method, we use the parameter values traditionally used in the literature (and estimated from data on other countries).

Our third decomposition is more innovative and was suggested to the authors by Rodi Manuelli. Here we abandon the Cobb-Douglas assumption and allow for a Constant Elasticity of Substitution (CES) production function. Using information on the share of output that goes to labor, we can estimate the substitution and distribution parameters of the production function. Then the residuals of the regression can be used to estimate a stochastic process that dictates the relative improvement in the units of capital with respect to labor. With those at hand, we could estimate a TFP-like factor and separate the contribution of factors and productivity in the behavior of growth.

The three methods are wildly different and produce very different quantitative results. However, all of them point to a declining TFP as a main explanation for the poor growth performance of Paraguay.

The first method is based on the estimation of a Cobb-Douglas production function:

$$Y(t) = A(t)K(t)^\alpha L(t)^\beta$$

Here  $Y(t)$  indicates aggregate output,  $A(t)$  is the total factor productivity,  $K(t)$  the flow of services from capital (which are assumed to be proportional to the existent capital) and  $L(t)$  the flow of services from labor. Taking logs

$$y(t) = a(t) + \alpha k(t) + \beta l(t)$$

where lower case variables indicate the natural log of that variable in capital letter. This equation can be estimated directly using Ordinary Least Square (OLS)<sup>31</sup>. However, there is another way to estimate the unknown parameters in the production function. That is using the “intensive” form

$$[y(t) - l(t)] = a(t) + \alpha [k(t) - l(t)]$$

This specification imposes constant returns to scale in  $K(t)$  and  $L(t)$ .

Also, in earlier sections of the paper we explored an extension using cultivated land, i.e. one that assumes that output is given by

$$Y(t) = A(t)K(t)^\alpha L(t)^\beta T(t)^\chi$$

where  $T(t)$  denotes cultivated land. However, the results we obtained were not interesting and point estimates on land were close to zero. This is probably due to the fact that the period in which cultivated land grew the fastest was precisely when capital was also growing very rapidly and even faster than land.

An extension that we do find interesting is the separation of capital between constructions and equipment. That is, we explore an aggregate production functions of the form

$$Y(t) = A(t)Kb(t)^\alpha Ke(t)^\chi L(t)^\beta$$

where  $Kb$  and  $Ke$  stand for the stock of capital in constructions and in equipment, respectively. We also explore correcting the series for the “quality” of capital and labor. However, we have serious reservations on the potential quality of the correction of the physical capital series. Information on interest rates and/or price of capital, which are of critical importance for those corrections, is very distorted and fragmented in a country like Paraguay, with a long history of government intervention in the financial markets.

Additionally, we shall assume that the log of total factor productivity follows a trend stationary process of the form:

$$a(t) = a_0 + a_1 t + u(t)$$

where  $u(t)$  is a random disturbance. With consistent estimates of  $a_0$  and  $a_1$  and given the value of  $u(t)$ , the estimated TPF of Paraguay at time  $t$  is given by

$$A(t) = \exp[a_0 + a_1 t + u(t)]$$

Depending on the stochastic properties of  $u(t)$ , the standard error of the estimated coefficients would need to be corrected. However, despite their popularity, econometric estimations of production functions of the previous forms have a fundamental limitation. This has to be emphasized. All regression estimates of the coefficients of production functions require the orthogonality of the residuals with the regressors. But, economic theory indicates that the amount of labor  $L(t)$ , and of capital  $K(t)$  -to the extent that it can be adjusted in the short term-, must respond to the value of the residual. Thus, regression estimates are inconsistent. This fact has to be bore in mind whenever interpreting the results.

Table 11 reports the results of all the different specifications, for both, intensive and extensive forms. The t-statistics reported in the table are computed simply using the OLS standard errors. Of course, there are valid concerns on the relevance of these standard errors. But there are econometric problems of fundamentally higher relevance than obtaining robust errors.

First, as we indicated above, economic theory strongly indicates that the regressors cannot be orthogonal to the residual. Periods of high TFP are also periods when investment is more profitable. Thus, the OLS estimates are inconsistent. But, and perhaps more importantly, the table shows strong anomalies with the obtained estimates with respect to the literature. For example, many times the results explicitly or implicitly yield negative point estimates for one of the inputs. This happens with more strength for labor and for capital in constructions.

---

<sup>31</sup> However, there are severe econometric problems with this approach (see below).

**Table 11: Estimation Results for the Aggregate Production Function of Paraguay, 1962-1999\***

Explanatory\Dependent	Log (Output)			Log (Output /Labor)		
<b>Constant</b>	0.12 (2.47)	0.06 (4.27)	0.03 (1.60)	0.05 (1.07)	0.03 (1.00)	0.05 (1.90)
<b>log. Labor</b>	-0.01 (-0.01)	0.77 (6.14)	0.18 (3.77)			
<b>log. Total Capital</b>	0.68 (0.96)					
<b>log. Capital Equipment</b>		0.44 (11.44)	0.52 (11.89)			
<b>log. Capital Constructions</b>		-0.60 (-4.92)				
<b>log. Total Capital/Labor</b>				2.29 (4.51)		
<b>log. Cap. Equipment/Labor</b>					0.65 (8.71)	0.62 (8.47)
<b>log. Cap. Construct/Labor</b>					0.28 (1.30)	
<b>Time Trend</b>	-0.00 (-0.22)	0.02 (5.04)	0.00 (1.36)	-0.04 (-10.34)	-0.02 (-8.15)	-0.02 (-19.45)
<b>R-square</b>	0.987	0.99	0.997	0.92	0.960	0.958

\* Small case numbers are the t-statistics under the null that the coefficient is zero.

**Source:** Authors' estimates.

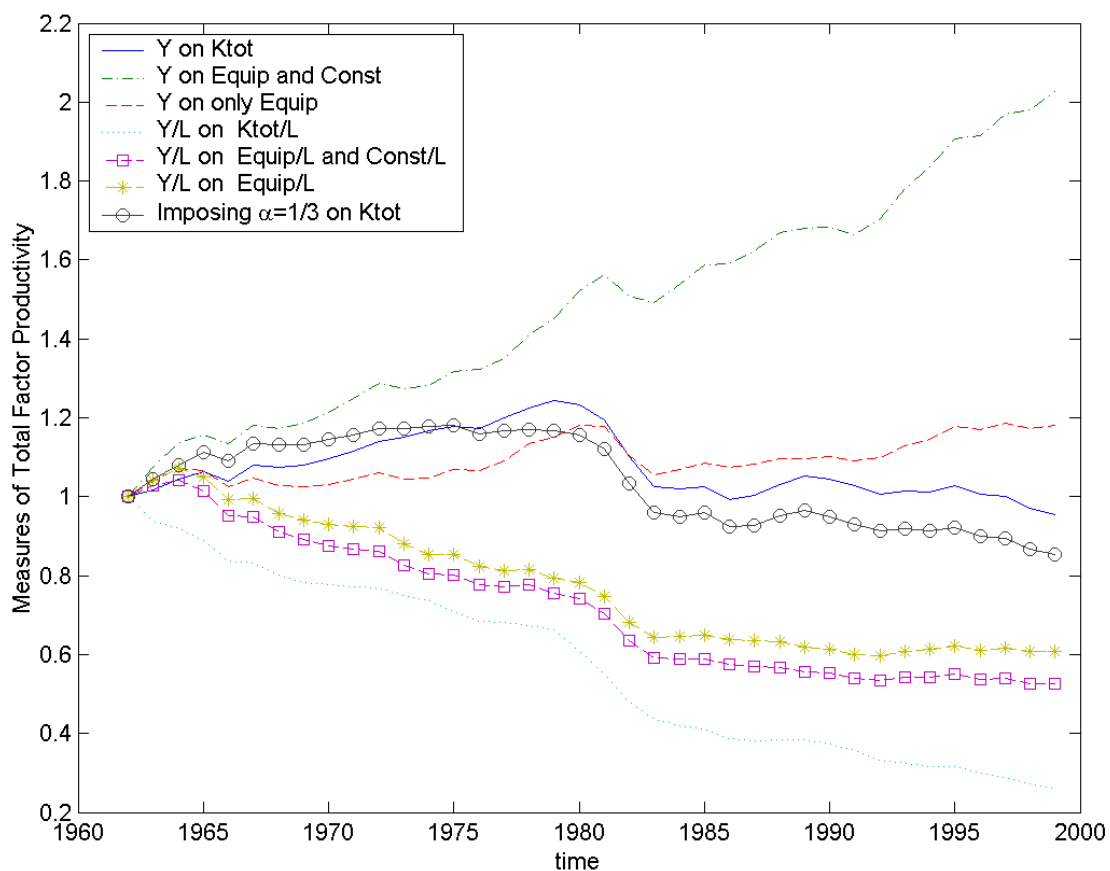
Using basic economics, it is clear that we cannot take seriously some of these results. For instance, in the second column, the regression in extensive form yields a value for the share on labor that is on the ball park of the literature, but it absurdly implies negative productivity of constructions. For the same reason we also disregard the results for the first regression, as it implies a negative (yet negligible) productivity of labor. We discard as well the third column because it implies decreasing returns to scale, a problem that is not resolved by introducing land in the regression. Thus, all the extensive form regressions cannot be used to decompose the sources of growth. Finally, we also ignore the fourth column, i.e. the first regression in intensive form. It implies a huge productivity of capital and negative productivity of labor, which obviously does not make any sense.

Consequently, the only usable results are in columns five and six. We will use these two regressions in the growth accounting exercises below. We also employ a value of 66% for the labor share, a percentage that is commonly used in the literature and that is obtained from data on other countries. We employ that share considering capital as the sum of equipment and structures. Results are similar if instead we use capital as compose solely by the stock of equipment. This variety of methods allows us to check for the robustness of the results.

Before exploring the third method, it is important to notice a remarkable finding: in most regressions the time trend consistently shows a negative and statistically significant coefficient. Also, the results show that the implied behavior of TFP from the different econometric regressions is very similar to each other. In Figure 3 below, we report the implied behavior of TFP from all the models considered.

The low average labor share makes us highly suspicious of measurement problems, specially of labor remunerations. This is the main reason we also computed the TFP and did the growth accounting exercises imposing the value of capital-output share to 1/3, which is the standard in business cycle and growth applied general equilibrium literature. We also explored a similar exercise including land with a capital share of 1/3 and several values for the land shared, including values as high as 1/3. The exercises including land provide very similar quantitative results because land expand the most during the Itaipú period, which is also the period in which capital was growing the fastest. We included those results in a previous version of the paper, but we omit them here for the sake of brevity.

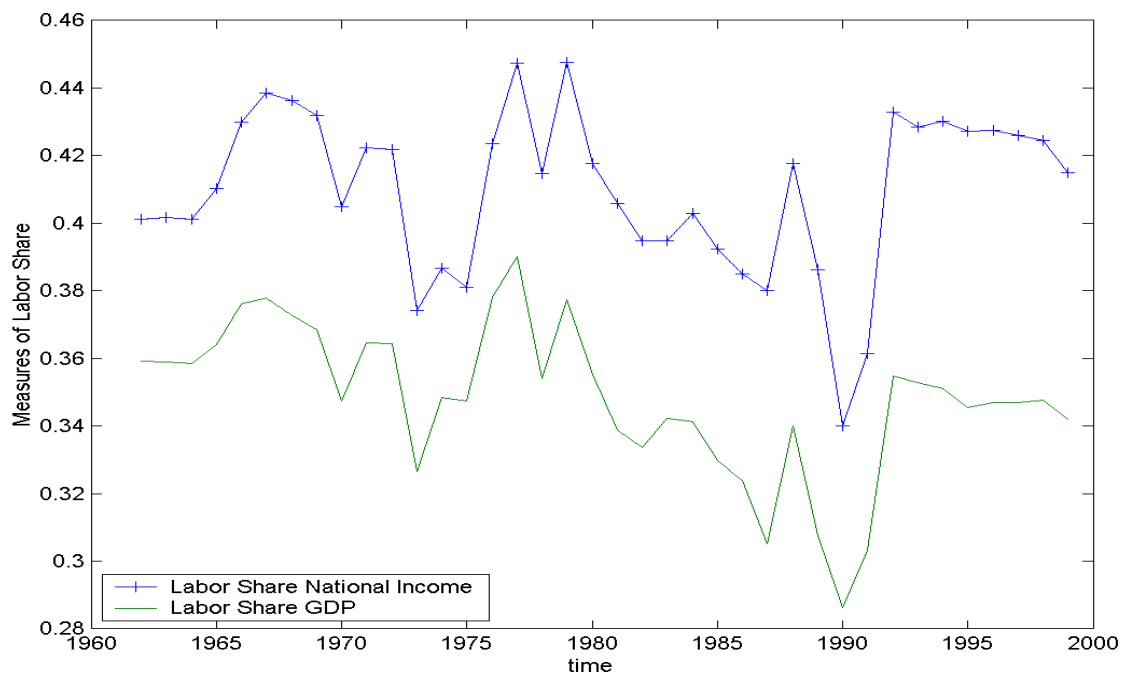
**Figure 3: Total Factor Productivity Using Different Methods for the Paraguayan Economy**



The previous graph shows the measures of TFP implied by the methods discussed above. All series are expressed as a ratio of the TFP in 1962. The different methodologies yield different behavior, specially in terms of magnitudes. However, there are strong similarities among them. Most of them indicate that TFP consistently grew in the 1960s and 1970s and then dramatically fell in the early 1980s. They also agree that TFP fell in the late 1990s. However, they differ on the implied behavior for the late 1980s and early 1990s. While some methods indicate that TFP starts recovering in that period, others illustrate that it keeps falling. But more importantly, the vast majority of the methods show that, from the beginning of the period, there have been a declining (or at best stagnant) path for the total factor productivity of the economy.

Instead of pursuing a refinement of the econometric estimation of the standard errors, we believe that there are much higher returns to explore and compare alternative methods to extract the total factor productivity in Paraguay. One common method is to directly look at the share of labor earnings on GDP from the National Accounts. Given the constant returns to scale and Cobb-Douglas functional form assumptions, one can use the average (or median) value during the sample period to estimate the labor share. The following figure shows the behavior of the labor share on output for Paraguay during the sample period.

**Figure 4: Output Labor Share in the Paraguayan Economy**



The graph vividly shows relevant features of the series. First, the share is unusually low with respect to international evidence. The average value is only 34.56%. Second, the share is not stable over time. It reaches almost 40% in the late 1970s, but it falls to less than 29% in 1990. Interestingly, the labor share is highly pro-cyclical. It raises during the Itaipú episode, then it falls sharply during the 80s and recovers during the early 90s. This behavior casts doubts on the Cobb-Douglas functional form, but it may also reflect measurement problems, labor market frictions, capacity utilization, relative price fluctuations, etc. In what follows, we explain how extending the model to a CES and using information on the labor share can be used to obtain two technological factors: TFP and a relative measure of capital efficiency.

#### **4.2. Separating TFP and Capital Augmenting Productivity Improvements.**

Imagine that instead of the traditional Cobb-Douglas, the production function takes the form of a Constant Elasticity of Substitution (CES), i.e. aggregate output is given by

$$y(t) = B(t)[\theta(\lambda_L(t)L(t))^{-\rho} + (1-\theta)(\lambda_K(t)K(t))^{-\rho}]^{-1/\rho}$$

where  $B(t)$  is the total factor productivity while  $\lambda_L(t)$  and  $\lambda_K(t)$  are labor and capital augmenting technologies. The latter are quality indexes which effectively act as if the total units of labor and capital had increased. We can factor out one of these two and we opt to factor out the labor quality, obtaining:

$$y(t) = B(t)\lambda_L(t)[\theta(L(t))^{-\rho} + (1-\theta)(\lambda_K(t)/\lambda_L(t)K(t))^{-\rho}]^{-1/\rho}$$

This expression simplifies to

$$y(t) = A(t)[\theta(L(t))^{-\rho} + (1-\theta)(\lambda(t)K(t))^{-\rho}]^{-1/\rho}$$

where we define the two components of productivity improvement as total factor productivity,

$$A(t) = B(t)\lambda_L(t)$$

and relative improvement of capital with respect to labor, i.e.

$$\lambda(t) = \lambda_K(t)/\lambda_L(t)$$

Clearly, the first term is a total factor productivity term that incorporates the common improvement of labor and capital quality.

Assuming that factor prices are competitive, then the share of output that goes to capital is

$$s_k(t) = \frac{\partial y(t)}{\partial K(t)} \frac{K(t)}{y(t)} = (1-\theta)[\theta(\lambda(t)K(t)/L(t))^\rho + (1-\theta)]^{-1}$$

After some easy manipulations, it yields

$$\frac{1-s_k(t)}{s_k(t)} = \frac{\theta}{(1-\theta)} [\lambda(t)K(t)/L(t)]^\rho$$

This equation can be estimated. In particular, taking logs,

$$\ln\left(\frac{1-s_k(t)}{s_k(t)}\right) = \ln\left(\frac{\theta}{(1-\theta)}\right) + \rho \ln(K(t)/L(t)) + \rho \ln(\lambda(t))$$

We further assume that the relative capital/labor quality follows a trend stationary process of the form,

$$\lambda(t) = \exp[\rho\bar{\lambda}t + \varepsilon(t)]$$

where  $\varepsilon(t)$  is a random process. Then we obtain the equation:

$$\ln\left(\frac{1-s_k(t)}{s_k(t)}\right) = \ln\left(\frac{\theta}{(1-\theta)}\right) + \rho \ln(K(t)/L(t)) + \rho\bar{\lambda}t + \varepsilon(t)$$

Notice that this relationship should hold regardless of the behavior of the TFP,  $A(t)$ , of the economy.

Running a simple regression of the form

$$\ln\left(\frac{1-s_k(t)}{s_k(t)}\right) = \alpha + \beta \ln(K(t)/L(t)) + \delta t + \varepsilon(t)$$

we could obtain estimates of  $\alpha$ ,  $\beta$  and  $\delta$ . With those estimates, we could then calculate the parameters of the production function as,

$$\hat{\theta} = \frac{\exp(\alpha)}{1 + \exp(\alpha)}$$

$$\hat{\rho} = \beta$$

$$\bar{\lambda} = \delta / \beta$$

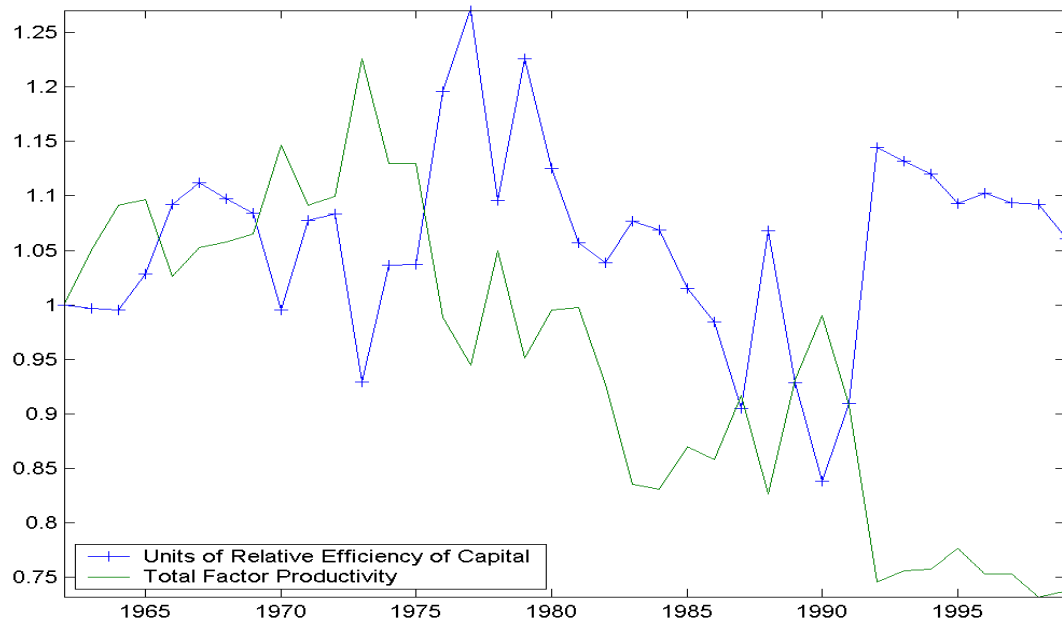
With those estimates in hand, we can back out the implied value of  $\lambda(t) = \exp[\rho\bar{\lambda}t + \varepsilon(t)]$  using the residuals of the regression as consistent estimates of the shocks. Finally, we can compute the implied  $A(t)$  as

$$A(t) = y(t) / [\theta(L(t))^{-\rho} + (1-\theta)(\lambda(t)K(t))^{-\rho}]^{-1/\rho}$$

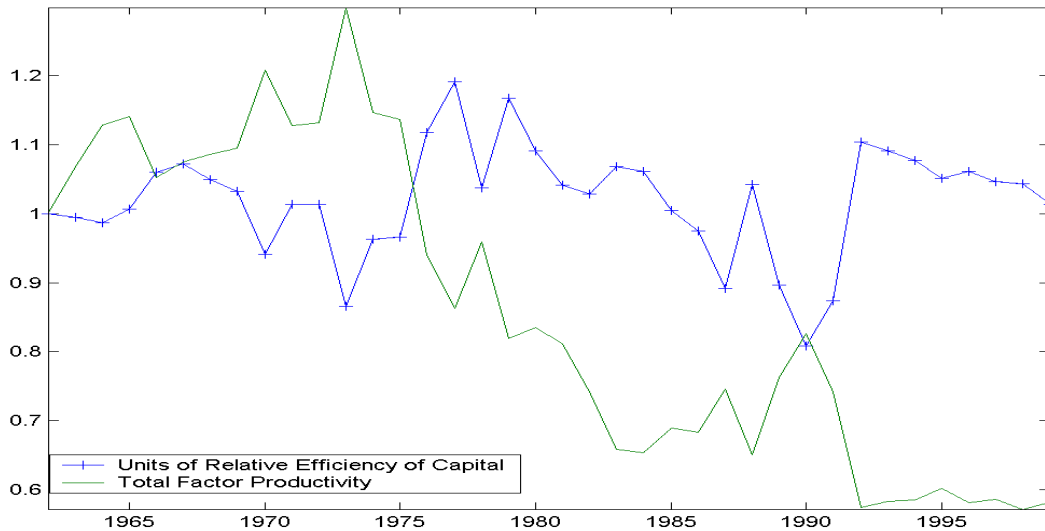
The point estimates of the regression, using only capital equipment, are  $\theta = 1.7357e-007$  and  $\rho = -0.2491$  with a R square of 38%. Very similar results hold if total capital is used. Thus, the data suggest that capital and labor in Paraguay are more substitutable than what a Cobb-Douglas production function suggests and, moreover, that the contribution of labor is negligible.

With those estimates, we computed the implied TFP and the relative efficiency of capital, which are reproduced in the following figures.

**Figure 5: Total Factor Productivity and Capital Augmenting Progress.  
Using Capital in Equipment Only**



**Figure 6: Total Factor Productivity and Capital Augmenting Progress.  
Using Total Capital**



Notice that the implied behavior of total factor productivity is in line with the previous methods: we observe a steady decline following 1970s in TFP. Moreover, there are periods in which TFP and the relative efficiency of capital move in the same direction, specially in the period between mid 1970s up to 1990. In that period, both TFP and the relative quality of capital decline gradually. This period coincides with Itaipú project and the lost decade of the 1980s. It is interesting however, that both behave very different in the 1990s. The results suggest that the quality of the investment in capital had an important recovery, while TFP was still declining.

### **4.3. Growth Accounting.**

Table 12 shows the results of the growth in output decomposition, showing the determinants of output growth in five different subperiods as well as in the whole sample period. The panel shows the percentage accumulated growth in output, measured as log differences, and the contribution to output growth from total factor productivity and from the accumulation of production inputs, using the parameters for the labor share. The first two panels show the results for the methods employing the typical value of labor share used in calibrations. The first uses capital as the sum of structures and equipment, while the second employs capital as equipment only. The third panel do the same calculation, but using the coefficients

estimated from the regressions in the previous section. The fourth panel uses also the regression estimates, but allowing structures and equipment separately.

The last panel uses the CES specification. Growth accounting in this case is not as straightforward and requires more elaboration. Here it is not possible to decompose the contributions of the different production inputs linearly. Accordingly, the sum of the contributions between factors and TFP across subperiods need not to add up. What we report in the table is the one-factor contribution. That is, we computed by how much output would have grown if only one of the factors were augmented by the value at the end of the subperiod, with all the other factors remaining at the same values as in the beginning of the period. For example, to calculate the contribution of labor on output growth between 1971 and 1980, we compute the implied output with the labor of 1980 but with the capital, capital efficiency and total factor productivity as of 1971. We then write down the log difference with the actual output of 1971. As with the other cases, here we multiply those differences by one hundred to express them in percentage terms.

The most striking feature in the table is that, indeed, TFP has had a negative contribution on output growth in most of the periods. Basically all the methods point in that direction. Perhaps the most dubitative in this conclusion is the method allowing for a CES production function. However, in this case notice that in the sub-periods when TFP has a positive contribution, typically capital efficiency has a significant negative contribution. In sum, the growth decomposition indicate that the productivity of factors, much more than their accumulation, is a major negative factor in the growth process of Paraguay.

The exercises show also that in general physical capital had a strong pull for growth in most of the periods, but all agree that the contribution is much higher for the period of 1971 to 1980, which is precisely when the construction of Itaipú took place. Furthermore, all the methods agree that the contribution of capital in the 1990s has been modest when compare to other periods. We believe that the political uncertainties of the period have lessen the incentives to invest in physical capital in Paraguay. However, over the entire sample period, it is clear that capital accumulation has outpaced output, so its accumulation does not seem to be the major deterrent of growth. The main problems appear in the accumulation of human capital and the overall productivity of factors. It seems safe to conclude that if Paraguay is to grow faster, more aggressive policies should focus on these problems. Any contribution in this respect would also have the benefit of fostering the accumulation of complementary factors, such as physical capital .

**Table 12: Productivity and Factor Accumulation Contributions to Output Growth (%)**

Period	Labor Share=2/3, all capital				
	Ouput	TFP	Capital	Labor	
1962-1970	36.5	7.2	13.4	15.8	
1971-1980	78.5	-22.8	33.9	67.4	
1981-1990	22.0	-25.7	17.4	30.3	
1999-1991	19.8	-16.0	14.3	21.5	
1999-1962	170.7	-64.8	86.5	149.0	
	Labor share=2/3, Equipment only				
	Ouput	TFP	Capital	Labor	
1962-1970	36.5	2.0	18.7	15.8	
1971-1980	78.5	-19.5	30.6	67.4	
1981-1990	22.0	-21.5	13.2	30.3	
1999-1991	19.8	-6.2	4.5	21.5	
1999-1962	170.7	-51.1	72.8	149.0	
	Regression, Equipment only				
	Ouput	TFP	Capital	Labor	
1962-1970	36.5	-7.3	34.8	9.0	
1971-1980	78.5	-16.8	57.2	38.2	
1981-1990	22.0	-19.8	24.6	17.1	
1999-1991	19.8	-0.8	8.4	12.2	
1999-1962	170.7	-49.6	136.0	84.4	
	Regression, Equipment and Structures Separated				
	Output	TFP	Equipment	Construction	Labor
1962-1970	36.5	-13.2	36.1	11.7	1.9
1971-1980	78.5	-15.7	59.3	27.0	7.9
1981-1990	22.0	-24.3	25.5	17.2	3.6
1999-1991	19.8	-5.0	8.7	13.6	2.5
1999-1962	170.7	-64.4	141.0	76.6	17.5
	Regression, CES and Separation of TFP and Relative Capital Efficiency				
	Output	TFP	Labor	Capital	Rel. Capital Eff.
1962-1970	36.5	18.9	0.0	23.7	-6.1
1971-1980	78.5	-30.0	0.0	101.1	7.4
1981-1990	22.0	1.9	0.0	45.4	-25.3
1999-1991	19.8	-35.0	-20.1	32.3	22.6
1999-1962	170.7	-54.1	170.0	202.3	192.6

**Source:** Authors' estimates.

## 5. Growth and Other Main Macro Variables.

In this section we investigate the relation of growth in Paraguay with domestic institutions and policies. Empirical studies analyzing the long run determinants of growth typically relate the real per capita growth rate to two kinds of variables. First, the initial levels of state variables, such as stocks of physical and human capital. Second, environmental and policy variables such as the ratio of government consumption to GDP, the ratio of domestic investment to GDP, movements in the terms of trade, inflation, measures of political instability and the rule of law, tariff rates, and so on. These empirical studies usually employ cross-country evidence (data) to identify what are the policy and institutional factors that are significantly related to the growth rate of real GDP<sup>32</sup>. That is, the analysis is based on a general framework of cross-country regressions, which puts the experience of individual country in a global context. Since these regressions apply to a panel set of cross-country data over a few decades, the papers contain a limited amount of time series variation.

Although cross-country data seems to support the hypothesis that several external environmental and policy variables could affect output growth, it is important to test if these findings hold for a single country over time. However, a test on a time series data for a single country could be difficult to carry out. One element of the problem could be to obtain a suitable approach to defining the long run and detecting long run relationships. In this part of the paper, the basic proposition that the growth rate of the economy and some of the factors usually considered in growth regressions are correlated is examined from a non-structural, low frequency point of view. This methodology is based on Lucas (1980). In this paper, Lucas presents empirical illustrations of two central implications of the quantity theory of money: that a given change in the rate of change in the quantity of money induces (i) an equal change in the rate of price inflation; and, (ii) an equal change in nominal rates of interest. Since the two quantity-theoretic propositions hold only in the “long run”, Lucas constructs a filter to smooth the original data (i.e. to extract its long run components) before testing the implications of the theory.

Here, we use the approximate band-pass filter developed by Baxter and King (1995) to obtain the low frequency components of the time series. For the empirical applications, we adopt the definition of the business cycle suggested by the procedures and findings of NBER researchers, like Burns and Mitchell (1946), that specified business cycles as the cyclical components between eighteen months and eight years. We adopt these limits as the definition of the business cycles so, to isolate the trend or low frequency of the data, we consider those frequencies with periodicity of eight years or higher.

Specifying the business cycle as fluctuations with a specified range of periodicity results in a particular two-sided moving average (a linear filter). In the particular case of the NBER definition of the business cycle, the desired filter is a band-pass filter, i.e., a filter which passes through components of the time series with fluctuations of eight years or higher while removing components at higher frequencies. However, the resulting moving average is of infinite order and an approximation to this filter is necessary for it to be applicable to finite time series. Therefore, in order to analyze the hypothetical relationship in the log run between economic growth and each of the factors considered, we first apply the following filter to the original time series data:

$$y_t^* = \sum_{j=-k}^k a_j y_{t+j}$$

where  $y_t^*$  is the value of the filtered series. The optimal approximate filter weights,  $a_j$ , are functions of the weights of the ideal low-pass filter,  $b_j$ , and an adjustment term,  $\theta$ . Thus,  $a_j = b_j + \theta$ <sup>33</sup>.

A parameter to be chosen is the value of  $k$ , the number of leads and lags in the filtered series. We have set this value equal to six<sup>34</sup>. Thus the approximate band-pass used in this analysis is the  $BP_6(8)$  filter described in Baxter and King (1995). The notation reflects the fact that the filter passes through components of the data with cycles higher than 8 years and the subscript "6" means that 6 leads and lags of the data were used in constructing the filter (i.e. 6 annual observations are lost at the beginning and end of the sample period for the filtered data).

A wide variety of external environment and policy and policy variables could affect growth rates by changing the long run potential income and the rate of productivity growth. Based on the results from previous empirical research, we consider the following variables as important determinants of long-run per capita income: (1) inflation rate, (2) government consumption, (3) investment rate, (4) private consumption, (5) exogenous shock (terms of trade growth), and (6) growth of exports.

**1. Inflation rate:** in recent years, the contours of an inverse connection between inflation and growth across countries have begun to emerge from econometric studies. For example, Barro (1991) reports a negative relationship between inflation and the growth rate of real GDP during 1970-1985 in a cross section of 117 countries. Similarly, Fischer's (1993) cross section regression estimates, based on data from Penn World table compiled by Summers and Heston (1993), from 1960 to 1989, indicate that an

---

<sup>32</sup> See for example De Gregorio and Lee (1999) for a paper that examines the growth experience of Latin America countries or Barro (1991) for a study the uses cross-country data from developing and developed countries.

<sup>33</sup> For a more detailed discussion of the issues involved in constructing the approximate band-pass filters for economic time series (i.e. how to calculate the ideal weights and the adjustment term) see Baxter and King (1995).

<sup>34</sup> There is a trade-off when choosing the value of  $k$ : increasing  $k$  leads to a better approximation to the ideal filter, but results in more lost observations. Baxter and King (1995) proposed a value of 3 or 6 to filter annual data.

increase in inflation reduces the growth of GDP, other things being equal. Theoretical models which founded a negative relationship between inflation and economic growth includes Jones and Manuelli (1995), Wu and Zhang (1998) and Fernández Valdovinos (1999). Therefore, we expect that, in the long run, an increase in the inflation rate will reduce output growth.

**2. Government consumption:** several papers have studied the empirical regularities relating fiscal policies variables and the rate of growth of the economy. Some of those studies, like Engen and Skinner (1992), found a consistently negative impact of the share of government spending on output growth rates, lending support to the notion that smaller government sectors are associated with faster growth rates. However, as pointed out by Aschauer (1989), when considering the impact of government spending on output growth, it is important to distinguish between government capital accumulation and government consumption. While the former one could have a positive impact on productivity growth, the later one could entail distortions on private decisions leading to a lower growth rate. Thus, when considering the long run, an increase (growth) in the ratio of government consumption to GDP will have a negative relationship with output growth.

**3. Investment ratio:** in the neoclassical growth models of Solow (1956) and Swan (1956) an exogenously higher value of the ratio of real gross investment to real GDP raises the steady state level of output per effective worker and accordingly the growth rate tends to increase. For example, De Gregorio (1992), using a five-year panel data for 12 Latin American countries between 1950 and 1985, finds that one of the most important factors inhibiting growth in these countries was the low investment rate registered during the period. Additionally, Bradford de Long and Summers (1991) found that machinery and equipment investment has a strong association with growth and that this correlation is a much stronger one than those found between growth and any other component of investment. Hence, an increase in the investment in machinery to GDP ratio will result in the long run in a higher rate of output growth.

**4. Private consumption:** in the neoclassical growth models, a higher value of saving rate raises the steady state level of output per capita and thereby increases the growth rate for a given starting value of GDP. Thus, even though the saving rate does not affect long-run growth, for a given level of initial income economies with higher savings rate will grow faster in the transition period. Accordingly, given a level of income, a higher amount of private consumption means a lower saving rate and, therefore, a lower growth rate.

**5. Terms of trade shock:** as stated by De Gregorio and Lee (1999), the terms of trade shock could be considered as an exogenous variable that affects the growth rate of an individual economy. An improvement in the terms of trade makes a country produce more and expand its export sector. Based on

data from Latin America countries, the regression results from these authors provide a significant positive relationship between change in the terms of trade and per capita GDP growth. Thus, when considering the long run, an increase (growth) in the terms of trade will have a positive influence on output growth.

**6. Exports:** over recent decades a considerable amount of empirical evidence has support the notion that less protectionist regimes grows faster. In the early 1970's Balassa and others began exploring the links between trade and growth<sup>35</sup>. For example, Frankel and Romer (1999) use instrumental variables estimates to analyze the effect of trade on income. Their results suggest that ordinary least squares estimates understate the effects of trade, and that trade has a quantitatively large, significant, and robust positive effect on income. Complementary, a large number of studies found that export growth and export levels were highly correlated with GDP growth. See for example Edwards (1994) for a survey on this later literature. Hence, in the long run we expect to find a positive correlation between the growth rate of exports and GDP growth.

The data used in this section are from the International Monetary Fund, "International Financial Statistics" and "Direction of Trade Statistics", and from the Central Bank of Paraguay, "Boletín de Cuentas Nacionales". For every variable the original annual data runs from 1970 to 2000, so given the value chosen for  $k$ , we have 19 observations for the filtered data. In Appendix A.2, Figures A.1.B. to A.8.B. plot the long run relationship between the growth rate of GDP and 8 different variables. We have used the filtered data and, for comparison, for each country we have also plotted the raw (original) data for the period 1976-94 giving also a total of 19 observations for every variable (see Figures A.1.A. to A.8.A.).

For all the variables considered, the plots of the original data illustrate the absence of a clear relationship over time between these variables and GDP growth. However, after filtering the data and extracting only its long run components, a clear relationship between the two time series emerges. Complementary, Table 13 gives the correlations coefficients of the growth rate of GDP per capita and the different variables. This table confirms the impression from Figures A.1.B. to A.8.B. The signs of the correlation coefficients are the expected ones. For example, in the long run, the rate of GDP growth is negatively correlated with the inflation rate, the government consumption to GDP ratio and the private consumption to GDP ratio. On the contrary, a higher growth rate of GDP is observed with a higher investment in machinery to GDP ratio, with a higher rate of growth of exports and with a favorable shock in the terms of trade.

---

<sup>35</sup> See for example, Balassa (1978).

**TABLE 13: Correlation Coefficients with GDP Growth Rate**

<b>Variables</b>	<b>Original Data</b>	<b>Filtered Data</b>
<b>Inflation rate</b>	- 0.0997	- 0.8382
<b>Gov. Cons./GDP</b>	- 0.6038	- 0.5573
<b><math>\Delta</math> (Gov. Cons./GDP)</b>	0.0169	- 0.6716
<b>Private Cons./GDP</b>	- 0.5482	- 0.7506
<b><math>\Delta</math> (Private Cons./GDP)</b>	- 0.3424	- 0.9157
<b>Investment/GDP</b>	0.6904	0.8776
<b><math>\Delta</math> Terms of Trade</b>	0.1803	0.5424
<b><math>\Delta</math> Exports</b>	0.5389	0.8746

**Source:** Authors' estimates using the Baxter and King filter.

## **6. The Co-movement of Paraguay with its trade partners.**

In this part of the paper we address the issue of the cyclical co-movements of the Paraguayan output with those from countries in the MERCOSUR area and the USA<sup>36</sup>. The main features of the aggregate fluctuations in the seven countries are considered, exploring the direction and magnitude of the co-movements of output across countries<sup>37</sup>. Furthermore, we study the association of their business cycles decomposing the series in output into cycles of different frequencies. Due to its widespread use in empirical economics, the Hodrick-Prescott filter is employed to mechanically decompose the individual series into a trend movement and a cyclical component. Correlation analysis is then used to summarize the extent to which the cyclical components exhibit co-movements across countries. Finally, developments over time in the synchronization of the series cyclical component are examined on the basis of the contemporaneous cross correlation coefficients for rolling 10-year periods.

### **6.1. Growth correlations across countries.**

A first glance in the grade of symmetry between Paraguay and the other economies in the MERCOSUR area and the USA can be obtained by analyzing unprocessed data from the countries. Annual data on real GDP for the countries considered in the study, spanning the period 1970-2000, were obtained from the International Monetary Fund (IMF) and the Economic Commission for Latin America and the Caribbean (ECLAC). For each country, the rate of growth of GDP is calculated as the first difference of the logarithm of real GDP.

<sup>36</sup> Throughout this section we shall refer as MERCOSUR to Argentina, Bolivia, Brazil, Chile, Paraguay and Uruguay.

We first consider data on the growth rate of real GDP. Table 14 shows standard deviations and correlation coefficients for the growth in output across the seven countries, considering the full data period and also ten years intervals. Correlations are measured with respect to Paraguay.

**TABLE 14: Output Growth Correlations and Volatilities.**

Periods	Argentina	Bolivia	Brazil	Chile	Uruguay	Paraguay	USA
	<b><u>Correlations with Paraguay</u></b>						
<b>1970-00</b>	-0.1036	0.3761	0.4751	0.1889	0.3122	1.0000	-0.0317
<b>1970-79</b>	0.0587	-0.8366	-0.3055	0.3957	0.3408	1.0000	0.2783
<b>1980-89</b>	-0.4568	0.7035	0.2195	0.6807	0.5049	1.0000	-0.1246
<b>1990-00</b>	0.0833	0.4200	0.6539	0.4618	0.0460	1.0000	-0.5169
	<b><u>Standard Deviation</u></b>						
<b>1970-00</b>	0.0509	0.0310	0.0433	0.0616	0.0414	0.0389	0.0219
<b>1970-79</b>	0.0442	0.0176	0.0371	0.0707	0.0272	0.0229	0.0260
<b>1980-89</b>	0.0487	0.0279	0.0459	0.0705	0.0572	0.0444	0.0255
<b>1990-00</b>	0.0508	0.0162	0.0215	0.0359	0.0368	0.0170	0.0156

Source: Authors' estimates.

For the full period, the data shows that the degree of output growth volatility have been very different, not only across countries but also over time. For the whole period, USA is by far the country with the lowest standard deviation (a value of only 0.022). In the MERCOSUR area, Bolivia and Paraguay present the lowest degree of volatility (with 0.031 and 0.039 respectively), all other values for this statistic are above 0.04. Moreover, the data indicates that output fluctuations in MERCOSUR countries have generally been bigger (across all countries) during the eighties than during any other ten years period. The findings also show that for most countries, and certainly for the average, volatility of the growth rate of GDP reached its lowest value during the nineties<sup>38</sup>. For Paraguay, the growth rates of real GDP have been relatively stable in all periods with a coefficient of standard deviation above 0.04 only during the eighties.

On the other hand, correlation coefficients reveal that, when considering the whole period, Paraguayan output growth was more highly correlated with the Brazilian one<sup>39</sup>. Additionally, for the whole period, correlations with Bolivia and Uruguay reach a value of 0.38 and 0.31, respectively. In general, the correlation coefficients are not particularly very high with values below 0.5, revealing a moderate degree of co-movement of the different economies with Paraguay. However, given the observed instability of the

<sup>37</sup> In Mundell's theory of optimum currency areas the incidence of disturbances across regions or countries is a critical determinant in the design of those areas. Fernández Valdovinos (2000) explores the feasibility of a currency area in MERCOSUR analyzing the distribution of output disturbances across countries in the region.

<sup>38</sup> For Argentina and Uruguay, the seventies were the more stable years.

coefficients over time, it seems more plausible to examine those coefficients by breaking the sample in ten years periods. The analysis by sub-samples have the correlation coefficients reflecting, during the seventies, Paraguay's dependence on USA, one of its main trading partner in this period. The construction of the highway to Brazil, the development of the lands in the frontier region with this country, the building of the world's largest hydroelectric project (Itaipú) and the implementation of MERCOSUR substantially change the degree of co-movements with the countries. For example, the ensuing dramatic increase in trade with Brazil was echoed in a higher value of the correlation coefficient during the eighties and nineties<sup>40</sup>. Notice also the low degree of correlation of the Paraguayan economy with the USA. During the eighties and nineties the correlation coefficient is even negative. On the other hand, output growth correlations have being also relatively high with Bolivia and Chile, specially during the last two decades considered.

We have also calculated an alternative measure for asymmetric output disturbances by estimating the parameter  $\gamma_{ij}$  defined as the standard deviation of the difference in the growth rate of GDP between countries  $i$  and  $j$ ,  $SD(\Delta y_i - \Delta y_j)$ . Thus, for countries where business cycles are symmetric and national output move together, the value of this measure will be small. Table 15 presents the parameter  $\gamma_{ij}$  estimated using the full period and intervals of ten years, for both MERCOSUR countries and the USA.

**TABLE 15: Parameter Gamma, j = Paraguay**

Periods	Argentina	Bolivia	Brazil	Chile	Uruguay	Paraguay	USA
<b>1970-00</b>	0.0672	0.0396	0.0423	0.0663	0.0472	0.0000	0.0453
<b>1970-79</b>	0.0486	0.0389	0.0492	0.0651	0.0290	0.0000	0.0295
<b>1980-89</b>	0.0795	0.0317	0.0564	0.0518	0.0518	0.0000	0.0539
<b>1990-00</b>	0.0522	0.0179	0.0165	0.0319	0.0399	0.0000	0.0284

**Source:** Authors' estimates.

For the full period, data reveals that MERCOSUR countries or the USA do not usually have a close business cycle conformance with Paraguay. The value of the parameter  $\gamma_{ij}$  is in general, for any of the countries, higher than 0.04 with a maximum value of 0.067 for Argentina<sup>41</sup>. However, when examining the behavior of the parameter gamma in ten years intervals, business cycles with some countries seems to be more synchronized. As found before, dissimilarities of business cycles have been significantly lower

<sup>39</sup> This result is explained mainly by the close behavior of the economies during the nineties.

<sup>40</sup> The outcome that closer international trade links result in more closely correlated business cycle across countries is found in Frankel and Rose (1997) using data in 20 industrialized countries over 30 years.

<sup>41</sup> In comparison, business cycles correlations have been higher in European Union (EU) countries. Fernández Valdovinos (2000) found an average value for  $\gamma_{ij}$  of 0.017, 0.019 and 0.020 during each of the three periods considered (1970-79, 1980-89 and 1990-98). The countries analyzed are Belgium, Denmark, France, Germany, Italy and Netherlands.

during the nineties than during any other ten-year period, especially with Bolivia and Brazil. The value of the parameter  $\gamma_{ij}$  in the decade was only 0.018 and 0.017, respectively. These values are very close to those observed in some European Union (EU) countries (see previous footnote).

## **6.2. Business cycles fluctuations across countries.**

In this section of the paper we employ the methodologies of current business cycle research, so as to explore the direction and magnitudes of the co-movements of the economies. For a particular economic variable, long-term developments are reflected in the trend of the variable while cyclical movements are determined as short-term deviations from this trend. Nevertheless, it can prove difficult in practice to distinguish between trend and cycle. Consequently, studies of the business cycles still face the basic problem of how to isolate those features in the data that are associated with long-term growth and those related with business cycles.

As a result, to decompose each of the time series in output into a trend component and a cyclical component, we employ the well-known Hodrick-Prescott (HP) filter. The HP filter is applied to the logarithm of the series and the smoothing parameter  $\lambda$  is set equal to 100, a number commonly used for annual data.

Table 16 presents the results. Initially we consider the volatility of the output cyclical component. The calculations show that volatility in MERCOSUR countries has been higher than in USA. When analyzing the full period, the lowest standard deviations in the sample of countries considered are for Bolivia, Brazil and USA (0.035, 0.036 and 0.021 respectively). At the same time, the coefficient is slightly larger for Paraguay, 0.039. Even when considering ten years intervals almost the same conclusions are reached. In addition, it is usually the case that volatility has been much higher in the countries during the eighties than in any other period, the exception being Argentina. It is perceived also that, excluding the Argentinean economy, the nineties were the more stable years.

**TABLE 16: Business Cycles Co-movements and Volatilities.**

Periods	Argentina	Bolivia	Brazil	Chile	Uruguay	Paraguay	USA
	<b><u>Correlations with Paraguay</u></b>						
<b>1970-00</b>	0.0292	0.6101	0.1725	0.7166	1.0000	0.6907	-0.1259
<b>1970-79</b>	0.1349	0.3693	-0.1142	0.5190	1.0000	0.8006	0.4861
<b>1980-89</b>	-0.0105	0.9773	0.2608	0.8884	1.0000	0.7367	-0.2907
<b>1990-00</b>	0.2640	0.6443	0.7302	0.7818	1.0000	0.4793	-0.5720
	<b><u>Standard Deviation</u></b>						
<b>1970-00</b>	0.0439	0.0348	0.0363	0.0617	0.0391	0.0473	0.0209
<b>1970-79</b>	0.0337	0.0344	0.0384	0.0719	0.0287	0.0341	0.0235
<b>1980-89</b>	0.0413	0.0443	0.0471	0.0764	0.0600	0.0719	0.0255
<b>1990-00</b>	0.0555	0.0151	0.0234	0.0369	0.0182	0.0316	0.0142

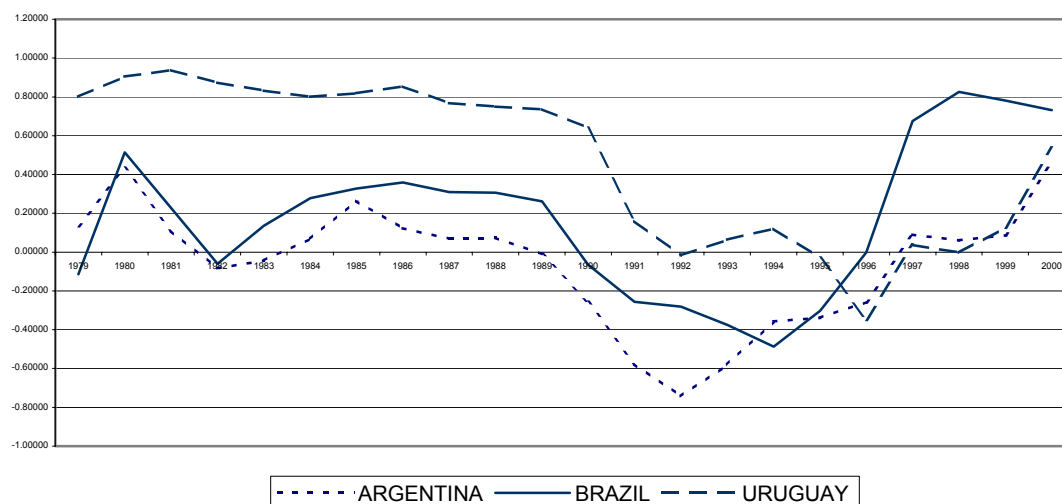
**Source:** Authors' estimates.

Regarding the pattern of correlation among the series, statistics reveal that, for Paraguay, co-movements of outputs with other MERCOSUR countries or the USA were not usually very high. Specifically, when considering the full period, the highest values are the coefficients with Bolivia, Chile and Uruguay, 0.61, 0.72 and 0.69 respectively<sup>42</sup>. However, data analyzed by shorter periods reveals that co-movements of the series could be stronger when considering ten-years periods. For example, during the eighties the correlation coefficient with Bolivia is above 0.97 and, with Chile, it is 0.89 and 0.78 during the eighties and the nineties respectively. With the USA, the coefficient value has a significant value only during the seventies, 0.48, and it is even negative during the eighties and nineties<sup>43</sup>. Notice also that business cycles correlations with the MERCOSUR countries are, in average, much higher during the nineties.

<sup>42</sup> Fernández Valdovinos (2000) obtains that, for the same European countries cited before, output correlations are generally much higher. In addition, it is found that the degree of co-movement is more pronounced in subgroups of countries: Belgium, France, Italy and Netherlands. For these countries the correlation coefficient is in average above 0.70.

<sup>43</sup> These results cast doubts about the convenience of dollarizing the Paraguayan economy.

**Figure 7: Ten-years Rolling Correlation Coefficients  
with Paraguay**



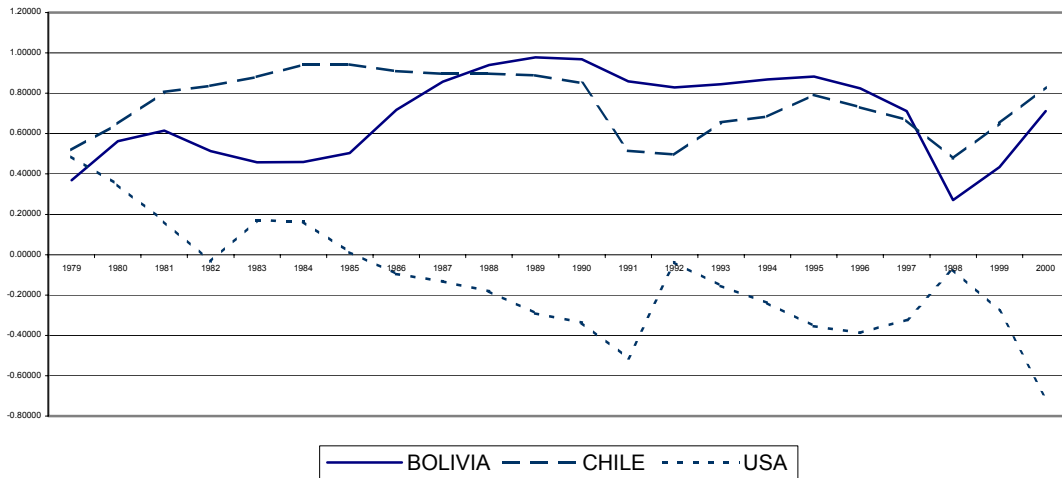
A question that may arise is if there have been changes in the output co-movements over time. One possible explanation for the low correlations found previously is that they reflect the low co-movement from earlier periods. Figures 7 and 8 illustrate the correlation coefficients between cyclical components compiled for rolling 10-year periods. Similar findings are obtained for rolling periods of shorter length. The figures display the rolling correlations of Paraguay with the rest of the countries.

It can be seen that co-movements of output among the three full members of MERCOSUR and Paraguay follow similar patterns. In most cases, correlations tend to slightly fall from the initial periods of the sample up to the beginning of the eighties. Since then they all abruptly decline and, in some cases, they become even negative at the beginning of the decade. Finally, coincidentally with the beginning of the MERCOSUR area, the coefficients resume to increase until the end of the nineties. The degree of synchronization of output cyclical movements among Paraguay and these countries usually achieves its maximum at the end of the period considered. For example, during this decade the correlation coefficient with Argentina reach a value of 0.46 while the same coefficient with Brazil attains a value of 0.82.

The behavior of the coefficients with the other countries do not follow a common pattern. For the whole period, correlation coefficients with Bolivia and Chile fluctuate between 0.40 and almost 1. Notice however that the correlation coefficient with USA shows a clear tendency to decline over time and it has a negative value since the mid eighties.

Findings in this section reinforce previously reached conclusions. Business cycles correlations with the countries in the MERCOSUR area and the USA are not very high when considering the whole sample. However, when disentangling the sample in ten-years periods sub-samples, more common patterns emerge, especially with Bolivia, Brazil and Chile.

**Figure 8: Ten-years Rolling Correlation Coefficients  
with Paraguay**



## 7. Conclusions

In this work we have investigated the process of economic growth in Paraguay from the 1940s to the present. The paper explored a variety of dimensions that are relevant to understand the recent economic history of the country. The picture that has emerged is not an optimistic one and, if the trends that we found are to be perpetuated, the future for Paraguay is grim and the country would remain as one of the poorest countries in the hemisphere.

The three main conclusions from the case study in Paraguay are the following. First, there have been a declining (or at best stagnant) path for the total factor productivity of the economy. Thus, despite a significant accumulation of physical capital, income per capita has been unable to grow. Second, it could be seen a poor performance of Paraguay in the accumulation of human capital. Compared with the region, Paraguay has been left behind as vividly shown by the statistics on poverty. Third, the paper confirmed the importance of macroeconomic stability and of aggregate fluctuations with the country's main trading partners. Our results indicate that periods of macroeconomic stability have been associated with higher growth. Furthermore, the data shows an increase over time in the importance of fluctuations with some of the country's trading partners, specially Brazil.

We believe that the first two findings, lack of productivity growth and human capital accumulation, are the results of a highly inoperative public sector. It is important to highlight this point as the (relatively) small size of its public sector is perhaps the most distinguishing feature of the Paraguayan economy in the Latin American context. As any relevant theory of economic growth would predict, small taxes, specially on capital, are likely to foster growth. However, what appears to be the dominant effect, investments in infrastructure, could radically determine the rate of return of private investment. We believe that the government in Paraguay has been subpar in the provision of public investment.

A similar consideration can be made on the accumulation of human capital. There are numerous reasons to believe that unregulated markets would under perform in the provision of quantity and quality of primary schooling, which is simply the first step in the accumulation of human capital and productive skills. Thus, in the presence of a public sector inefficiently providing primary and secondary education, it can only be expected that the country would not take off. It is also important to emphasize that, as human capital is complementary to physical capital, the lack of its accumulation would also impaired the accumulation of physical capital.

Improving the accumulation of infrastructure and human capital would require in the case of Paraguay of a pivotal role by the government in the future. To that end, the collection of taxes need to be improved. But even then, the Paraguayan may not be able to succeed by itself and the international community may have an important role to play.

In terms of the relevance of macroeconomic stability, the lessons are in line with the current consensus and, thus, we do not need to elaborate on them further. In terms of the higher interdependence on the Brazilian economy, we just want to emphasize that this may simply be the outcome of geographical, historical and cultural proximity, which are natural advantages that Paraguay should definitely exploit. However, it seems safe to assert that in addition to these static gains from trade advantages, Paraguay would benefit greatly in terms of growth and stability if it reduces any existent biases in the trade and investment with the rest of the world.

## Appendixes

### A.1. Incentives to accumulate capital.

Paraguay's tax/GDP ratio has been usually among the lowest in the hemisphere, remaining usually below 10% since 1971. Although this implies that the tax burden of the private sector was low, the limited volume of public sector resources had also some drawbacks: public sector wages were usually low (which encourage corruption); public investment in some of the standard public sector areas, such as transport, basic health and education, has been limited and social expenditures benefiting the poor were low.

**TABLE A.1: Paraguay - Tax Burden. In % of GDP.**

<b>1970</b>	<b>1973</b>	<b>1975</b>	<b>1978</b>	<b>1980</b>
10.3	8.0	8.1	9.4	8.4
<b>1983</b>	<b>1985</b>	<b>1988</b>	<b>1990</b>	<b>1993</b>
6.4	6.9	6.9	9.0	8.5
<b>1995</b>	<b>1998</b>	<b>2000</b>		
10.0	10.6	9.9		

**Source:** Central Bank of Paraguay.

In 1992 a significant, and at the time largely overdue, tax reform was implemented in the country. The tax system in force until 1991 was characterized by the proliferation of legal norms and an immense quantity of taxes and tax rates, which indeed constituted a set of tax laws which were very complex and difficult to manage<sup>44</sup>. Among its most salient features, we may mention the following characteristics:

- Predominance of indirect taxes, which for the most part responded to fiscal needs of a partial nature.
- The regressive nature and complexity of the system, which encouraged fiscal evasion and increased the loss of credibility towards the administrative taxation agency.
- The proliferation of tax exonerations and special regimes.
- Custom tariffs that were contrary to a policy of openness and integration.
- Administrative bureaucracy which provided incentives for the infringement of tax laws by evaders.

---

<sup>44</sup> According to multilateral organizations, Paraguay's tax system at that time was antiquated and very inefficient. It was often argue by these institutions that Paraguay's tax system has not kept pace with domestic inflation and growth, a fact which endangered macroeconomic equilibrium, future growth and prospects for eradicating poverty.

Before 1992, taxes could be classified into four broad categories: taxes on goods and services, income taxes, taxes on capital and foreign trade taxes. The first category grouped sales taxes, several selective consumption taxes (fuel, liquor, cigarettes, livestock, etc.), stamp taxes on different kinds of transactions and several other small taxes. In term of revenues, they represented about 4.2 – 4.3 percent of GDP in 1984-88.

The structure of taxes on goods and services changed significantly overtime. The general sales tax represented 0.6 percent of GDP in 1984, a ratio that increased progressively to 0.8 percent by 1987. Although exemptions were widespread and potential revenues were difficult to calculated, evasion must have been large, since the tax rate on domestic sales was 4 percent, and on imports 8 percent or 14 percent, with 80 percent of the proceeds coming from the latter two<sup>45</sup>. The domestic sales tax was charged only to the final consumer. Even if it affected only half of GDP, it should have generated more than 2 percent of GDP in revenues but collections were less than half of that. Even though selective consumption taxes and stamp taxes were classified under this heading, they include many taxes with no relation to each other. For example, the stamp tax included 84 different taxes affecting civil and commercial dealings. Many of these taxes were specific and thus declined in importance with inflation. Erosion of potential tax revenues also occurred through widespread exemptions.

**TABLE A.2: Paraguay – Tax Structure. In % of GDP.**

<b>Taxes</b>	<b>1984</b>	<b>1986</b>	<b>1988</b>	<b>1990</b>
<b>Taxes on Goods &amp; Services</b>	4.21	4.18	4.30	4.61
Consumption	2.26	2.40	2.30	2.21
General Taxes	0.56	0.74	0.81	0.78
Selective taxes	1.70	1.66	1.49	1.43
Stamp Taxes	1.79	1.65	1.90	2.34
Other	0.15	0.13	0.10	0.06
<b>Income taxes</b>	1.11	1.25	1.42	1.26
<b>Capital Taxes</b>	0.38	0.38	0.28	0.27
Land / Property	0.35	0.35	0.25	0.27
Other	0.03	0.03	0.03	0.00
<b>Other taxes<sup>1</sup></b>	1.01	1.01	1.02	3.08
<b>Tax Revenues</b>	6.71	6.82	7.02	9.21

<sup>1</sup> Mostly import and export taxes.

**Source:** Central Bank of Paraguay.

<sup>45</sup> Therefore the sales tax basically amounted to an import tax.

The second broad category of taxes, income taxes, was another collection of uncoordinated small taxes. They applied mainly to enterprises, since the personal income tax applied in few instances and was negligible in effect. The income tax on profits (agriculture was exempted) was slightly progressive, with rates moving from 25 percent to 30 percent with higher corporate incomes. Incomes taxes represented 1.6 to 1.7 percent of GDP in the early 1980s, with that share dropping to 1.2 percent in 1984-86; they were about as much in 1990. Evasion must have been pervasive in this category as well. With returns to capital amounting to about half of value added and assuming that the tax applied to half of GDP, the enterprise tax alone should have represented 6.5 percent of GDP, over 5 times the actual collection. It must be mentioned that an Investment Incentives Law was enacted in 1990. This law gave beneficiaries 5-year tax holidays on 95 percent of income taxes and 6 months of duty-free imports.

Additionally, capital taxes generate little revenue, about 3 percent of total taxes and less than 0.3 percent of GDP. Although tax rates were about 1 percent of property value, assessments were extremely low. On the average, urban property tax values represented less than 35 percent of market value and in rural areas taxable values were just 5 percent of market values. The capital tax category also included an inheritance tax that was so easily evaded that its proceeds were insignificant.

Regarding trade taxes, during these years Paraguay operated with tariffs that were low and quite homogeneous, despite a Custom Law often suggesting high tariffs (30 percent and sometimes reaching over 70 percent) with wide dispersion. Three factors had helped achieve low, homogeneous tariffs in practice. First, simple special regimes operating with low flat rates have replaced many ordinary tariffs. Second, taxes often reaching close to 5 percent of imports were charged under different names even on tariff-free items; therefore, even though the lowest tariff was often zero, some taxes were paid even in these cases. And third, unregistered imports set a ceiling on tariff rates. If tariffs exceeded 10-15 percent, goods tended to be imported through informal channels.

As mentioned before, taxes were widely evaded in Paraguay during this period because of what the private sector considered unreasonably high tax rates: 30 percent tax on profits, some high import tariffs, and the stamp tax (an inefficient scheme that levies contracts rather than output, income or wealth). To avoid these taxes, the private sector developed a complex "parallel economy" with surprisingly favorable results relative to those obtained in the "formal economies" in neighboring countries. Additionally, sanctions for failing to pay taxes due on time varied by tax and they often were nonexistent. In fact, the system not only did not penalize infractions, but in practice encouraged tax payers to avoid payments. In most instances, penalty interest rates were lower than commercial interest rates. Thus, for the taxpayer, it was more profitable to delay payment until the infraction was discovered (if it ever was) than to pay on time.

In 1992, the authorities proposed a plan to reduce the number of taxes while making the system simpler and easier to manage. It basically: (i) replaced the stamp tax and a myriad of small, difficult to collect, indirect taxes with two new ones: a value added tax that replaced sales taxes and a few ad-valorem taxes on consumption (fuels, liquors, cigarettes, luxuries, etc.); (ii) enacted a direct and indirect “sole” tax on small businesses replacing all direct and indirect taxes applying to them<sup>46</sup>; (iii) increased the profits tax from a progressive system involving two rates with a flat rate equal to the higher prior rate; (iv) enacted an income tax on agriculture property using the presumptive income concept; and (v) changed the penalty system as needed to truly fight late payments and evasion. Other reforms included proper assessment of property values and the abolition of the inheritance tax.

**TABLE A.3: Paraguay – Tax Structure. In % of GDP.**

<b>Taxes</b>	<b>1995</b>	<b>1997</b>	<b>1999</b>	<b>2001</b>
<b>Income taxes</b>	2.3	2.1	2.3	1.5
<b>Taxes on Goods &amp; Services</b>	6.1	6.3	6.0	6.4
Excises taxes	1.2	1.3	1.3	1.9
Value added tax	4.4	4.5	4.3	4.1
Stamp tax	0.4	0.4	0.3	0.3
Other	0.2	0.1	0.1	0.2
<b>Taxes on international transactions</b>	2.8	2.3	1.7	1.7
Import duties	2.8	2.3	1.7	1.7
<b>Tax Revenue</b>	11.2	10.7	9.9	9.6

**Source:** Central Bank of Paraguay.

The tariff regime improved substantially after the reform and Central Government revenues increased rapidly during the nineties, reaching around 10% of GDP. Most of the increase in revenues was due to import taxes and the introduction of a value-added tax of 10 per cent. Import taxes, which today account for around 20% of tax revenues, increased from 0.9% of GDP to 2.8% of GDP in 1995, slightly decreasing afterward to 1.7% of GDP in 2001. At the same time, the value added tax accounted for an equivalent of 4.4% of GDP in 1995 and 4.1% of GDP in 2001. Another important source of revenue came from the income taxes and from excises taxes in some specific products. Somewhat surprisingly, Paraguay was able to collect revenues worth 10% of GDP with a comparatively low tax burden and few

<sup>46</sup> Small enterprises were exempt from the value added tax, but they paid the “sole” tax mentioned above. Additionally, they allowed to deduct from that “sole” tax half the amount of the value added tax they paid on the inputs they purchased.

forms of taxation: a VAT of 10 per cent, low import tariffs, no personal income tax and a corporate income tax of 30 per cent with many exceptions.

It must be mentioned that, under the Treaty of Asunción of March 1991 that was ratified in July 1991, Paraguay agreed to an automatic schedule of tariff reduction as well as to reduce its list of exceptions so as to become part of the MERCOSUR free trade zone. Additionally, beginning in July 1992 Paraguay replaced the tariff schedule enacted in July 1991 with a new schedule of even lower and more homogeneous rates and instituted a value-added tax on imports at a 10 percent uniform rate. The tariff changes left tariff positions –not including lists of exceptions and internal consumption taxes—at 0 percent for inputs, 5 percent for capital goods, 10 percent for final goods and 15 percent and 20 percent for cars<sup>47</sup>. At the same time, imports were also subject to a 10 percent value-added tax. These changes brought the tariff code more in line with the de facto openness of the economy.

In summary, during the whole period, tax and external tariff distortions to accumulate capital seem to have been not important in Paraguay. For the years before 1992, tax evasion, special tax and tariff regimes and smuggling substantially reduced the tax burden of the private sector. After the tax reform, even though initially it was expected to yield higher revenues, the tax/GDP ratio remained among the lowest in the region. It is well known that incentives for investments, such as exemption from taxes, subsidies and other benefits, can be important, but may not be crucial in attracting private capital. Paraguay seems to be an example. The Paraguayan Investment Incentives Law provides better incentives than the laws of many Latin American countries and it still could not attract large flows of private capital.

As agreed by several authors, an important element to attract private capital seems to be the maintenance of stable policies in the long run, which should be enforced by the credibility of the country. As mentioned by Insfrán Pelozo (2001), this credibility could be obtained in the long run only by restraining the government's ability to change the rules of the game with respect to restrictions on capital movements, taxes, property rights, risk of expropriation, non convertibility of local currency, civil wars, etc. Similarly, Barro (1991) and De Gregorio and Lee (1999) mention the rule of law and the quality of political institutions as important factors explaining growth rates across countries. They consider that institution environment that secures property rights and provides a strong legal system is central for investment and other aspects of economic activities. We may need to look at all these alternative factors in order to understand why growth and investment have been so low in Paraguay.

---

<sup>47</sup> The tariff simplification eliminated all special regimes and exceptions.

## A. 2. Graphs for Growth and Other Main Macro Variables.

Figure A.1.A. Inflation and growth. Unfiltered data.

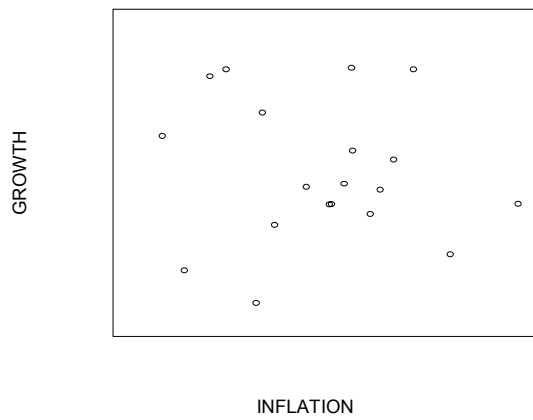


Figure A.1.B. Inflation and Growth. Filtered data.



Figure A.2.A. Gov. Cons./GDP. Unfiltered data.

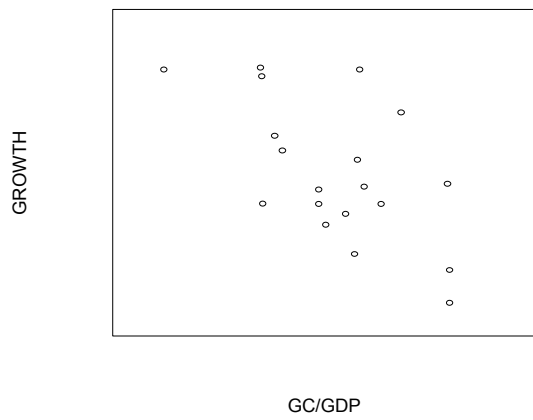


Figure A.2.B. Gov. Cons./GDP. Filtered data.

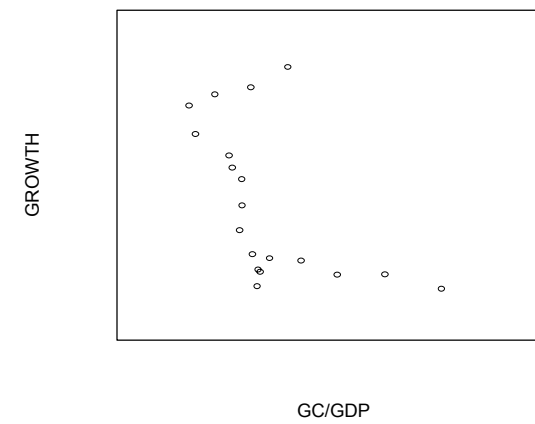


Figure A.3.A.  $\Delta$  (Gov. Cons./GDP). Unfiltered data.

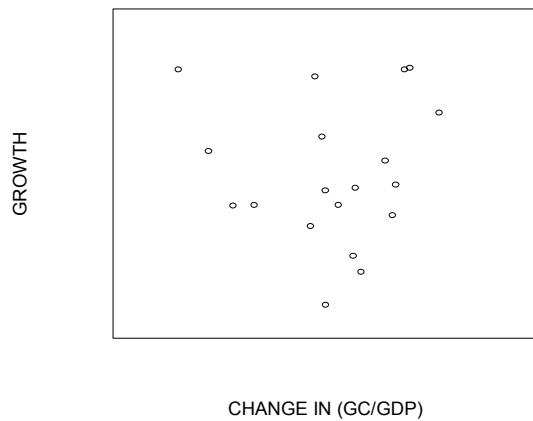


Figure A.3.B.  $\Delta$  (Gov. Cons./GDP). Filtered data.

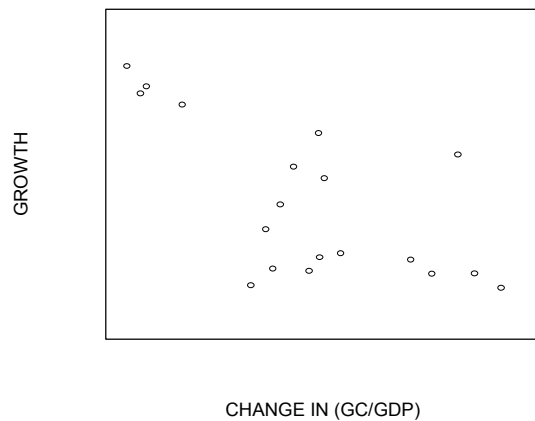


Figure A.4.A. Private Cons./GDP. Unfiltered data.

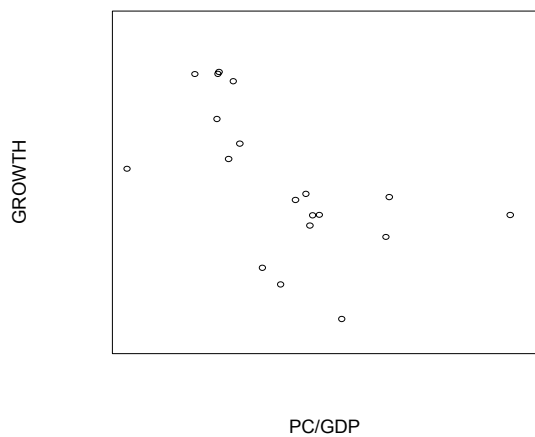


Figure A.4.B. Private Cons./GDP. Filtered data.

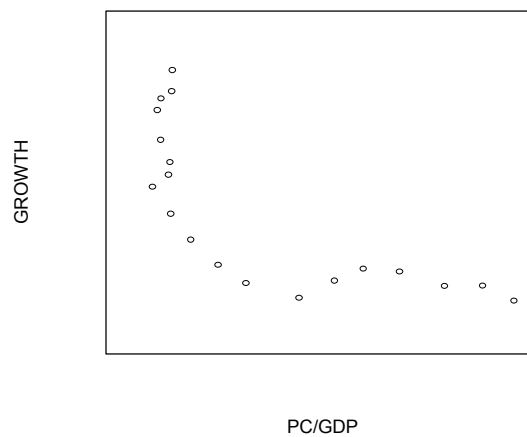


Figure A.5.A.  $\Delta$ (Private Cons./GDP). Unfiltered data.

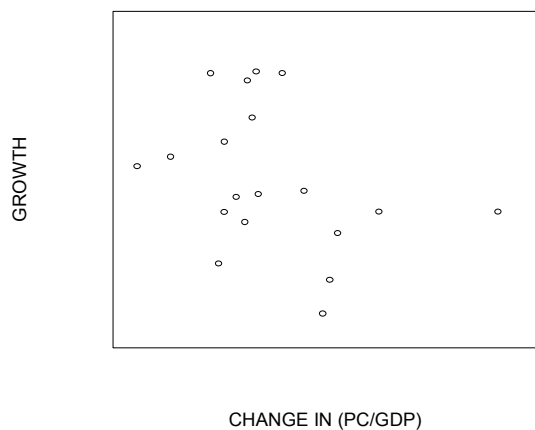


Figure A. 5.B.  $\Delta$ (Private Cons./GDP). Filtered data.

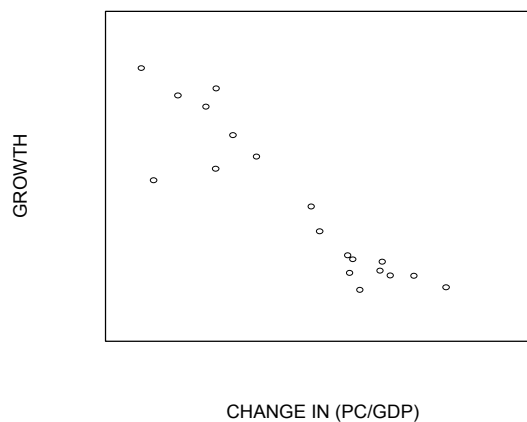


Figure A.6.A. Investment/GDP. Unfiltered data.

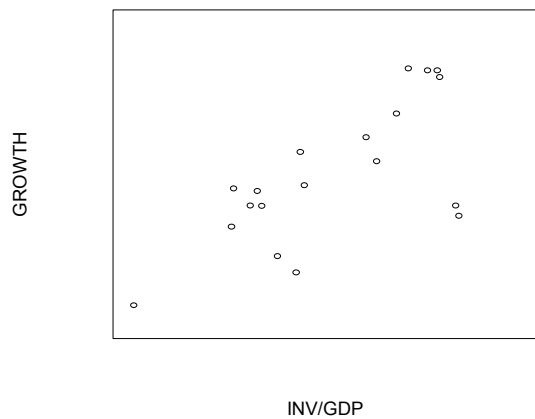


Figure A. 6.B. Investment/GDP. Filtered data.

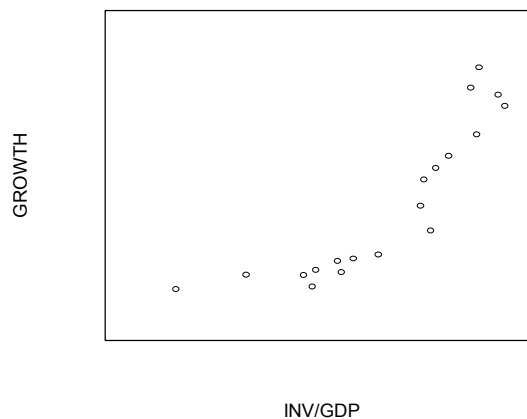


Figure A.7.A.  $\Delta$  Terms of Trade. Unfiltered data.



Figure A.7.B.  $\Delta$  Terms of Trade. Filtered data.



Figure A.8.A.  $\Delta$  Exports. Unfiltered data.

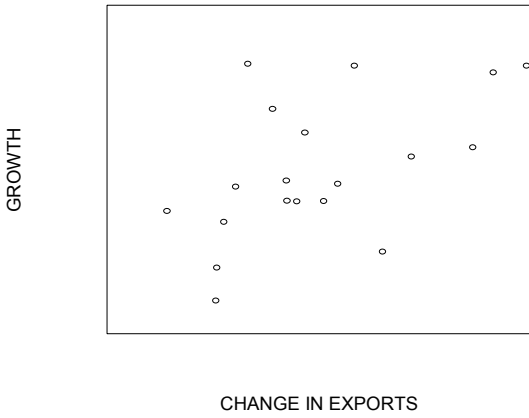
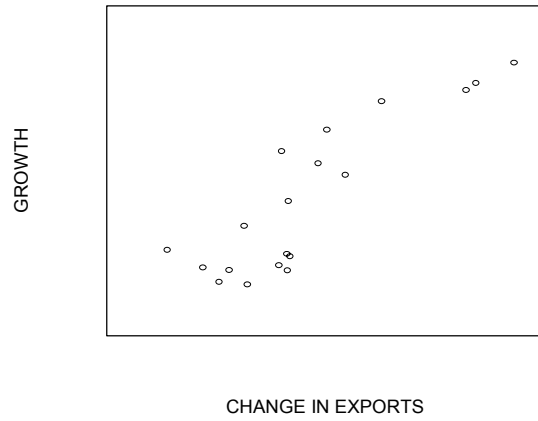


Figure A.8.B.  $\Delta$  Exports. Filtered data.



## References.

- Artis, M. and Zhang, W. (1999). "Further evidence on the international business cycle and the ERM: Is there a European business cycle?". *Oxford Economic Papers* 51, pp. 120-132.
- Aschauer, David (1989). "Is public expenditure productive?". *Journal of Monetary Economics* 23, pp. 177-200.
- Baer, W. and Breuer L. (1986). From Inward to Outward Oriented Growth: Paraguay in the 1980s. *Journal of Inter American Studies and World Affairs* , Vol. 28, Issue 3, pp. 125-140.
- Baer, W. and Birch M. (1984). Expansion of the Economic Frontier: Paraguayan Growth in the 1970s. *World Development*, Vol.12, No.8, pp. 738-798.
- Balasa, Bela (1978). "Exports and Economic growth: Further evidence". *Journal of Development Economics*, Vol. 5, No.2, pp.181-189.
- Barro, Robert (1991). "Economic growth in a cross section of countries". *Quarterly Journal of Economics*, Vol. 106, No.2, pp.407-443.
- Bayoumi, T. and B. Eichengreen (1997). "Optimum currency areas and exchange rate volatility: Theory and evidence compared", in B.J. Cohen (Ed.), *International trade and finance new frontiers for research: Essays in honor of Peter Kenen*. Cambridge University Press, Cambridge, Mass.
- Bayoumi, T. and B. Eichengreen (1993). "Shocking aspects of European monetary unification", in F. Torres and F. Giavazzi (Eds.), *Adjustment and growth in the European Monetary Union*. Cambridge University Press, Cambridge, Mass.
- Baxter, M. and R. King (1995). "Measuring business cycles approximate band-pass filters for economic time series". National Bureau of Economic Research Working Paper No. 5022.
- Bradford de Long J. and L. Summers (1991). "Equipment investment and economic growth". *The Quarterly Journal of Economics*, Vol. CVI, pp. 445-502.
- Burns, A. and W. Mitchell (1946). "Measuring business cycles". National Bureau of Economic Research. New York, New York.
- Cabello, C., A. Hosono and J. Molinas (2000). "Escenarios alternativos de crecimiento de la economía paraguaya". Unpublished Manuscript.
- De Gregorio, José (1992). "Economic growth in Latin America". *Journal of Development Economics*, Vol. 39, pp. 59-84.
- De Gregorio, J. and J. W. Lee (1999). "Economic growth in Latin America: sources and prospects". Paper prepared for the Global Development Network Research Project.
- Edwards, Sebastian (1994). "Openness, trade liberalization and growth in developing countries". *Journal of Economic Literature*, Vol. 31, No. 3, pp. 1358-1393.

- Eichengreen, Barry (1998). “Does MERCOSUR need a single currency?”. National Bureau of Economic Research Working Paper No. 6281.
- Engen E. and J. Skinner (1992). “Fiscal policy and economic growth”. National Bureau of Economic Research Working Paper No. 4223.
- Fernández Valdovinos, Carlos (2000). “Cyclical co-movements in output across MERCOSUR countries”. Working Paper. Central Bank of Paraguay.
- Fernández Valdovinos, Carlos (1999). “Inflation and welfare in an endogenously growing economy”. Unpublished dissertation. University of Chicago, Chicago, Illinois.
- Fischer, Stanley (1993). “The role of macroeconomic factors in growth”. National Bureau of Economic Research Working Paper No. 4565.
- Frankel, J. and D. Romer (1999). “Does trade cause growth?”. *The American Economic Review*, Vol. 89, pp. 379-399.
- Frankel, J. and A. Rose (1997). “Is EMU more justifiable ex post than ex ante?”. *European Economic Review* 41, pp. 753-760.
- Hall, L.; A. Hoffmaister; A. Monge and E. Robles (2000). “Fluctuations, Trends and Transmission of Shocks in Central America, Mexico and U.S.A.”. Unpublished working paper.
- Insfrán Pelozo, José Anibal (2001). “Privatization in Paraguay: Some lessons”. *Quarterly Review of Economics and Finance*, Vol. 41, N° 5, 2001. pp. 737-753.
- International Monetary Fund (1997). “Paraguay: Country Report”. No. 01/87. Washington D.C.
- International Monetary Fund. Public Information Notices. Several Numbers. Washington D.C.
- Jones, L. and R. Manuelli (1995). “Growth and the effects of inflation”. *Journal of Economic Dynamics and Control*, Vol. 19, pp. 1405-1428.
- Lucas, Robert (1980). “Two illustrations of the quantity theory of money”. *The American Economic Review*, Vol. 70, pp.1005-1014.
- McKinnon, Robert (1963). “Optimum currency areas”. *The American Economic Review* 53, pp. 717-724.
- Mundell, Robert (1961). “A theory of optimum currency areas”. *The American Economic Review* 51, pp. 657-665.
- Rojas, Bernardo Darío (2001). “La Influencia de Itaipú en la economía paraguaya”. Unpublished manuscript.
- Solow, Robert (1956). “A contribution to the theory of growth”. *Quarterly Journal of Economics*, Vol. 70, No. 1, pp. 65-94.

- Summers, R. and A. Heston (1993). "Penn World Tables, Version 5.5". available on diskette from the National Bureau of Economic Research.
- Swan, Trevor (1956). "Economic growth and capital accumulation". Economic Record, No. 32, pp. 334-361.
- World Bank (2001). "Paraguay. Attacking poverty". Unpublished manuscript.
- World Bank (1999). "Paraguay: Country Economic Memorandum". Macroeconomic Policies to Reactivate Growth. Washington D.C.
- World Bank (1993). "Paraguay: Country Economic Memorandum". Washington D.C.
- World Bank (1992). "Paraguay: Country Economic Memorandum". Washington D.C.
- Wu, Y. and J. Zhang (1998). "Endogenous growth and the welfare costs of inflation: a reconsideration". Journal of Economic Dynamics and Control, Vol. 22, pp. 465-482.

\*\*\*\*\*