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## **ECONOMIC GROWTH IN PARAGUAY**

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# **ECONOMIC GROWTH IN PARAGUAY**

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## **Preface**

This paper is part of the project “Explaining Economic Growth Performance” launched by the Global Development Network (GDN). The purpose of this project is to explain economic growth performances across seven regions - East Asia, South Asia, Latin America, Eastern Europe, Former Soviet Union, Middle East and North Africa, and Sub-Saharan Africa. Project support was provided by the GDN. Eduardo Fernández-Arias coordinated the preparation of the country papers for the Latin American region on behalf of the Latin American and Caribbean Economic Association (LACEA).

## Introduction

Isolated by nature, inhabited by a small and unskilled population, lacking mineral resources, punished by devastating wars, and surrounded by highly unstable neighbors, it would be surprising if Paraguay's small economy were not among the least developed in South America. Indeed, according to the index of human capital development, the country lags significantly behind most of its neighbors. As of 2000, its GDP per capita was only 50 percent of the Latin American average and only 34 percent of its MERCOSUR partners.

Poverty statistics paint an even bleaker picture. According to the 1999 Household Survey,<sup>1</sup> the urban poverty rate was 26.7 percent, with some 810,000 individuals barely able to buy their daily food. Moreover about 6.1 percent of urban residents, or some 184,000 people, are mired in "extreme poverty" and unable to cover basic food expenditures. The situation is even worse in the countryside, where 42 percent of families fell below the poverty line and 26.5 percent of these were below the extreme poverty line. Even by Latin American standards, development conditions in Paraguay are dire.

Given its long history of unsustainable macroeconomic imbalances, policy reversals, bad policies, and political repression and turmoil, the dismal economic performance is deeply engrained. The average annual growth rate between 1950 and 2000 was only 1.7 percent. If we exclude the 1970s, when much of the Itaipú project infrastructure was constructed, the average drops to only 0.5 percent annually.<sup>2</sup> During the "lost decade" of the 1980s, Paraguay had a yearly GDP per capita growth rate of -1.7 percent. During the next decade, unlike the average Latin American country, Paraguay was essentially stagnant. Current per capita GDP levels equal those in 1976.

Undoubtedly these meager growth rates lie at the center of all other major problems in the country. Getting out of the hole and catching up will not be easy. For example, between 1990 and 1995, per capita Chilean GDP grew an average 5.3 percent per year while the rate for Paraguay was only 0.5 percent. Expressed in 1990 U.S. dollars, average GDP per capita in Latin America was \$3,429 in 1995 and only \$2,178 in Paraguay. Thus starting from that 1995 level, it would take a little more than 11 years for Paraguay to reach the Latin American average GDP if it could grow at the Chilean rates and everyone else stood still. At its present pace, however, it would take Paraguay 192 years to catch up. The point is obvious: Growth rates have cumulative effects, and even small differences compounded over a generation or more make a huge difference in standards of living. Growth policies must be the first priority of macroeconomists and other policymakers in the region.

This paper will examine the Paraguayan growth experience since the early 1960s, looking at different periods to try to identify the main factors behind particular levels of performance. Studying the determinants of growth is particularly important for a country like Paraguay that just recently recovered the most basic political rights and is still trying to consolidate its gain by building effective democratic institutions. Thus far the positive political trend has not been accompanied by economic growth and less poverty.

During different periods, Paraguay's growth rates have varied sharply. Table 1 compares the growth performance 1960–95 relative to MERCOSUR countries, Latin America countries, and the world. The average growth performance of Paraguay has not

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

<sup>2</sup> During the 1970s, the average per capita GDP grew at a record rate of 6.2 percent annually. It peaked at 8.6 percent in 1978.

been impressive, falling far below the mean of East Asian and OECD countries. Although higher than the Latin American and MERCOSUR averages, this performance is deceptive since it includes a brief bubble that was not sustained. The 1960s were a middling decade, with Paraguay growing in tandem with the region. During the 1970s, construction of the huge Itaipú hydroelectric project allowed Paraguay to match the high growth rates in East Asia, clearly outperforming the rest of Latin America. By the 1980s this stimulus had vanished and, like the rest of the region, external debt problems, stagnation, and macroeconomic instability were reflected in negative average per capita growth rates. But in the 1990s, Paraguay fell behind its peers. While Latin America experienced a strong recovery, Paraguay turned in probably the worst relative growth performance in its recent history, with an average growth rate one-third of the Latin American average and one-fifth of its MERCOSUR partners.<sup>3</sup>

**Table 1. GDP Per Capita, and Average GDP Per Capita Growth Rates for Paraguay and Six Country Clusters**

	1960 (\$)	1995 (\$)	1960–70 (%)	1970–80 (%)	1980–90 (%)	1990–95 (%)	1960–95 (%)
Paraguay	1,177	2,178	1.7	6.2	–1.7	0.5	1.8
MERCOSUR <sup>a</sup>	2,571	4,132	2.3	3.0	–1.2	2.5	1.5
Latin America (21)	2,319	3,429	2.3	2.3	–1.5	1.4	1.1
Sub-Saharan Africa (17)	784	1,061	2.1	1.1	–0.8	–1.9	0.5
East Asia	1,275	8,119	4.7	6.0	4.6	4.1	5.0
OECD (22)	5,592	13,364	4.3	2.5	2.1	1.1	2.7
World (81)	2,667	6,141	3.2	2.6	0.6	1.1	2.0

Source: De Gregorio and Lee (1999).

Notes: Parentheses indicate the number of countries in the grouping; GDP per capita is expressed in 1990 US dollars.

<sup>a</sup> Includes Bolivia and Chile.

The most striking conclusion from the growth accounting exercises is that total factor productivity (TFP) has been falling over time. This result is robust to a variety of methods for measuring capital and decomposing input contribution versus productivity. We also find that physical capital had a strong pull for growth in most periods, but was stronger during the 1970s and much more modest during the 1990s. We believe this reflects construction of the Itaipú dam in the 1970s and political uncertainties after Stroessner's 1989 ouster from power, respectively.

For the entire sample period, capital accumulation clearly has outpaced output, so its availability does not seem to be the major deterrent to growth. The main problems appear in the accumulation of human capital and the overall productivity factors. If Paraguay is to grow faster, one can presume that policies should focus more aggressively on these problems. Any improvement in these areas would also foster the accumulation of complementary factors, such as physical capital.

Our analysis of Paraguayan growth follows in six stages. We begin with an overview of the most important historical events during the past half century. Then we examine the statistics on human capital and poverty, which prove to be very disappointing, even compared with other countries in the region. Third, we examine the importance of factor accumulation and productivity in leading output growth. Fourth, we

<sup>3</sup> Following a banking crisis and a strong reduction in triangular trade, economic performance was even worse 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 performances in Latin America.

argue that changes in fiscal variables, inflation, and some other economic variables move in tandem with growth and hence are likely to influence it. Fifth, we look at the movement of Paraguay in tandem with its main trading partners and argue that the importance of Brazil has increased dramatically in recent years. Finally we include some summary remarks. An appendix discusses the major factors affecting incentives to accumulate capital.

## **An Historical Overview**

Paraguay's economy has always been concentrated on agriculture. The country's small size and openness have made it very sensitive to events that affected the international market for agricultural products, causing sharp and long-lasting fluctuations that have triggered other macro instabilities, such as fiscal and exchange crises and high rates of inflation. This section will briefly review the main characteristics experienced in different economic periods since 1940.

The 1940s and 1950s were periods of important institutional changes and severe fluctuations. World War II led to sharply increased demand for Paraguayan agriculture products, sparking relatively high growth rates for the entire economy.<sup>4</sup> Between 1938 and 1946, average GDP grew 2.5 percent annually and exports grew 8.2 percent annually. But tight world supply and the higher demand for domestic output were also reflected in rising domestic prices. Between 1939 and 1944 the cost of living increased 300 percent for higher income groups and 50 percent for the poor. As in most countries in Latin America, this was also when Paraguay established a national currency and founded its Central Bank. The guarani became the country's monetary unit in November 1943, with an initial exchange rate of G 3.07 per U.S. dollar.

What appeared to be the beginning of a new and better era for the country came to a sudden halt. Cessation of world hostilities in 1945-46 was followed by a long-lasting and drastic drop in overseas demand for agricultural products. And at home, a cruel civil war erupted in 1946. Output the next year dropped by 13 percent. Problems caused by low export demand and disrupted production from social unrest persisted through the early 1950s, and were 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 percent in 1952. More distortions gradually appeared as a system of multiple exchange rates and exchange rate controls took shape. 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 U.S. dollar (at a rate of 126 to 1).<sup>5</sup> Growth recovered in the latter half of the decade, with commerce and construction leading the way.

During the 1950s foreign aid was ample, and basic physical infrastructure gradually expanded. In this respect, it is important to highlight the treaties signed with Brazil. In January 1956 Paraguay signed an agreement whereby Brazil offered to finance the studies and consign the loans necessary for construction of a hydroelectric plant in the Acaray River, close to an area where transport projects were being advanced. This treaty

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<sup>4</sup> During this period, tobacco exports tripled, while vegetable oil exports increased more than sixfold, wood fivefold, meat exports doubled, and cotton increased 50 percent.

<sup>5</sup> Between 1952 and 1955 the inflation rate averaged 53 percent per year. After implementation of the stabilization plan, price increases fell to 12.2 percent per year between 1956 and 1960.

would become a prototype for the later treaty to construct Itaipú, which will be discussed in detail when we examine the 1970s.

**Table 2. Sectoral Composition of GDP (%)**

Sectors	1951–60	1961–70	1971–80	1981–90	1991–2000
Agriculture	38.1	34.5	29.3	26.2	26.8
Mining	0.1	0.1	0.2	0.4	0.5
Manufactures	16.7	17.1	17.7	16.5	14.7
Construction	1.5	2.2	3.5	6.2	5.4
Electricity, Gas, Water	n.a.	0.6	1.4	2.6	5.2
Transport and Comm.	n.a.	4.2	4.2	4.4	4.9
Commerce and Finance	26.0	25.8	26.3	26.7	24.9
Government	4.3	4.4	4.5	4.4	5.3
Misc. Services	13.3	11.1	12.9	12.6	12.3

Source: Central Bank of Paraguay.

As stated previously, agriculture has been the main activity in Paraguay since colonial times, and the 1940s and 1950s were no exceptions. In 1960 agriculture still accounted for almost 39 percent of GDP and employed 55 percent of the economically active population. Manufactures contributed 17.3 percent to GDP, employing 15 percent of the workforce. Over 75 percent of the value added in manufactures originated in agro-industries. During the first half of the 1960s, agriculture remained 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 of the internal road network.

The second half of the decade was very different. Public-sector works and commerce began setting the pace.<sup>6</sup> The government started to carry out important programs, especially road building, hydropower development, expansion of port facilities, installation of water services for Asunción, and even the construction of a cement plant. Consequently public investment averaged 5.3 percent of GDP in 1966–70, double the rate of the previous five years. Increased investment was partly financed externally but mostly from higher public savings from rising tax revenues. Of the various investments, energy ventures to harness the country's hydroelectric potential were the most striking. Besides construction of the Acaray plant, Paraguay and Brazil signed the Acta Final in June 1966, which would become the basis for the Itaipú treaty signing of 1973.

Commerce was another strong sector, expanding by more than 6 percent per year. The main stimulus for the sector came from Argentine and Brazilian tourists attracted by the lower prices of nontradables, and the much lower taxes that Paraguay imposed on imported goods compared to the protectionist policies of their own countries.

With savings and investment hovering around 12–13 percent of GDP, the average yearly growth rate of real GDP in the 1960s was 4.2 percent, while population was growing at 2.5 percent. After the financial chaos of 1947–54, stability was restored so that

<sup>6</sup> For example, during this period construction was increasing at annual rates well above the GDP's, while electricity and water growth began to exceed the GDP's.



by the sixties the cost of living was rising at an average of only 2 percent yearly. Additionally, there was total exchange rate stability, with a pegged rate of G 126 per dollar.

### *The Itaipú Boom*

The 1970s were unusually prosperous for Paraguay. GDP growth accelerated dramatically to an average of almost 9 percent annually, doubling the performance of the previous decade.<sup>7</sup> The driving force 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 (jointly with Brazil) of the world's largest hydroelectric project at Itaipú.

**Table 3. Annual Average GDP Growth by Sector (%)**

Sectors	1951–60	1961–70	1971–80	1981–90	1991–2000
Agriculture	1.8	3.0	6.7	4.0	1.7
Mining	n.a.	57.5	28.4	4.9	2.7
Industry		6.5	8.3	2.2	0.8
Construction	7.5	7.4	20.3	0.7	2.8
Electricity, Gas, Water	n.a.	11.3	17.5	7.9	10.2
Transport/Communication	n.a.	37.3	9.7	3.7	4.1
Commerce and Finance	3.5	4.8	9.0	2.8	–0.5
Government	3.3	7.8	4.3	5.0	5.4
GDP	2.9	4.8	8.8	3.1	2.0

Source: Central Bank of Paraguay.

Starting in the early 1970s the government accelerated efforts to expand the agricultural frontier. Heavy investment in infrastructure began, and the eastern frontier was opened to development. New lands in this fertile region were brought under cultivation through the establishment of numerous settlements.<sup>8</sup> These settlements were the main reason for agricultural growth in a sector that expanded on average 6.9 percent yearly during the decade. Due to rising world demand and favorable international prices, the frontier lands were mainly used for export crops, primarily cotton and soybeans, which became Paraguay's dominant exports. Cotton mushroomed from 1.1 percent of total exports in 1960 to 44 percent in 1985; while soybeans, which did not appear on export lists at all in 1960, attained a share of over 16 percent in 1981.<sup>9</sup> It should be noted that quebracho extracts and livestock, Paraguay's traditional exports, declined dramatically during the same period.

The highway to Brazil and the development of frontier lands substantially reduced Paraguay's traditional dependence on Argentina as its trade route. This was reflected by the dramatic increase in trade with Brazil to the detriment of other countries, especially the United States. For example, in 1960 only 0.2 percent of Paraguay's exports went to Brazil and 0.8 percent of imports came from there. By 1981 the respective shares were 18.3 percent and 25.9 percent, respectively.

<sup>7</sup> In particular, the yearly real growth rate of GDP averaged over 11 percent in 1977–80.

<sup>8</sup> By the end of 1976, almost 90,000 land titles had been issued, covering about 4 million hectares. Paraguayan colonists were joined by large numbers of Brazilian and Japanese farmers who came in response to several economic stimuli: low land prices, low taxes, and high world prices for farm products.

<sup>9</sup> Soybean exports as a percentage of total exports grew further during the 1980s and 1990s.

The expanding agricultural frontier also affected regional demographics. While only 18.3 percent of the population lived in the eastern frontier region in 1962, 27.3 percent lived there 20 years later. Meanwhile about 40.5 percent of the population lived in the *minifundia* region in 1962 compared to 34.2 percent in 1982.<sup>10</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. Instead it experienced a rural-rural shift away from the traditional *minifundia* regions to the newly opened lands.

**Table 4. Employment by Production Sector (%)**

Sectors	1950	1962	1972	1982	1992	1999
Agriculture	55.4	54.7	47.9	42.9	35.6	30.4
Industry	16.1	15.1	14.0	12.0	12.5	12.3
Construction	3.0	3.3	3.9	6.7	7.2	5.2
Transport/Communications	2.3	2.5	2.8	2.9	3.3	4.3
Commerce and Finance	7.1	7.1	8.0	9.3	13.9	24.8
Services	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 1970s was construction of the Itaipú hydroelectric dam. The work, which was concentrated from 1973–83, cost more than four times Paraguay's GDP and was financed externally through the Itaipú Binational Entity. The debt was guaranteed by Brazil.<sup>11</sup> It has been estimated that between 1977 and 1980 around US\$250 million (equivalent to 6 percent of Paraguay's GDP) were spent in Paraguay each year.

The capital inflow from the Itaipú project and the easy credit conditions in the international markets of the time translated into large increases of liquidity and a tremendous credit expansion, while simultaneously exerting 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 percent between 1973 and 1981. The dramatic increase from representing less than 10 percent of GDP in the 1960s to over 20 percent at the end of the 1970s stemmed from a large expansion in private investment.<sup>12</sup> At the same time, public investment remained at about 5 percent of GDP.

However linkages to other sectors of the economy were weak, except for the service sector, especially commercial and financial activities. For example in 1972 there were only six banks in Asunción. By 1981 there were 20. Commerce and finance grew at annual rates above 10 percent in 1976–80, and this sector accounted for 26 percent of GDP by 1981.

Public finances remained strong during this period and huge increases occurred in foreign reserves, which grew from less than US\$20 million at the beginning of the 1970s to US\$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

<sup>10</sup> The *minifundia* region comprises the four departments around Asunción: Cordillera, Guairá, Paraguari, and Central.

<sup>11</sup> Most of this spending is not shown in Paraguay's national accounts since for this purpose Paraguay does not consider binational enterprises to be located within the national territory.

<sup>12</sup> Many private-sector investments later proved to be overestimated; construction investment certainly was greatly exaggerated.

prices. All these occurrences, combined with the increased market liquidity, resulted in strong inflationary pressures: By the late 1970s Paraguay again experienced double-digit inflation, reaching 28.2 percent in 1979.<sup>13</sup>

### *The Lost Decade*

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

Incidentally, the sectors that suffered most post-Itaipú were those that had grown most rapidly in the 1970s boom. For example, although commerce and finance was 17 percent higher in 1989 than in 1981, the sector's average annual growth rate was below that for GDP. The construction sector also was affected severely, contracting more than 6 percent in 1982 and sustaining negative growth rates in each subsequent year until 1986. Consequently construction activity in 1989 was still more than 7 percent 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 project postponements. Other sectors did not perform well either, with manufacturing output moving at about the same pace as global GDP. Basic services — electricity, water and sewerage, and transport — expanded faster than the economy, but growth also declined substantially compared to earlier years. Even though it averaged 8.5 percent growth in 1987–89, the agricultural sector was still expanding at half its rate of the previous decade.<sup>14</sup>

A second factor contributing to the country's stagnation was the world recession, which hit Argentina and Brazil, Paraguay's largest trading partners, particularly hard. Both countries were caught up in a period of structural adjustment that forced them to slash imports sharply and devalue their currencies. Accordingly Paraguayan exports also declined. Worldwide recession also caused a fall in the international prices of Paraguay's main exports. For example soybean prices decreased 2.6 percent in 1981 and 5.4 percent in 1982, while cotton prices fell 11.4 percent in 1981 and 16.7 percent in 1982 (Bayer and Breuer, 1986).<sup>15</sup>

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<sup>13</sup> These inflation rates were low by Latin America standards, mainly due to the extreme openness of the economy and the overvaluation of the guarani.

<sup>14</sup> However a significant restructuring of output also occurred, shifting toward the domestic market with an impressive expansion in corn and wheat production.

<sup>15</sup> Baer and Breuer (1986).

**Table 5. Composition of Registered Export Commodities (%)**

Products	1960	1970	1980	1990	2000
Wood products	18.7	19.7	21.4	3.9	8.6
Livestock & meat	26.5	23.8	0.3	13.9	8.1
Tobacco	5.9	9.0	3.3	0.6	0.4
Cotton	1.1	6.3	34.1	34.7	10.6
Soybeans	0.0	0.0	13.6	27.9	32.9
Vegetable oil	5.7	10.9	5.5	1.4	4.8
Quebracho extract	10.9	3.0	1.4	0.6	0.0
Others	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 economic scenario. The government responded with a macroeconomic policy using public investment and spending to combat the post-Itaipú recession. The government also began to speed up disbursement of previously contracted foreign loans and arranged new ones. Most of the increase in external debt during this time came from public-sector borrowing to finance infrastructure as well as some heavy industries like steel and cement.

However these actions had outcomes substantially different from expectations. Investments turned out to be unprofitable and oversized for the domestic market. Sectors had been targeted in which regional markets already showed substantial excess capacity. Meanwhile, foreign debt increased dramatically, rising from 15 percent of GDP in 1981 to 62 percent in 1987. In the mid-1980s, the government stopped servicing much of its international debt, causing the country to lose access to international markets and several creditors to suspend the disbursement of previously contracted loans.

In addition to the external borrowing, internal credit expanded rapidly during this decade. Domestic credit to the public sector (including the Central Bank's deficit) increased sharply, contributing to the rise in prices.<sup>16</sup> Inflation, which had fallen from 14 percent in 1981 to 6.8 percent in 1982, doubled in 1983 and kept rising in following years. The consequences of higher inflation were then amplified by the multiple exchange rate system instituted in 1982.<sup>17</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 created opportunities for private parties and public officials to engage in corruption and glean easy profits, especially as domestic price levels increased. The principal legal beneficiary of the multiple exchange rate system was the nonfinancial public sector. Although official figures suggest the sector remained roughly constant throughout the 1980s, it received explicit and implicit subsidies from the Central Bank and exporters that reached an equivalent of about 6 percent of GDP annually in 1986–88.

<sup>16</sup> For example, in 1978–84 domestic credit grew at an annual average rate of 26.5 percent.

<sup>17</sup> The exchange rate was fixed at G 126 to the U.S. dollar in 1961 and remained there until mid-1982, when a system of multiple exchange rates was introduced. Rates then ranged from 128 to 240 guaraníes to the dollar, with 160 being the dominant figure.

### *Falling Behind in the 1990s*

As mentioned earlier, economic policy in the latter half of the 1970s did not prepare the country for post-Itaipú conditions since most of the transitory additional resources being generated were spent as if the flow were permanent. On top of that, when the inevitable slow-down occurred in the 1980s, it was aggravated by poor macroeconomic policy and rent-seeking practices. In part the increased rent-seeking practices were symptomatic of the cronyism rife in Stroessner's authoritarian regime. That regime, one of the longest-lasting in recent Latin American history, was weakening rapidly and finally toppled when social unrest burst out in February 1989. As might be expected after a dictatorship of 35 years, the country embarked on a pseudodemocratic transition period characterized by a drifting, unstable balance of power that hopefully will settle with formation of strong democratic institutions. The political uncertainty may have negatively affected the incentives to invest in the country, but in general, many important changes have taken place and the trend has been positive.

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

**Table 6. Main Macroeconomic Indicators**

Indicators	1960	1970	1980	1990	2000
GDP growth, % per year <sup>a</sup>	2.9	4.8	8.8	3.1	2.0
Inflation, % per year <sup>a</sup>	30.3	3.4	13.1	21.7	13.4
Exchange rate, G/US\$ <sup>b</sup>	131.0	133.0	136.0	1,230.0	3,507.0
Int. reserves, US\$ Mill.	0.9	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	12.2	26.8	21.9	18.3
Tax revenues, % GDP	n.a.	10.3	8.1	9.2	10.3
Public-sector deficit, % GDP <sup>a</sup>	n.a.	n.a.	1.2	3.1	-0.9

Sources: Central Bank of Paraguay and World Bank.

<sup>a</sup>Ten-year averages: 1951–60, 1961–70, 1971–80, 1981–90, and 1991–2000.<sup>b</sup>

<sup>b</sup>Free market price; end of period.

Thereafter, significant changes were made in public finances, international economic policy, and financial sector policy.<sup>18</sup> Regarding public finances, the public-sector deficit was initially reduced, financial management of 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 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

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<sup>18</sup> A main economic problem in previous periods was the large but hidden public deficit, which reached around 8 percent of GDP in 1988 (including interest arrears and the public-sector foreign exchange subsidy). The official 1988 figures showed a deficit of only 3.1 percent of GDP.

the country's interest burden and its susceptibility to external interest rate shocks.<sup>19</sup> In the financial sector, interest rates were liberalized in 1990 and completely freed by 1991, when they were influenced only by the Central Bank via the discount rate. Meanwhile selective credit controls were abolished almost completely and reserve requirements reduced. With regard to trade policy, a new tariff code was passed in 1992, lowering and simplifying rates to bring them in line with the de facto openness of the economy.<sup>20</sup> Also in 1991, Paraguay joined the common market MERCOSUR, cosigning the Treaty of Asunción with Argentina, Brazil, and Uruguay. Since then the country has complied with treaty obligations to reduce tariffs to MERCOSUR partners.

Despite all the reforms, however, economic growth was far from outstanding during the first part of the decade. GDP grew an average of 3.2 percent yearly between 1990 and 1995, barely keeping pace with population growth. GDP continued to be heavily influenced by agricultural output, which was severely affected by adverse weather in 1990 and 1991, and deteriorated further in 1992. The next year brought a rebound in the agricultural sector, pushing GDP growth above 4 percent. Most other sectors in the economy during this period grew around 3 percent annually, except for basic services. This sector was the pacesetter, with an annual growth rate above 7 percent, reflecting the rural electrification program established by the power company and investment programs to increase water coverage in Asunción.

Except at the outset, inflation usually remained under control during this period. The liberalization of exchange rates in 1989, adjustments on the prices of public services, and a high rate of monetary expansion due to the accumulation of foreign reserves drove inflation above 40 percent in 1990.<sup>21</sup> Since then the exchange rate has been used as the nominal anchor. After initially seeking to accumulate international reserves and to protect export competitiveness, the government began to worry more about domestic inflation, shifting the priority in exchange rate management toward price stability. Consequently the exchange rate was devalued to a level below inflation, and the guarani started to appreciate in real terms. Inflation was gradually lowered from 44.1 percent in 1990 to 13.4 percent in 1995, when the policy was derailed by a banking crisis.

The overarching reforms of the financial sector were undertaken in 1989 and 1990, 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 financial institutions. As a result, a full-fledged banking crisis erupted in 1995. A second round of bank failures followed in 1997.<sup>22</sup> Thirteen domestic banks (about a third of the banking system) and a

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<sup>19</sup> In 1989 Paraguay reduced its debt with Brazil by over US\$400 million through a swap for Brazilian debt purchased in the secondary market. In 1992, arrears to commercial bank creditors were reduced from over US\$200 million to less than US\$3 million through the buyback of US\$172 million of debt and the restructuring of most of what remained.

<sup>20</sup> External tariff rates, which ranged from 3 percent to 86 percent prior to the reform, went to 9.6 percent for manufactures, 6.9 percent for agriculture, and 3.4 percent for mining and quarrying.

<sup>21</sup> From March 1989 through 1991, the Central Bank accumulated more than US\$700 million in foreign reserves, equivalent to nearly 20 percent of GDP. Most of these resources were later used to solve Paraguay's external debt problems.

<sup>22</sup> Many actors share 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).

number of other financial institutions failed post-1995. The cumulative cost of the banking crisis by 1998 reached an estimated 13 percent of GDP.

During the second half of decade, monetary conditions reflected the increasing financial needs of banks in distress. From the middle of 1995 through 1997, the Central Bank was forced to absorb the costs of the crisis. In order to mitigate the inflationary impact of credit 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 nearly 40 percent from their 1996 peak, the Central Bank abandoned its support of the guaraní, which depreciated by some 20 percent. The weakening domestic economy kept inflation below the rate of depreciation and, in real effective terms, the guaraní depreciated during this period.<sup>23</sup>

In the fiscal area, structural reforms and a comprehensive adjustment in 1990 led to a series of surpluses during the first half of the decade that helped reduce the country's debt burden. For several years prior to 1997, the nonfinancial public sector achieved surpluses averaging around 2 percent of GDP annually.<sup>24</sup> Beginning in 1997, however, the balance slipped into deficit, caused mainly by weakened tax collection, strong wage growth, and the need to undertake long-delayed maintenance investment. Public enterprises also saw their cash flow squeezed as tariffs were not adjusted in line with costs. Moreover, 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 percent of GDP in 2000, when spending surged, financed by a large injection of external debt.<sup>25</sup>

As mentioned earlier, economic growth was moderate in the early years of the 1990s and accelerated briefly during a middecade credit expansion. However the banking crisis brought the expansion to a halt in 1996, and since then the economy has undergone sustained contraction. As a result of the problems in the financial system, private-sector credit contracted sharply and real interest rates rose to around 25 percent, while depositors increasingly shifted toward U.S.-dollar-denominated assets. Additionally, the recession led to a sharp rise in nonperforming loans and increased bank reluctance to extend credit 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 combined to reduce real GDP, at first per capita and then, in 1998 and 2000, absolutely.<sup>26</sup> As a consequence, poverty deepened — especially in rural areas — and income distribution became more unequal.

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<sup>23</sup> Inflation initially picked up to 14.6 percent at the end of 1998 but rapidly declined to single digits the following year.

<sup>24</sup> The surpluses were mainly explained by the increase in revenues. For example central government revenues increased from about 8 percent of GDP in the late 1980s to about 15 percent in 1997. Most of the increase was due to import taxes, imposed on triangular trade, and the 1992 introduction of a 10 percent value-added tax. Nevertheless, most of the additional revenue was spent on personnel, whose expenditures rose from 3 percent of GDP in 1990–92 to about 7 percent in 1997.

<sup>25</sup> Paraguay's public external debt has doubled over the last five years to about 32 percent of GDP. In 1999 the country obtained a loan from Taiwan of US\$400 million, equivalent to 30 percent of the external debt at the time. The government spent the full amount in 1999 and 2000 in a futile attempt to reverse the economic stagnation.

<sup>26</sup> The average growth rate of real GDP was only 0.7 percent per year in 1996–2000.

## Poverty, Inequality, and Social Indicators in Paraguay

The previous section showed that, during the past 50 years, the economic performance of Paraguay has gone through different stages. The 1960s were years of increased growth and financial and political stability compared to the previous decades, with commerce and construction being the main sources of growth. In the 1970s Paraguay had a good economic performance thanks to agricultural expansion and the construction of large hydroelectric projects. After the completion of the main works at Itaipú in 1981, the Paraguayan economy entered a deep recession that lasted well into the mid 1980s. Economic recovery started in the first half of the 1990s but a combination of factors, both domestic and external, led to a new recession over the second half of this decade. A glance at the social indicators available over this whole period shows that, in spite of some improvement over time in many of them, the bulk of the Paraguayan population continued to live on a fairly low standard.

In this section we provide a brief summary of poverty, income distribution, health and education environment in Paraguay. Data in some important economic and social indicators became available only in recent years. For example, the household survey program in Paraguay started in 1983, and data have been collected once every year since. However, until 1993 the surveys covered only the metropolitan area of Asuncion and, just in 1995, the first national survey was implemented. All these issues have placed important constraints on the analysis of this section.

The share of the population living in poverty is still high in Paraguay, both in the metropolitan area and in the country as a whole. According to Robles (1999), the population in poverty in the metropolitan area of Asuncion has been steadily decreasing between 1983 and 1997. In 1983, the share of the population in poverty was 55.4% (of which, 16.2% were in the extreme poverty category). By 1990, this share was 41.6% (11.9% in extreme poverty) and by 1997 it further decreased to 23.7% (4.0%). At the same time, this author noticed that inequality, as measured by the Gini index, has remain stable in the metropolitan area during most of the period, but slightly increased in the most recent years. The Gini index has a value of 0.473 in 1983, 0.449 in 1987, 0.445 in 1990, 0.472 in 1993, 0.503 in 1995 and 0.483 in 1997.

**TABLE 7: Poverty and inequality indicators in the metropolitan area of Asuncion**

	1983	1987	1990	1993	1995	1997/8
<b>Extreme poverty</b>	16.2	16.0	11.9	11.2	6.0	4.0
<b>Poverty</b>	39.2	32.2	29.7	24.8	21.5	19.7
<b>Gini index</b>	0.473	0.449	0.445	0.472	0.503	0.483

Source: Robles (1999).

Complementary, the World Bank (2001) found that, between 1995 and 1999, the share of the population in poverty rose from 30.3 percent in 1995 to 33.7 percent (Table



8). At the same time, the share of the population in extreme poverty increased from 13.9 to 15.5 percent. These increases were largely due to the country's bad economic performance. A severe banking crisis, falling agricultural prices, and other shocks combined to produce the worst macroeconomic performance in Latin America, with four consecutive recessionary years and an overall per capita GDP contraction of 6.5 percent. During this period, the ranks of the extreme poor rose by 75,000 and the ranks of the poor by 180,000. The impact has been severe for households in smaller cities and especially severe for those in rural areas, both of which were more affected by the economic downturn than Asunción.<sup>27</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.

**Table 8. Population Percentages for Poverty and Extreme Poverty (1995–99)**

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

Source: World Bank (2001).

Inequality has also increased, contributing to the high poverty rates. In the 1980s the prevailing wisdom was that Paraguay had an equitable distribution of income (due to a relatively low level of inequality in metropolitan Asunción), but when national survey data became available, it became apparent that the country actually ranked among the worst in Latin America. Inequality at the national level, as measured by the Gini index, increased further in the second half of the 1990s, rising in rural areas while remaining stable in urban areas (Table 9). 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 (having been observed in many other countries), the important message is that disparities in education seem to have increasingly impacted income inequality over time.

<sup>27</sup> According to some studies, rural poverty may have begun rising as far back as 1980, even during relatively prosperous periods for the economy as a whole and even when urban poverty was declining. These studies suggest that while extreme poverty fell in Asunción between 1983 and 1992, it rose in the countryside during a comparable period (1980–92).

**Table 9. Changes in the Gini Index of Income Inequality (1995–99)**

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

Source: World Bank (2001).

While there has been virtually no growth in per capita GDP over the last two decades, Paraguay has shown progress in some nonmonetary 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 (Table 10). The improvement in nonmonetary 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 10. Human Development Index (HDI) Levels in Six Latin American Countries (1975–99)**

	Paraguay	Uruguay	Chile	Bolivia	Argentina	Colombia
1975	0.663	0.755	0.700	0.512	0.784	0.657
1980	0.698	0.755	0.735	0.546	0.798	0.686
1985	0.704	0.779	0.752	0.572	0.804	0.700
1990	0.716	0.800	0.779	0.596	0.807	0.720
1995	0.733	0.813	0.809	0.628	0.829	0.746
1999	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 decades, but it still lags behind for enrollment in secondary education. According to the United Nations Development Program (UNDP), illiteracy, in the population aged 15 years and over, decreased from a high 34,2% in 1950 to 22,8% in 1982. It was further reduced to 9.7% in 1992 and to 8.4% in 2000/01. Also, as indicated in Table 12, the number of years of schooling for the population aged 15 and over has doubled over the last two decades and the rate of illiteracy has been cut in half. 15 and over has increased gradually since 1970, but it barely pass 6 years in 2000. That is, Paraguay 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<sup>28</sup>. The same table shows that the number of years of schooling in Paraguay is low when compared to other countries in the region. The relatively low level of the population's human capital, as measured by the number of years of schooling, could be an important factor in explaining the meager economic growth rates observed in Paraguay in recent years.

<sup>28</sup> Returns to education in Paraguay are similar to those found in other countries in the region. Psacharopoulos (1994) found that the coefficient on years of schooling in a mincerian regression was 11,5% in Paraguay, 10,3% in Argentina, 14,7% in Brazil, 12,0% in Chile and 9,7% in Uruguay.

**TABLE 11: Trend in illiteracy rate and net enrollment rates**

	1960	1970	1980	1985	1990	1997
<b>Illiteracy rate<sup>a</sup></b>	25.6	20.0	22.8	n.a.	9.7	8.4
<b>Men<sup>a</sup></b>	19.0	15.2	20.0	n.a.	8.3	6.9
<b>Women<sup>a</sup></b>	31.5	24.8	25.5	n.a.	11.8	9.8
<b>Enrollment primary</b>	n.a.	n.a.	88.7	89.5	92.8	91.2
<b>Enrollment secondary</b>	n.a.	n.a.	n.a.	25.4	25.8	37.9

Source: UNDP (2003) and World Bank (2001).

<sup>a</sup> Years 1962, 1972, 1982, 1992 and 2000.

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 12: Average years of schooling in the population aged 15 years and over**

Country	1970	1980	1990	2000
<b>Argentina</b>	6.2	7.0	8.1	8.8
<b>Brazil</b>	3.3	3.1	4.0	4.9
<b>Chile</b>	5.7	6.4	7.0	7.6
<b>Paraguay</b>	4.2	5.1	6.1	6.2
<b>Uruguay</b>	5.7	6.2	7.1	7.6

Source: UNDP (2001).

Paraguay's fertility rate (and consequently, its rate of population growth) is among the highest in Latin America, even though it has been decreasing over time. The country's fertility rate was 6.6 in the period 1960-65, 5.7 in 1970-75, 5.3 in 1980-85, 4.6 in 1990-95 and 4.2 in 1995-00. The average fertility rate for the countries in Latin America and the Caribbean during the same periods were 6.0, 5.1, 3.9, 3.0 and 2.729. The World Bank (2001) also found that fertility rates have decreased in the 1990s, but with a leveling off in recent years. The fertility rate has diminished 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. At the same time, life expectancy of the population have been increasing. According to the UNDP (2003), in 1950 the life expectancy of a typical Paraguayan was only 62.7 years. In 1960 it was 63.8 years, in 1980 it reached 65 years, in 1990 it was 67.1 years, while at the end of 2000 it attained 70.1 years.

<sup>29</sup> See Economic Commission for Latin America and the Caribbean (1981) and (2001).

Both factors have put pressures on the yearly rate of economic growth necessary to rise per capita income in the country.

Finally, while there has been no increase in per capita GDP and probably no decrease in poverty over the last two decades, there has been a reduction 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 across the board. Nationally the share dropped from 86.9 percent in 1982 to 55.3 percent in 1997/98, while shares dropped from 72.2 to 44.7 percent and from 99.5 to 67.5 percent in urban and rural areas respectively.

## **Accounting for Growth**

This section details a production function approach for determining the sources of growth in Paraguay during 1962–2000. The objective is to separate the impact of input accumulation from that of increased total factor productivity (TFP) on the growth of aggregate output. For reasons that soon will become apparent, a variety of methodologies are used to make the decomposition.

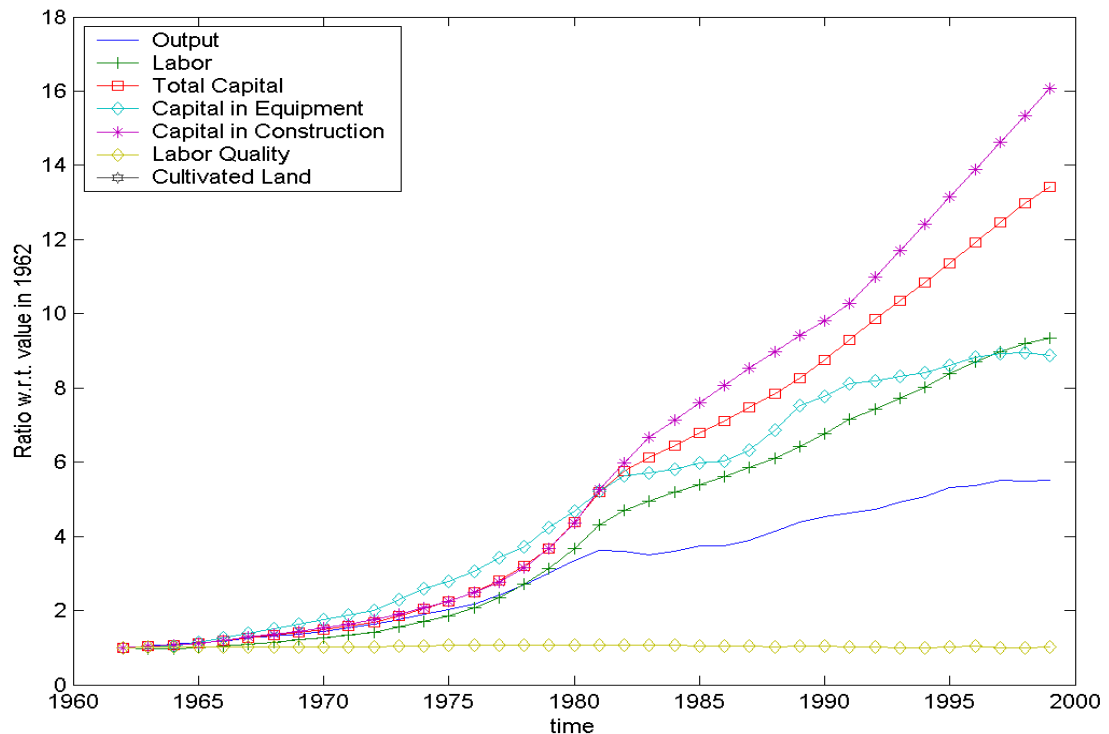
First, we explore the behavior of the relevant time series. Figure 1 displays the series for output, capital, employment, labor quality, and cultivated land. All are expressed as a ratio of their original values in 1962 except for cultivated land, which is expressed as a ratio of its 1966 value because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

The series for capital is estimated using the traditional perpetual inventory method, with a yearly depreciation rate of 8 percent. For almost any relevant value of the depreciation rate, the implied series for capital was found to grow much faster than aggregate output, causing us to use this rather high (but still reasonable) value to minimize the impact of a possibly artificial capital/output ratio on the growth accounting exercises. However, the qualitative conclusions are robust for using depreciation rates of 4 percent or 6 percent, changing the outcome numbers, but not dramatically. Indeed, we later will make the case that the rising capital/output ratio is simply a reflection of the poor behavior of TFP.

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

**Figure 1. Basic Aggregate Time Series for the Paraguayan Economy**



The employment series was constructed using the series on population and participation rates by gender from the World Bank dataset. Results change little if the series in Summers and Heston (1993) is substituted instead. We also consider cultivated land as another input in production. The numbers of hectares come from Cabello et al. (2000). The employment series corrected for labor quality was based on data about educational attainment in the workforce and variations in salaries and wages by level of schooling. Such corrections had negligible impact, which is consistent with the results of the poverty and education statistics discussed in the previous section.

Several features are evident from Figure 1. While all series increase consistently over time, with a notable exception discussed below, their behavior varies markedly. Importantly, as discussed earlier, the growth rate of per capita output is disturbingly low. Output spurts during the 1970s, contracts during a sharp recession in the early 1980s, rebounds timidly during the early 1990s, and subsequently declines. Capital growth also slows after the 1980s, although the capital/output ratio clearly has increased.

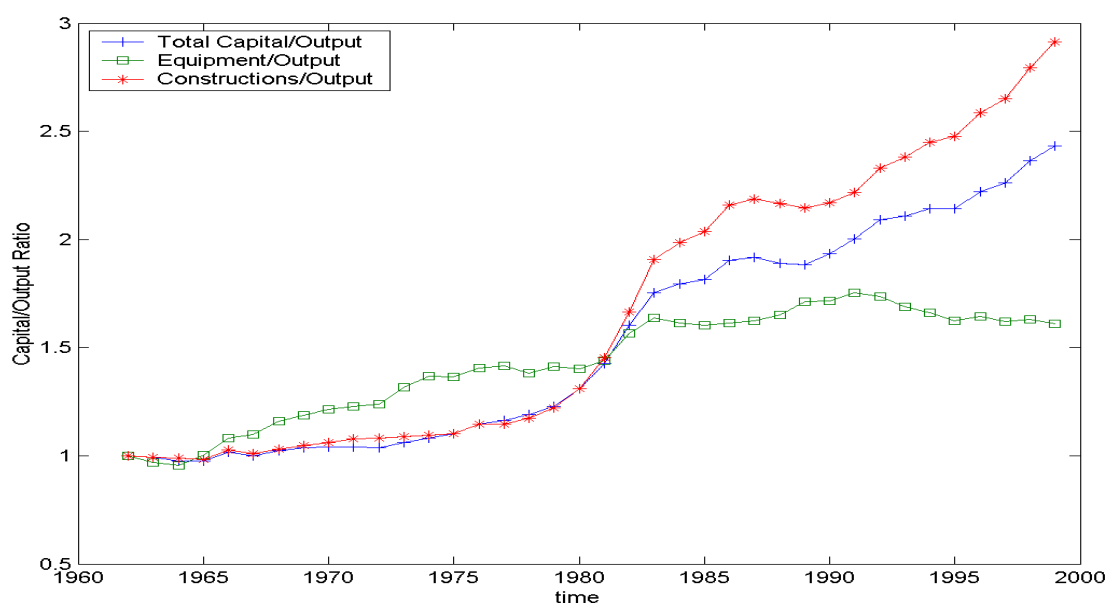
During the sample period, cultivated land grew significantly. It nearly doubled between 1975 and 1980, and then slowed to a rate of 20 percent over the following two decades as the country approached the limits of arable land.

The figure's most striking feature is the lack of growth in labor quality. Naturally this index would not be expected to match the growth rate of other aggregate series, but the actual performance was very disappointing since Paraguay started with an index of human capital among the lowest in the region and its improvements lagged behind the other Latin American countries. There are theoretical and empirical reasons to believe

that human capital is one of the most important factors behind growth, making the lack of human capital accumulation a prime suspect in Paraguay's meager growth rates.

The data also points to the disparate growth in construction. Many observers in Paraguay believe there is widespread overinvestment in housing. Given this, we explore econometric specifications and growth accounting techniques that consider investment in equipment separately from construction investment. Figure 2 reports the behavior with respect to GDP of total capital, capital equipment, and construction capital. The series are normalized to equal one at the beginning of the period. Each outpaces output, especially construction after the mid-1970s. As the figure clearly shows, construction stock as a share of GDP rises sharply in the late 1970s and early 1980s, reflecting in part the push from the Itaipú project. But the upward trend is also present in the ratio of equipment stock to GDP, which increased by more than 50 percent during the sample period.

**Figure 2. Capital Output Ratio, Using Different Measures of Capital**



The only way to revert these results is to use incredibly large depreciation rates. However the rising capital/output ratios more likely reflect declining total factor productivity. To find out, a battery of methods was employed to decompose factor accumulation and show their results.

### ***Input Accumulation and Total Factor Productivity***

Given the time series of output and different inputs, the natural questions that arise are, what quantitative contribution does each input make to output growth and how much is attributable to an overall increase in productivity? Several different methodologies are used to perform this accounting. First, simple econometric methods are employed to estimate a production function. Then the point estimates and the regression residuals are used to compute the contribution of each factor and of TFP. The second method uses the parameter values traditional in the literature (and estimated from data on other countries).

Our third decomposition is more innovative. Abandoning the Cobb-Douglas assumption, we allow for a constant elasticity of substitution (CES) production function.

Using information on the share of output that goes to labor, one 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, one can estimate a TFP-like influence 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 point to declining TFP as a main cause of Paraguay's poor growth.

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

$$Y(t) = A(t)K(t)^\alpha L(t)^\beta \quad (1)$$

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

$$y(t) = a(t) + \alpha k(t) + \beta l(t) \quad (2)$$

where lower-case variables indicate the natural log of the variables expressed as capital letters in (1). This equation can be estimated directly using the ordinary least square (OLS).<sup>31</sup> However, there is another way to estimate the unknown parameters in the production function, using the "intensive" form

$$[y(t) - l(t)] = a(t) + \alpha [k(t) - l(t)]. \quad (3)$$

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

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

$$Y(t) = A(t)K(t)^\alpha L(t)^\beta T(t)^\chi \quad (4)$$

where  $T(t)$  denotes cultivated land. However the results 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 interesting extension is the separation of capital between construction and equipment. That is, we explore an aggregate production function of the form

$$Y(t) = A(t)Kb(t)^\alpha Ke(t)^\chi L(t)^\beta \quad (5)$$

where  $Kb$  and  $Ke$  stand for the stock of construction capital and capital 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 capital prices, which are

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

critical for such corrections, is very distorted and fragmented in a country like Paraguay with a long history of government intervention in the financial markets.

Additionally, we assume that the log of TFP follows a trend stationary process of the form

$$a(t) = a_0 + a_1 t + u(t) \quad (6)$$

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

$$A(t) = \exp[ a_0 + a_1 t + u(t)] . \quad (7)$$

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. All regression estimates of the coefficients of production functions require the orthogonality of the residuals with the regressors. Yet economic theory indicates that the amount of labor, or  $L(t)$ , and of capital, or  $K(t)$  — 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 borne in mind whenever interpreting the results.

Table 13 reports results of all the specifications, for both intensive and extensive forms. The t-statistics in the table are computed simply using the OLS standard errors. Beyond obviously valid concerns about the relevance of these standard errors, there are econometric problems of fundamentally higher relevance than merely obtaining robust errors. First, as cited earlier, economic theory strongly indicates that the regressors cannot be orthogonal to the residual. Periods of high TFP are also when investment is more profitable. Thus the OLS estimates are inconsistent. But perhaps even 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 construction capital.



**Table 13. Estimation Results for Paraguay's Aggregate Production Function (1962–99)**

Explanatory\Dependent	Log (Output)			Log (Output/Labor)		
Constant	0.12 (2.47)	0.06 (4.27)	0.03 (1.60)	0.05 (1.07)	0.03 (1.00)	0.05 (1.90)
Log Labor	-0.01 (-0.01)	0.77 (6.14)	0.18 (3.77)			
Log Total Capital	0.68 (0.96)					
Log Capital Equipment		0.44 (11.44)	0.52 (11.89)			
Log Capital Construction		-0.60 (-4.92)				
Log Total Capital/Labor				2.29 (4.51)		
Log Cap. Equipment/Labor					0.65 (8.71)	0.62 (8.47)
Log Cap. Const/Labor					0.28 (1.30)	
Time trend	-0.00 (-0.22)	0.02 (5.04)	0.00 (1.36)	-0.04 (-10.34)	-0.02 (-8.15)	-0.02 (-19.45)
R <sup>2</sup>	0.987	0.99	0.997	0.92	0.960	0.958

Source: Authors' estimates.

Note: Numbers in parentheses are the t-statistics under the null that the coefficient is zero.

Using basic economics, it is clear that some of these results cannot be taken seriously. For instance in the second column, the regression in extensive form yields a value for the share on labor that is in the ballpark of the literature, but it absurdly implies negative productivity of constructions. We also disregard results for the first regression since it implies a negative (though negligible) productivity for labor. We also must discard results in the third column because they imply decreasing returns to scale, a problem that is not resolved by introducing land in the regression. Thus none of the extensive form regressions can be used to decompose the sources of growth. Finally, we ignore the fourth column, i.e., the first regression in intensive form. It implies a huge productivity of capital and negative labor productivity, which obviously makes no sense.

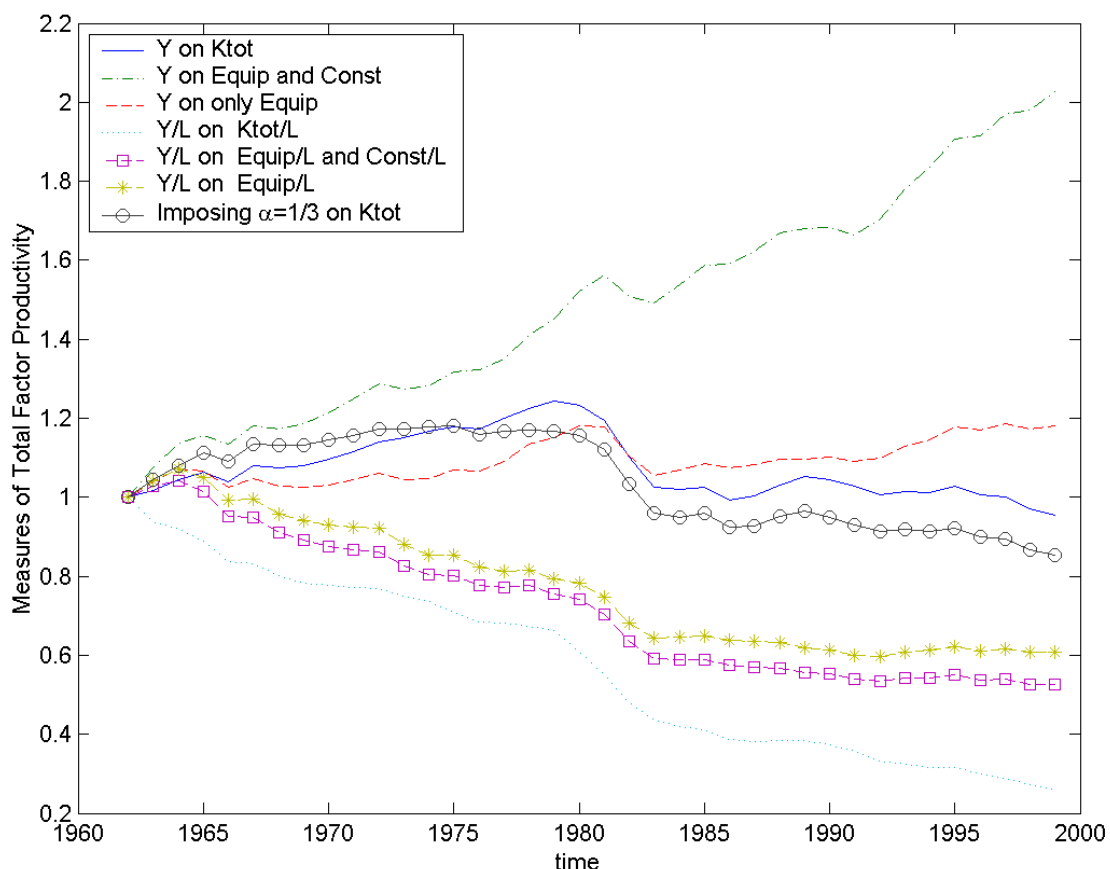
The only usable results are in columns five and six. These two regressions will be used in the growth accounting exercises below. A value of 66 percent is assigned for the labor share, a percentage commonly used in the literature and that has been obtained from data on other countries. For capital we employ the sum share of equipment and structures. (Results prove to be similar if only the stock of equipment is used for capital.) This variety of methods facilitates checking the robustness of the results.

Before exploring the third method, a remarkable finding must be noted: In most of the regressions the time trend consistently shows a negative and statistically significant coefficient. Results also show the implied behavior of TFP from the different econometric regressions to be very similar (Figure 3).

The low average labor share made us highly suspicious of measurement problems, especially of labor remunerations. So we recomputed the TFP and did the growth accounting exercises by setting the value of the capital-output share to one-third, the

standard in the business cycle and growth-applied general equilibrium literature. We also explored a similar exercise, incorporating land and several values for the land share, including values as high as one-third. The exercises including land provide very similar quantitative results because this variable expanded the most during the Itaipú period, which was also when capital grew fastest (Fernández Valdovinos and Monge Naranjo, n.a.).

**Figure 3. Calculating Paraguay's TFP, Using Various Methodologies**



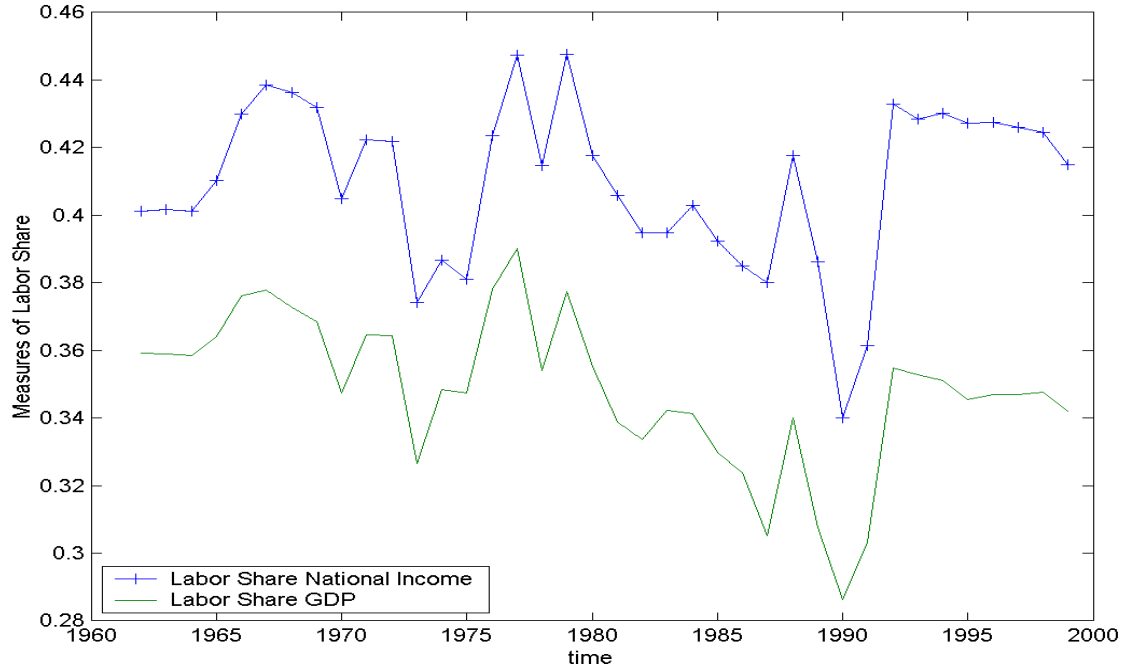
*Note:* All series are expressed as a ratio of TFP in 1962.

Figure 3 shows the measures of TFP derived by the methods discussed above. The various methodologies yield different behavior, especially in terms of magnitude. However there are strong similarities. Most indicate that TFP consistently grew in the 1960s and 1970s and plunged 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, others show it keeps falling. Nonetheless and more importantly, the vast majority of methods show a declining (or, at best, stagnant) path for total factor productivity in the economy.

Instead of refining the econometric estimation of the standard errors, we believe much higher returns can be gleaned from exploring and comparing alternative methods to extract TFP in Paraguay. One common method is to look directly 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. Figure 4 vividly shows the behavior of the labor share on output for Paraguay during the sample period.

**Figure 4. Labor/Output Share in the Paraguayan Economy**



First, the share is unusually low with respect to international evidence. The average value is only 34.56 percent.

Second, the share is unstable over time. It reaches almost 40 percent in the late 1970s and falls to less than 29 percent in 1990. Interestingly, the labor share is highly procyclical, rising during the Itaipú boom before sharply falling during the 1980s and then recovering in the early 1990s. While casting doubt on the Cobb-Douglas functional form, this behavior may also reflect measurement problems, labor market frictions, capacity utilization, relative price fluctuations, etc. To clarify the situation, we extended the model to a CES and used information on the labor share to obtain two technological factors: TFP and a relative measure of capital efficiency.

### ***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

$$y(t) = B(t)[\theta(\lambda_l(t)L(t))^{-\rho} + (1-\theta)(\lambda_k(t)K(t))^{-\rho}]^{-1/\rho}, \quad (8)$$

where  $B(t)$  is total factor productivity while  $\lambda_l(t)$  and  $\lambda_k(t)$  are labor and capital-augmenting technologies. The latter are quality indexes that effectively act as if the total

units of labor and capital had increased. We can factor out one of these two and opted to eliminate labor quality, obtaining

$$y(t) = B(t)\lambda_L(t)[\theta(L(t))^{-\rho} + (1-\theta)(\lambda_K(t)/\lambda_L(t)K(t))^{-\rho}]^{-1/\rho}. \quad (9)$$

This expression simplifies to

$$y(t) = A(t)[\theta(L(t))^{-\rho} + (1-\theta)(\lambda(t)K(t))^{-\rho}]^{-1/\rho}, \quad (10)$$

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

$$A(t) = B(t)\lambda_L(t), \quad (11)$$

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

$$\lambda(t) = \lambda_K(t)/\lambda_L(t). \quad (12)$$

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:

$$s_k(t) = \frac{\partial y(t)}{\partial K(t)} \frac{K(t)}{y(t)} = (1-\theta)[\theta(\lambda(t)K(t)/L(t))^\rho + (1-\theta)]^{-1}. \quad (13)$$

After some easy manipulations, this yields:

$$\frac{1-s_k(t)}{s_k(t)} = \frac{\theta}{(1-\theta)}[\lambda(t)K(t)/L(t)]^\rho. \quad (14)$$

This equation can be estimated. In particular, taking logs, one finds:

$$\ln\left(\frac{1-s_k(t)}{s_k(t)}\right) = \ln\left(\frac{\theta}{(1-\theta)}\right) + \rho \ln(K(t)/L(t)) + \rho \ln(\lambda(t)). \quad (15)$$

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

$$\lambda(t) = \exp[\rho\bar{\lambda}t + \varepsilon(t)], \quad (16)$$

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

$$\ln\left(\frac{1-s_k(t)}{s_k(t)}\right) = \ln\left(\frac{\theta}{(1-\theta)}\right) + \rho \ln(K(t)/L(t)) + \rho\bar{\lambda}t + \varepsilon(t). \quad (17)$$

Notice that this relationship should hold regardless of the behavior of the TFP, or  $A(t)$ , of the economy. Running a simple regression of the form

$$\ln\left(\frac{1-s_k(t)}{s_k(t)}\right) = \alpha + \beta \ln(K(t)/L(t)) + \delta t + \varepsilon(t), \quad (18)$$

one can obtain estimates of  $\alpha$ ,  $\beta$ , and  $\delta$ . With those estimates, one can then calculate the parameters of the production function:

$$\hat{\theta} = \frac{\exp(\alpha)}{1 + \exp(\alpha)}, \quad \hat{\rho} = \beta, \quad \text{and} \quad \bar{\lambda} = \delta / \beta. \quad (19)$$

With those estimates one can back out the implied value of

$$\lambda(t) = \exp[\rho \bar{\lambda} t + \varepsilon(t)], \quad (20)$$

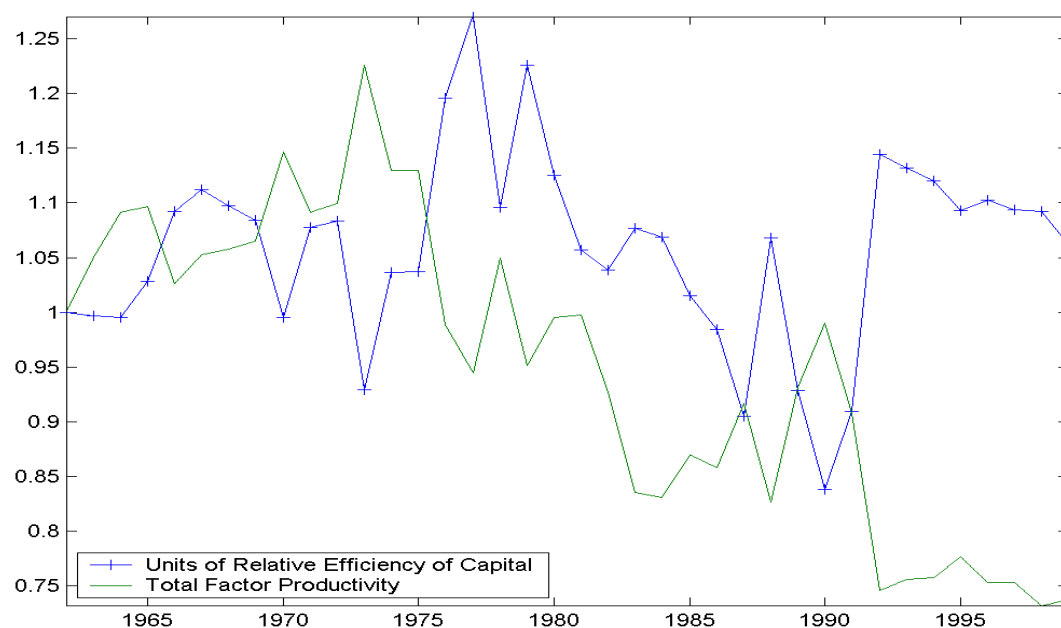
using the regression residuals as consistent estimates of the shocks. Finally, we can compute the implied  $A(t)$  as,

$$A(t) = y(t) / [\theta(L(t))^{-\rho} + (1 - \theta)(\lambda(t)K(t))^{-\rho}]^{-1/\rho}. \quad (21)$$

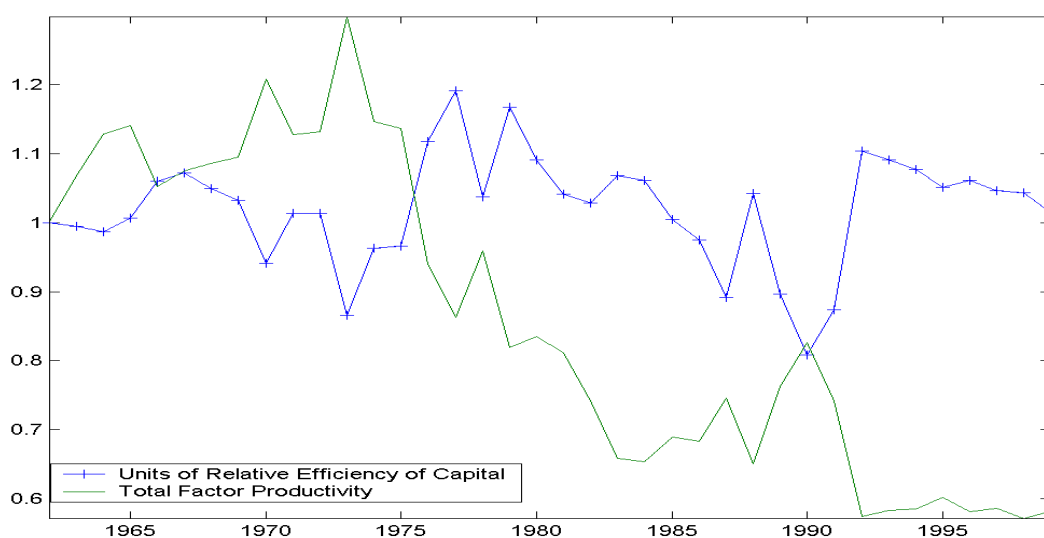
The point estimates of the regression, using only capital equipment, are  $\theta = 1.7357\text{e-}007$  and  $\rho = -0.2491$ , with an R-square of 38 percent. Very similar results hold if total capital is used. Thus the data suggest that capital and labor in Paraguay are more substitutable than a Cobb-Douglas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

With those estimates, we computed the implied total factor productivity and the relative efficiency of capital, which are reproduced in Figures 5 and 6.

**Figure 5. Using Capital Equipment to Compute TFP and Capital-Augmenting Progress**



**Figure 6. Using Total Capital to Compute TFP and Capital Augmenting Progress**



Notice that the implied behavior of TFP is in line with the previous methods, following a steady decline after the 1970s. Moreover there are periods in which TFP and relative capital efficiency move in the same direction, especially from the mid-1970s to 1990. In that period, both TFP and relative capital quality decline gradually. This time span coincides with the Itaipú project and the lost decade. However it is interesting that they behave very differently in the 1990s, with results suggesting that the quality of capital investment rebounded noticeably while TFP went on declining.

## ***Growth Accounting Results***

Table 14 shows the results of growth in output decomposition, showing the determinants of output growth in four subperiods as well as 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 reports the same calculation, but using coefficients estimated from the regressions previously cited. The fourth panel also uses the regression estimates, but considering structures and equipment separately. The last panel uses the CES specification.

Growth accounting in this last case is not as straightforward and requires more elaboration since it is impossible to decompose linearly the contributions of the different production inputs. Accordingly the sum of the contributions between factors and TFP across subperiods need not add up. The table reports the one-factor contribution. That is, we computed how much output would have grown if only a single factor were augmented by the value at the end of the subperiod, with all other factors remaining constant from the outset. For example in calculating labor's contribution to output growth between 1971 and 1980, we computed the implied output with the 1980 labor value but using the 1971 values for capital, capital efficiency, and total factor productivity. We then record the log difference with the actual output of 1971. As with the other cases, here we multiply those differences by 100 to express them in percentage terms.

The most striking feature in the table is that, indeed, TFP has had a negative impact on output growth in most periods. All the methods basically point in that direction. Perhaps the most dubitative in this respect is the method allowing for a CES production function. Yet in this case notice that in the subperiods when TFP has a positive contribution, capital efficiency typically is significantly negative. In sum, the growth decomposition indicates that the productivity of factors, much more than their accumulation, is a major negative factor in the growth process of Paraguay.

The exercises also generally show that physical capital had a strong pull for growth in most periods, but all agree that the contribution was much higher 1971–80, precisely when Itaipú was being built. Furthermore all the methods agree that the contribution of capital in the 1990s has been modest compared to other periods. We believe that the decade's political uncertainties have lessened incentives to invest in physical capital in Paraguay. However for the entire sample period, capital accumulation clearly 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 14. Productivity and Factor Accumulation Contributions to Output Growth (%)**

Table 11. Productivity and Factor Accumulation Contributions to Output Growth (%)					
Period	Labor Share = 2/3, All Capital				
	Output	TFP	Capital	Labor	
1962–70	36.5	7.2	13.4	15.8	
1971–80	78.5	–22.8	33.9	67.4	
1981–90	22.0	–25.7	17.4	30.3	
1991–99	19.8	–16.0	14.3	21.5	
1962–99	170.7	–64.8	86.5	149.0	
	Labor Share = 2/3, Equipment Only				
	Output	TFP	Capital	Labor	
1962–70	36.5	2.0	18.7	15.8	
1971–80	78.5	–19.5	30.6	67.4	
1981–90	22.0	–21.5	13.2	30.3	
1991–99	19.8	–6.2	4.5	21.5	
1962–99	170.7	–51.1	72.8	149.0	
	Regression, Equipment Only				
	Output	TFP	Capital	Labor	
1962–70	36.5	–7.3	34.8	9.0	
1971–80	78.5	–16.8	57.2	38.2	
1981–90	22.0	–19.8	24.6	17.1	
1991–99	19.8	–0.8	8.4	12.2	
1962–99	170.7	–49.6	136.0	84.4	
	Regression, Equipment, and Structures Separated				
	Output	TFP	Equipment	Construction	Labor
1962–70	36.5	–13.2	36.1	11.7	1.9
1971–80	78.5	–15.7	59.3	27.0	7.9
1981–90	22.0	–24.3	25.5	17.2	3.6
1991–99	19.8	–5.0	8.7	13.6	2.5
1962–99	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.
1962–70	36.5	18.9	0.0	23.7	–6.1
1971–80	78.5	–30.0	0.0	101.1	7.4
1981–90	22.0	1.9	0.0	45.4	–25.3
1991–99	19.8	–35.0	–20.1	32.3	22.6
1962–99	170.7	–54.1	170.0	202.3	192.6

Source: Authors' estimates.



## ***Discussion***

Without any doubt, the most salient finding is the behavior of TFP. Not only, it shows a weak growth overall, but, more strikingly, there is strong evidence for a persistent decline during the 1980s, and more surprisingly during the 1990s. The decline in the 1980s is not really surprising in light of the results for most Latin American countries. But, an open question is why TFP fell during the 1990s?

The data available at this point is not very useful in addressing this issue. Hence, we can only speculate. A possible explanation lies on the political uncertainty due to the transition from a dictatorship to an infant democracy. The presence of labor and credit market rigidities would impede the reallocation of labor and capital, and under increased uncertainty, the under-utilization of capital and labor, could be reflected in a decline of TFP. Another part of the explanation would rely on the lack of reforms during the nineties. As opposed to most Latin American countries, and specially the ones in the Southern Cone, Paraguay showed very little progress in its privatizations and trade reforms. Paraguay has been less successful in attracting foreign investments than the rest of the region. These factors could be underlying a departure of the behavior of Paraguay with its neighbors. An additional force behind a decline in TFP could arise from the disruption of the banking system during the nineties. The banking crisis observed during that period could have prevented the allocating of capital to the most productive uses. Finally, the implementation of MERCOSUR, may have represented a negative TFP shock to the Paraguayan economy, as it eliminate the role of Paraguay as the middle-man for the trade among its neighbors.

An entirely different set of explanations can be found on the fiscal incentives to over-accumulate capital and incentives to over-report investment and/or under-report income. Such hypotheses find support in cases like Itaipu, discussed above, and the fact that structures have been accumulated at a faster pace than equipment in Paraguay. It is widely believed that equipment have a higher contribution to growth than structures. It is also widely believed that there is a huge problem of income-tax evasion in Paraguay.

Finally, it would have been useful to have data on input prices, i.e. wages and rental rates of capital and land. In reserve of distortions and rigidities, the behavior of wages and interest rates indicate how productive labor and capital have been in Paraguay, and with the information on their quantities, one could construct alternative series of productivity. Moreover, the behavior of relative wages, i.e. across skill groups and industrial sectors, could be used to sharpen our analysis of aggregate productivity and its composition across sectors. Furthermore, such information could be used to understand the degree of complementarity or substitutability of capital with different forms of labor. This is important, as it is very likely that the degree of capital-skill complementarity has changed significantly in the last years as the result of regional integration agreements. But again, the lack of data is the main limitation.

## **Assessing the Macro Climate for Growth**

Empirical studies analyzing the long-run determinants of growth typically relate real per capita increases to two kinds of variables: initial-levels-of-state variables such as stocks of physical and human capital, which have been our focus thus far; and environmental and policy variables — including 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 — to which we now turn. This second kind of empirical study usually employs cross-country data to identify which policy and

institutional factors are significant to the growth rate of real GDP.<sup>32</sup> That is, analysis is based on a general framework of cross-country regressions, putting the experience of an individual country in a global context. Since these regressions apply to a panel of cross-country data spanning decades, the papers contain limited 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 in a particular country over time. Yet testing time series data for a single country can be tricky. Part of the problem is defining the appropriate time span suitable for detecting long-run relationships. Our analysis uses a nonstructural low-frequency point of view to examine the basic proposition that the economic growth rate and some of the factors usually considered in growth regressions are correlated. The methodology is based on Lucas (1980), who empirically illustrates two central implications of the quantity theory of money: that a given shift in the rate of change in the quantity of money induces (1) an equal change in the price inflation rate and (2) an equal change in nominal interest rates. Since the two propositions hold only in the “long run,” Lucas constructs a filter to smooth the original data (i.e., to extract its long-term components) before testing the implications of the theory.

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 use the business cycle definition suggested by the procedures and findings of NBER researchers such as Burns and Mitchell (1946), specifying cyclical components spanning eighteen months to eight years.

Specifying the business cycle as fluctuations with a specified periodic range results in a particular, two-sided moving average (a linear filter). In this case, the band-pass filter passes through time series components with fluctuations of eight or more years while removing the NBER business cycle components that occur more frequently. However the resulting moving average is of infinite order, and an approximation to this filter is necessary for it to apply to a finite time series. Therefore, in order to analyze the hypothetical long-term relationship between economic growth and each factor considered, we first apply the following filter to the original time series data:

$$y_t^* = \sum_{j=-k}^k a_j y_{t+j}, \quad (22)$$

in which  $y_t^*$  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:

$$a_j = b_j + \theta. \quad (23)$$

A parameter to be chosen is the value of  $k$ , the number of leads and lags in the filtered series. Since this value has been set to equal six,<sup>34</sup> the approximate band-pass

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<sup>32</sup> For example De Gregorio and Lee (1999) examine the growth experience of Latin American countries, while Barro (1991) uses cross-country data from developing and developed countries.

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

used in this analysis is the  $BP_6(8)$  filter described in Baxter and King (1995). That is, the filter passes through data components with cycles longer than eight years, and six leads and lags of the data were used in constructing the filter (reflecting the annual observations lost at the beginning and end of the sample period for the filtered data).

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

*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 1970–85 in a cross section of 117 countries. Similarly the cross-section regression estimates of Fischer (1993), based on data from the Penn World Table compiled by Summers and Heston (1993), from 1960 to 1989 indicate that an increase in inflation reduces GDP growth, other things being equal. Given supporting theoretical models such as Jones and Manuelli (1995), Wu and Zhang (1998), and Fernández Valdovinos (1999), we expect that, in the long run, an increase in the inflation rate will reduce output growth.

*Government Consumption:* Several papers have studied the empirical regularities relating fiscal policy variables and the rate of economic growth. Some studies, like Engen and Skinner (1992), found a consistently negative impact of the share of government spending on output growth rates, supporting the notion that smaller government sectors are associated with faster growth rates. However as Aschauer (1989) points out, it is important to distinguish between government capital accumulation and government consumption when considering the impact of government spending on output growth. While the former could spur productivity growth, the later could distort private decisions and curtail growth. 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.

*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 so that the growth rate tends to increase. For example, De Gregorio (1992), using a five-year data panel for 12 Latin American countries, between 1950 and 1985 finds the low investment rate to be one of the most important factors inhibiting growth. Additionally Bradford de Long and Summers (1991) found that machinery and equipment investment has a strong association with growth and that this correlation is much stronger than those between growth and any other investment component. Hence an increase in the ratio of machinery investment to GDP will result, in the long run, in a higher rate of output growth.

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

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

*Terms of trade shock:* Following 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 American countries, the regression results from these authors show a significant positive relationship between change in the terms of trade and per capita GDP growth. Thus over the long run, an increase (growth) in the terms of trade will positively influence output growth.

*Exports:* Since researchers began exploring the links between trade and growth in the 1970s,<sup>35</sup> considerable empirical evidence has been compiled supporting the notion that less protectionist regimes grow faster. For example Frankel and Romer (1999) use instrumental variable estimates to analyze the effect of trade on income. Their results suggest that OLS estimates understate the effects of trade and that trade has a quantitatively large, significant, and robust positive effect on income. Complementarily, a large number of studies have found that export growth and export levels are highly correlated with GDP growth (Edwards, 1994). Hence in the long run, we expect the growth rate of exports to be positively correlated with GDP growth.

The data in this section comes from the International Monetary Fund's "International Financial Statistics" and "Direction of Trade Statistics" and from the Central Bank of Paraguay's "Boletín de Cuentas Nacionales" various issues. 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 B, Figures B.1A to B.8.B plot the long-term relationship between GDP growth rate and eight 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.

For all considered variables, plots of the original data show no clear relationship over time with GDP growth. However once the data is filtered to extract its long-run components, a clear relationship emerges between the two time series. Complementarily, Table 15 shows the correlation coefficients of GDP per capita growth rate and the different variables. This table confirms Figures B.1.A to B.8.B since 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.

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

**Table 15. Correlation Coefficients with GDP Growth Rate**

Variables	Original Data	Filtered Data
Inflation rate	-0.0997	-0.8382
Gov. cons./GDP	-0.6038	-0.5573
$\Delta$ (Gov. cons./GDP)	0.0169	-0.6716
Private cons./GDP	-0.5482	-0.7506
$\Delta$ (Private cons./GDP)	-0.3424	-0.9157
Investment/GDP	0.6904	0.8776
$\Delta$ terms of trade	0.1803	0.5424
$\Delta$ exports	0.5389	0.8746

Source: Authors' estimates using the Baxter and King (1995) filter.

### Paraguay's Co-Movement with Its Trading Partners

Our analysis now examines the cyclical co-movements of Paraguayan output with the outputs of countries in the MERCOSUR area and with the U.S.<sup>36</sup> The main features of the aggregate fluctuations in the seven nations are considered, exploring the direction and magnitude of output co-movements across countries.<sup>37</sup> The study also probes 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 (HP) 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 components are examined based on the contemporaneous cross-correlation coefficients for rolling 10-year periods.

#### *Degree of economic integration*

Before analyzing the correlation of business cycles across countries, we first present some data on the degree of integration between the different economies and Paraguay. We consider two widely used indicators: the share in trade and the share in foreign direct investment. Paraguay's major regional trading partners are Mercosur, the European Union and the East Asian countries. For example, in 2001 the share of Paraguay's trade with Mercosur (including Chile and Bolivia) amounted to 59.2% of total trade, and the corresponding figures with the European Union and East Asian countries were 9.8% and 16.3%, respectively. Table 16 below shows the degree of integration with the different countries in the Mercosur area and with the USA. It can be seen that trade integration with the countries considered in this part of the paper is quite high, specially with Brazil and Argentina. Brazil has an average share of 30.1% in total trade (36.2% in exports and 28.0% in imports), while

<sup>36</sup> In this analysis MERCOSUR refers to Argentina, Brazil, Chile, Bolivia, Paraguay, and Uruguay.

<sup>37</sup> In the theory of optimum currency areas proposed by Mundell (1961), 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.

for Argentina this share reach 16.5% (7.9% in exports and 18% in imports). The importance of the other countries in total trade is not very significant: Bolivia 0.5%, Chile 2.4%, Uruguay 3.9% and U.S. 9%. Regarding the stock of foreign direct investment in Paraguay, Argentina and Brazil account again for a large percentage of the total: 16.4% and 10.3%, respectively. However, the share with USA is the largest, 34.2%. The contribution of the remaining countries is negligible. Hence, according to the indicators presented, Paraguay's integration with the countries considered in this section ranges from small to considerably large.

**TABLE 16: Share in trade and foreign direct investment. Average 1995-2001**

	Argentina	Bolivia	Brazil	Chile	Uruguay	USA
<b>Total Trade</b>	16.5%	0.5%	30.1%	2.4%	3.9%	9.0%
<b>Exports</b>	7.9%	1.3%	36.2%	3.9%	6.6%	4.7%
<b>Imports</b>	18.0%	0.1%	28.0%	1.8%	2.7%	10.5%
<b>Foreign Direct Investment</b>	16.4%	n.a.	10.3%	1.16%	5.9%	34.2%

Source: Author's estimates.

### ***Growth Correlations across Countries***

A rough estimate of the degree of symmetry among Paraguay and the other economies in the MERCOSUR area and the U.S. can be obtained by analyzing unprocessed data from the countries. Annual data on real GDPs in the 1970–2000 period were obtained from the International Monetary Fund (IMF) and the Economic Commission for Latin America and the Caribbean (ECLAC). For each country, the GDP growth rate is calculated as the first difference of the logarithm of real GDP.

We first consider data on the growth rate of real GDP (Table 17). 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 1970–2000 period, the U.S. by far has the lowest standard deviation (a value of only 0.022). In the MERCOSUR area, Bolivia and Paraguay have the lowest volatilities (with 0.031 and 0.039 respectively). The other countries are all above 0.04. Moreover, the data indicates that output fluctuations in MERCOSUR countries generally were bigger (across all countries) during the 1980s than during any other decade. The findings also show that for most countries, and certainly for the average, GDP growth rate volatility reached its lowest value during the 1990s.<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 1980s.

<sup>38</sup> For Argentina and Uruguay, the 1970s were more stable.

**Table 17. Output Growth Correlations and Volatilities**

Period	Argentina	Bolivia	Brazil	Chile	Uruguay	Paraguay	U.S.
Correlations with Paraguay							
1970–2000	–0.1036	0.3761	0.4751	0.1889	0.3122	1.0000	–0.0317
1970–79	0.0587	–0.8366	–0.3055	0.3957	0.3408	1.0000	0.2783
1980–89	–0.4568	0.7035	0.2195	0.6807	0.5049	1.0000	–0.1246
1990–2000	0.0833	0.4200	0.6539	0.4618	0.0460	1.0000	–0.5169
Standard Deviation							
1970–2000	0.0509	0.0310	0.0433	0.0616	0.0414	0.0389	0.0219
1970–79	0.0442	0.0176	0.0371	0.0707	0.0272	0.0229	0.0260
1980–89	0.0487	0.0279	0.0459	0.0705	0.0572	0.0444	0.0255
1990–2000	0.0508	0.0162	0.0215	0.0359	0.0368	0.0170	0.0156

Source: Authors' estimates.

On the other hand, correlation coefficients reveal that for 1970–2000 Paraguayan output growth was more highly correlated with Brazil's than any other.<sup>39</sup> Correlations with Bolivia and Uruguay reach values of 0.38 and 0.31, respectively. In general the correlation coefficients are not particularly high, with values below 0.5 revealing moderate co-movement of the other economies with Paraguay's. However given the observed instability of the coefficients over time, it seems more plausible to examine those coefficients by breaking the sample into 10-year periods. In analysis by sub-samples the correlation coefficients reflect Paraguay's dependence on the U.S. during the 1970s, when it was an important trading partner. Construction of the highway to Brazil, the development of frontier lands near the Brazilian border, erection of the world's largest hydroelectric project (Itaipú), and implementation of MERCOSUR substantially change the degree of co-movements with various countries. For example, the dramatic increase in trade with Brazil that followed these events is echoed in a higher correlation coefficient for the 1980s and 1990s.<sup>40</sup> Notice also the low correlation of the Paraguayan economy with the U.S., expressing a negative value during the eighties and nineties. On the other hand, output growth correlations also have been relatively high with Bolivia and Chile, especially during the last two decades.

We have also calculated an alternative measure for asymmetric output disturbances by estimating the parameter ( $\gamma_{ij}$ ) defined as the standard deviation (*SD*) of the difference in the growth rate of GDP between countries *i* and *j*, or

$$SD(\Delta y_i - \Delta y_j). \quad (24)$$

Thus for countries in which business cycles are symmetric and national outputs move together, the value of this measure will be small. Table 18 presents the estimated parameter ( $\gamma_{ij}$ ), using the full period and intervals of 10 years for both MERCOSUR countries and the U.S.

<sup>39</sup> This result is explained mainly by the close behavior of the economies during the 1990s.

<sup>40</sup> Frankel and Rose (1997) found, using data from 20 industrialized economies over 30 years, that closer international trade links result in more-closely correlated business cycles across countries.

**Table 18. Parameter Gamma,  $j$  = Paraguay**

Periods	Argentina	Bolivia	Brazil	Chile	Uruguay	Paraguay	U.S.
1970–2000	0.0672	0.0396	0.0423	0.0663	0.0472	0.0000	0.0453
1970–79	0.0486	0.0389	0.0492	0.0651	0.0290	0.0000	0.0295
1980–89	0.0795	0.0317	0.0564	0.0518	0.0518	0.0000	0.0539
1990–2000	0.0522	0.0179	0.0165	0.0319	0.0399	0.0000	0.0284

Source: Authors' estimates.

Data for the entire 1970–2000 period reveals that Paraguay's business cycle usually does not conform to those of either the MERCOSUR countries or the U.S. The value of the parameter ( $\gamma_{ij}$ ) is generally above 0.04, with a maximum value of 0.067 for Argentina.<sup>41</sup> However, when examining the behavior of the parameter gamma in 10-year intervals, business cycles with some countries seem to be more synchronized. As found previously, business cycle dissimilarities have been significantly lower during the 1990s than any other decade, especially with Bolivia and Brazil for which the value of the parameter ( $\gamma_{ij}$ ) was only 0.018 and 0.017, respectively. These values are very close to those observed in some European Union (EU) countries by Fernández Valdovinos (2000).

### ***Cross-Country Business Cycle Fluctuations***

Employing the methodologies of current business cycle research, we now explore in greater depth the direction and magnitude of co-movements between Paraguay and the other 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. Yet since it can be difficult in practice to distinguish between trends and cycles, business cycle studies still face the basic problem of how to isolate which features in the data are associated with long-term growth and which are keyed to business cycles.

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

Table 19 presents the results. Calculations of the volatility of the output's cyclical component show greater volatility in MERCOSUR countries than in the U.S. When analyzing the full period, the lowest standard deviations are for Bolivia, Brazil, and the U.S. (0.035, 0.036, and 0.021 respectively). At the same time, the coefficient is slightly larger for Paraguay: 0.047. Even when considering 10-year intervals, the conclusions are nearly identical. In addition, volatility usually has been much higher in countries during the 1980s than in any other period, except for Argentina. When Argentina is excluded, the 1990s displayed the most stability.

<sup>41</sup> In comparison, business cycle 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) for Belgium, Denmark, France, Germany, Italy, and the Netherlands.



**Table 19. Business Cycle Co-Movements and Volatilities**

Periods	Argentina	Bolivia	Brazil	Chile	Uruguay	Paraguay	U.S.
Correlations with Paraguay							
1970–2000	0.0292	0.6101	0.1725	0.7166	0.6907	1.0000	–
1970–79	0.1349	0.3693	–0.1142	0.5190	0.8006	1.0000	0.1259
1980–89	–0.0105	0.9773	0.2608	0.8884	0.7367	1.0000	–
1990–2000	0.2640	0.6443	0.7302	0.7818	0.4793	1.0000	0.2907
Standard Deviation							
1970–2000	0.0439	0.0348	0.0363	0.0617	0.0391	0.0473	–
1970–79	0.0337	0.0344	0.0384	0.0719	0.0287	0.0341	0.5720
1980–89	0.0413	0.0443	0.0471	0.0764	0.0600	0.0719	–
1990–2000	0.0555	0.0151	0.0234	0.0369	0.0182	0.0316	0.0209

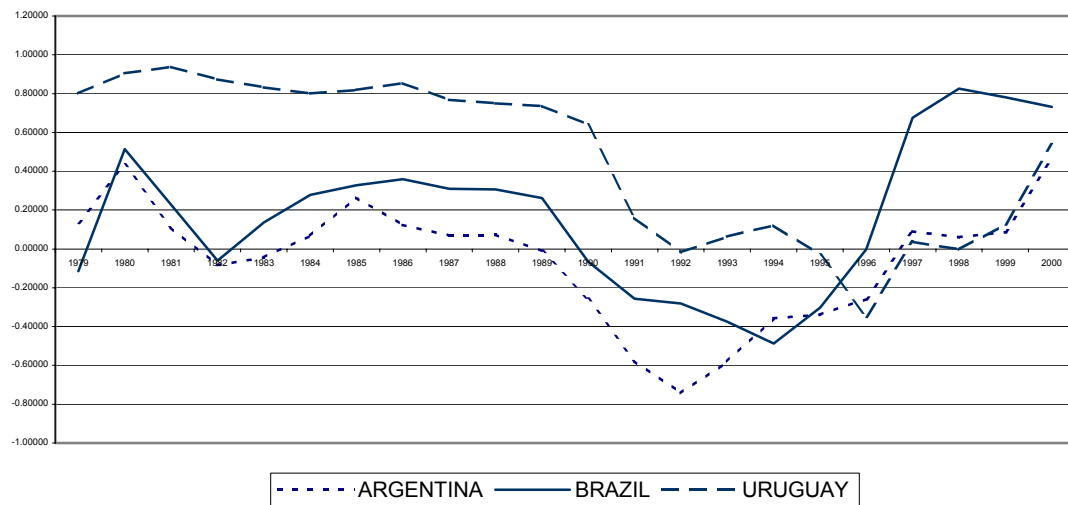
Source: Authors' estimates.

As for the pattern of correlation among the series, statistics reveal that Paraguay's output co-movement with other MERCOSUR countries or the U.S. was usually not 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 subperiods reveals that series co-movements could be stronger for decades. For example, during the 1980s the correlation coefficient with Bolivia is 0.98; and with Chile during the 1980s and 1990s, it is 0.89 and 0.78 respectively. With the U.S. the coefficient has significant value only during the 1970s and is even negative during the 1980s and 1990s.<sup>43</sup> Notice also that business cycle correlations with the MERCOSUR countries are, on average, much higher during the 1990s.

<sup>42</sup> Fernández Valdovinos (2000) finds that for its sample EU countries output correlations are generally much higher. In addition, the degree of co-movement is more pronounced in subgroups of countries: Belgium, France, Italy, and the Netherlands have an average correlation coefficient above 0.70.

<sup>43</sup> These results cast doubt on the utility of dollarizing the Paraguayan economy.

**Figure 7. Ten-Year Rolling Correlation Coefficients with Paraguay**



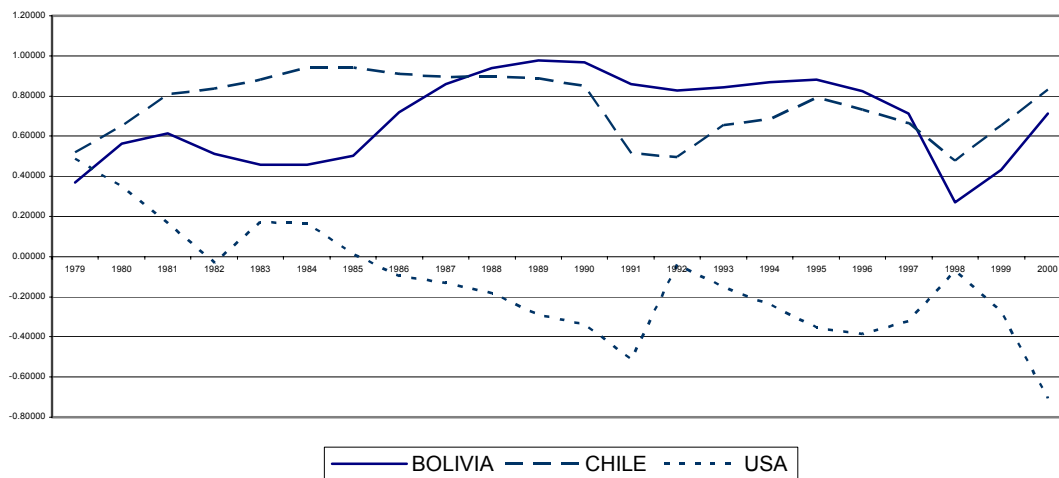
A question that may arise concerns changes in the output co-movements over time. One possible explanation for the low correlations found previously is that they reflect low co-movement from earlier periods. Figures 7 and 8 illustrate the correlation coefficients between cyclical components compiled for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

Figure 7 shows 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 through the early 1980s, when they somewhat recover. Then they all abruptly decline, in some cases even becoming negative at the beginning of the 1990s. With the beginning of the MERCOSUR area, the coefficients again rise until the end of the 1990s. Synchronization of output cyclical movements among Paraguay and these countries usually reaches its maximum at the end of this period. For example, during this decade the correlation coefficient with Argentina attains a value of 0.46 while the coefficient with Brazil reaches 0.82.

The coefficients with the other three countries in Figure 8 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 the U.S. shows a clear tendency to decline over time, and it has a negative value after the mid-1980s.

These findings reinforce conclusions reached in earlier sections. Business cycle correlations with countries in the MERCOSUR area and the U.S. are not very high when considering the whole sample. However, disentangling the sample into 10-year subsamples reveals more commonality, especially with Bolivia, Brazil, and Chile.

**Figure 8. Ten-Year Rolling Correlation Coefficients with Paraguay**



## Conclusions

This paper has investigated the process of economic growth in Paraguay from the 1940s to the present, exploring a variety of dimensions relevant to understanding what has happened economically over time, particularly during the past 30 years. The picture that has emerged is not optimistic, and if the trends continue, Paraguay's future is bleak and the country will remain one of the poorest in the hemisphere.

This case study draws three main conclusions. First, total factor productivity of the economy has been on a declining (or at best stagnant) path. So despite a significant accumulation of physical capital, income per capita has not grown. Second, Paraguay has failed to accumulate human capital. Paraguay has been left behind the rest of the region, as poverty statistics vividly show. Third, analysis confirms the importance of macroeconomic stability and of aggregate fluctuations with the country's main trading partners. 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, especially Brazil.

We believe that the first two findings, lack of productivity growth and human capital accumulation, stem from a highly inoperative public sector. It is important to highlight this point since the (relatively) small size of Paraguay's public sector is perhaps the most distinguishing feature of this economy in the context of Latin America. As any relevant theory of economic growth would predict, low taxes, especially on capital, are likely to foster growth. However, infrastructure investments can radically determine the rate of return of private investment. We believe that the Paraguayan government's provision of public investment has been subpar.

A similar assessment can be made in regard to the accumulation of human capital. There are numerous reasons to believe that unregulated markets would underperform in providing sufficient quality primary schooling, which is merely the first step in amassing human capital and building productive skills. Given the public sector's deficiencies in providing primary and secondary education, the country's failure to take off economically is unsurprising. And since human capital is complementary to physical capital, failure to accumulate it necessarily impairs the accumulation of physical capital.

Improving the accumulation of infrastructure and human capital requires Paraguay's government to take a pivotal role in the future. To that end, tax collection needs to be improved. But even if this happens, the country may be unable to lift itself up without assistance from the international community.

As to the relevance of macroeconomic stability, the lessons are in line with the current consensus so there is no need to elaborate them further. As for the greater interdependence with the Brazilian economy, this may simply be the outcome of natural advantages in geographical, historical, and cultural proximity that Paraguay is definitely wise to exploit. Even so and despite the built-in static gains from these localized advantages, Paraguay would still benefit greatly in terms of growth and stability if it reduces any existent biases in trade and investment with the rest of the world.

## APPENDIXES

### A. Incentives to Accumulate Capital

Paraguay's tax/GDP ratio has been usually among the lowest in the hemisphere, usually below 10 percent since 1971. Despite the positive implications of a smaller tax burden for the private sector, the corollary reduced volume of public-sector income also had drawbacks: Public-sector wages typically were low, encouraging corruption; investment in 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's Tax Revenues as a Percent of GDP (1970–2000)**

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

*Source:* Central Bank of Paraguay.

In 1992 a significant and long-overdue tax reform was implemented. The previous tax system was hobbled by a proliferation of legal norms and an immense quantity of taxes and tax rates, creating a body of tax law that was complex, confusing, and unwieldy.<sup>44</sup> Among its most salient features, were the following:

- Indirect taxes predominated, usually responding to partial fiscal needs.
- The system was regressive and complex, encouraging fiscal evasion and undermining the credibility of the agency administering taxes.
- Tax exonerations and special regimes were prolific.
- Custom tariffs were in force that discouraged a policy of openness and integration.
- Administrative bureaucracy provided incentives for the infringement of tax laws by evaders.

Before 1992, taxes could be classified into four broad categories: taxes on goods and services, income taxes, taxes on capital, and foreign trade taxes (Table A.2). The first category grouped sales taxes, several selective consumption taxes (on fuel, liquor, cigarettes, livestock, etc.), stamp taxes on different kinds of transactions, and several other small taxes. Their total revenue represented 4.2 to 4.3 percent of GDP in 1984–88.

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<sup>44</sup> Multilateral organizations characterized Paraguay's pre-1992 tax system as antiquated, inefficient, and unable to keep pace with domestic inflation and growth, thereby endangering macroeconomic equilibrium, future growth, and prospects for eradicating poverty.

The tax structure on goods and services changed over time. The general sales tax totaled 0.6 percent of GDP in 1984, rising to 0.8 percent by 1987. Though exemptions were common and potential revenues difficult to calculate, evasion must have been high since the tax rate was 4 percent on domestic sales and 8 percent or 14 percent on imports, with 80 percent of the proceeds coming from the latter two.<sup>45</sup> The domestic sales tax only applied to the final consumer. Even if it affected only half of GDP, it should have raised more than 2 percent of GDP, more than twice the revenues actually collected. Although selective consumption taxes and stamp taxes fell under this heading, they were a grab bag of often unrelated fees. For example, the stamp tax included 84 different charges on civil and commercial dealings. Many were specific and thus declined in importance with inflation. Potential tax revenues also eroded through widespread exemptions.

**Table A.2. Pre-Reform Taxes as a Percent of GDP (1984–90)**

	1984	1986	1988	1990
Taxes on Goods & Services	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	0.16	0.13	0.10	0.06
Income Taxes	1.11	1.25	1.42	1.26
Capital Taxes	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
Other Taxes <sup>a</sup>	1.01	1.01	1.02	3.08
Total Tax Revenue	6.71	6.82	7.02	9.22

*Source:* Central Bank of Paraguay.

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

The second broad category was also a collection of uncoordinated small taxes. Enterprises bore the brunt of income taxes since the personal tax was narrow and had negligible effect. The tax on profits (agriculture was exempted) was slightly progressive, with a bottom rate of 25 percent and a top rate of 30 percent. Incomes taxes represented 1.6 to 1.7 percent of GDP in the early 1980s, dropping to 1.2 percent in 1984–86 where they roughly remained in 1990. Evasion also must have been pervasive in this category. 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 five times the actual collection. It must be mentioned, however, that an Investment Incentives Law was enacted in 1990 that gave beneficiaries five-year tax holidays on 95 percent of income taxes and six months of duty-free imports.

Capital taxes, the third category, generated little revenue, about 3 percent of total taxes and less than 0.3 percent of GDP in 1990. Although tax rates were about 1 percent of property value, assessments were extremely low. On average, urban property tax

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

values represented less than 35 percent of market value while rural rates were only 5 percent. The capital tax category also included an easily evaded inheritance tax whose proceeds were insignificant.

Finally, Paraguay operated during this period with tariffs that were low and quite homogeneous despite customs law that implied wide dispersion and rates from 30 percent to sometimes above 70 percent. Three factors helped keep actual tariffs homogeneous and low. First, simple special regimes with low flat rates replaced many ordinary tariffs. Second, taxes close to 5 percent of import values often were charged under different rubrics so that some taxes were paid even on tariff-free goods. And third, unregistered imports set a rate ceiling. If tariffs exceeded 10 to 15 percent, goods tended to be imported through informal channels.

As mentioned above, taxes were widely evaded during this period because of what the private sector considered to be unreasonably high rates: 30 percent on profits, some high import tariffs, and the stamp tax (an inefficient scheme levying contracts rather than output, income, or wealth). The private sector evolved a complex “parallel economy” to avoid payments, with surprisingly favorable results relative to the “formal economies” in neighboring countries. Additionally sanctions for missing tax deadlines varied by tax and often did not exist. The system was rife with disincentives. When penalty interest rates were levied, they usually were lower than commercial rates, making it more profitable for the taxpayer to delay payment until the infraction was discovered (if it ever was).

In 1992, the authorities proposed a plan to reduce the number of taxes while making the system simpler and easier to manage (Table A.3). It basically (1) replaced the stamp tax and a myriad of small, hard-to-collect, indirect taxes with a value-added tax and a few ad valorem taxes on consumption of fuels, liquors, cigarettes, luxuries, etc.; (2) enacted a direct and indirect “sole” tax on small businesses, replacing all direct and indirect taxes previously applicable;<sup>46</sup> (3) increased the profits tax by dropping the bottom tier of the previous system and adopting the top-tier as a flat rate; (4) enacted an income tax on agriculture property, using the presumptive income concept; and (5) put teeth in the penalty system to truly fight late payments and evasion. Other reforms included proper assessment of property values and abolition of the inheritance tax.

**Table A.3. Post-Reform Taxes as a Percent of GDP (1995–2001)**

	1995	1997	1999	2001
Income Taxes	2.3	2.1	2.3	1.5
Taxes on Goods & Services	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
International Transaction Taxes	2.8	2.3	1.7	1.7
Import duties	2.8	2.3	1.7	1.7
Total Tax Revenue	11.2	10.7	9.9	9.6

Source: Central Bank of Paraguay.

<sup>46</sup> Small enterprises were exempt from charging the value-added tax to their customers. Additionally, they were allowed to deduct from the new “sole” tax half the value-added taxes they paid for inputs.

The tariff regime improved substantially after the reform, and central government revenues increased rapidly during the 1990s, reaching about 10 percent of GDP. Most of the increase was due to import taxes and the introduction of a value-added tax (VAT) of 10 per cent. Import taxes, which today account for some 20 percent of tax revenue, rose from 0.9 percent of GDP before reform to 2.8 percent in 1995, falling slightly to 1.7 percent in 2001. Meanwhile the VAT accounted for 4.4 percent of GDP in 1995 and 4.1 percent in 2001. Income taxes and selective excises taxes also were important. Somewhat surprisingly Paraguay collected revenues worth 10 percent of GDP despite a relatively low tax burden and few forms of taxation: a 10 percent VAT, low import tariffs, no personal income tax, and a 30 percent corporate income tax with many exceptions.

It must be mentioned that in ratifying the Treaty of Asunción in July 1991 Paraguay agreed to an automatic schedule of tariff reductions and a reduced list of exceptions so as to become part of the MERCOSUR free-trade zone. Paraguay then replaced the 1991 tariff schedule in July 1992 with a new schedule of even lower and more homogeneous rates and instituted an import VAT. The 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> The uniform import VAT was set at 10 percent. The net effect brought the tariff code more in line with the de facto openness of the economy.

In summary, tax and external tariff distortions to accumulate capital do not seem to have been important during the whole period. Tax evasion, special tax and tariff regimes, and smuggling substantially reduced the tax burden of the private sector before 1992. After the tax reform, the tax/GDP ratio remained among the lowest in the region even though it was expected initially to yield higher revenues. It is well known that investment incentives such as tax exemptions, subsidies, and other benefits can be important, without being crucial, in attracting private capital. Paraguay seems a case in point. Its Investment Incentives Law provided better incentives than laws in many Latin American countries without being able to attract large flows of private capital.

As several authors agree, a country's credibility in maintaining stable long-term policies is vital to attracting private capital. Insfrán Pelozo (2001) says this credibility depends on 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, nonconvertibility of local currency, civil wars, etc. Barro (1991) and De Gregorio and Lee (1999) cite the rule of law and the quality of political institutions as important factors explaining growth rates across countries. They argue that an institutional environment with a strong legal system that secures property rights is central for investment and other economic activities. Further examination of these alternative factors may shed light on why growth and investment have been so low in Paraguay.

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



## B. Graphs for Growth and Other Main Macro Variables.

Figure B.1.A. Inflation and Growth, Unfiltered Data

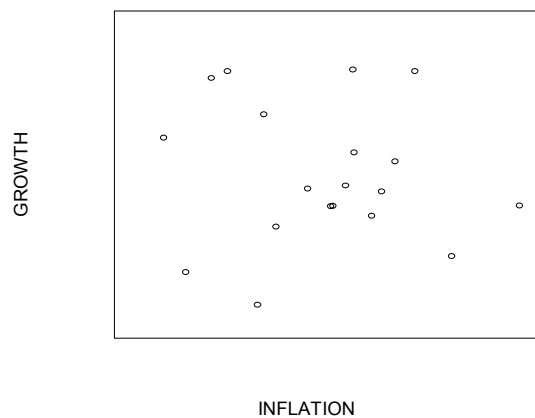


Figure B.1.B. Inflation and Growth, Filtered Data



Figure B.2.A. Gov. Cons./GDP, Unfiltered Data

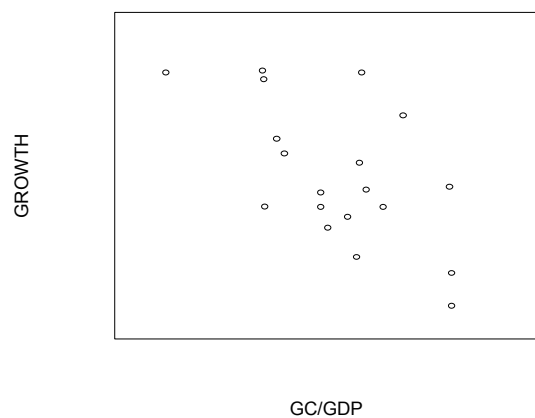


Figure B.2.B. Gov. Cons./GDP, Filtered Data

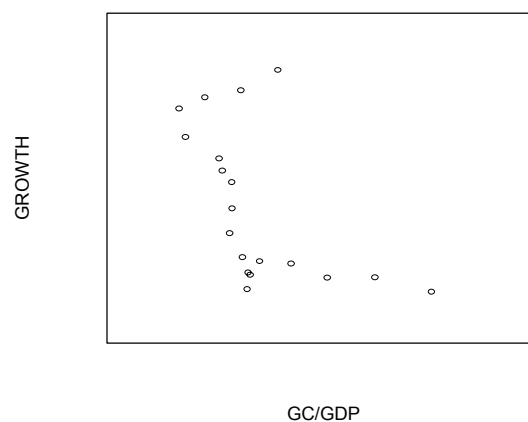


Figure B.3.A. (Gov. Cons./GDP), Unfiltered Data

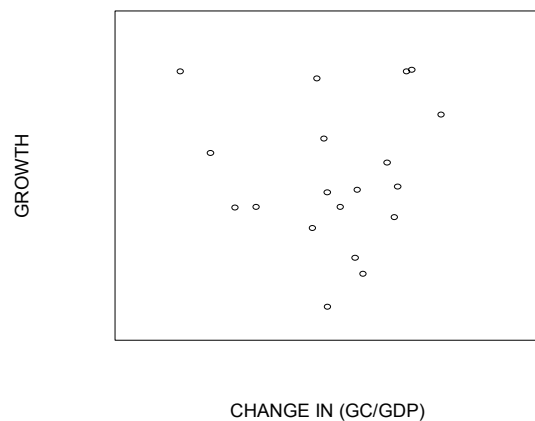
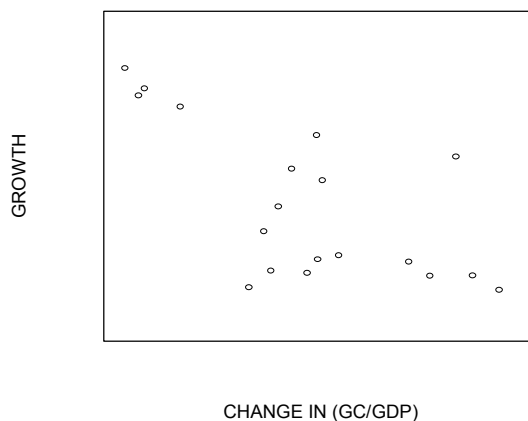
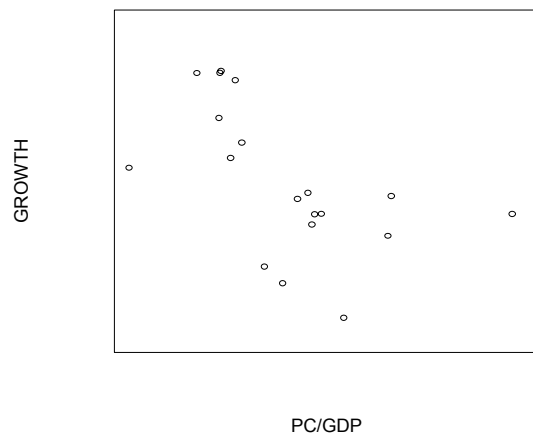


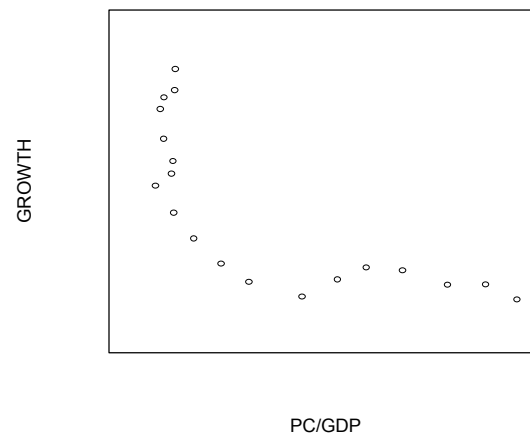
Figure B.3.B. (Gov. Cons./GDP), Filtered Data



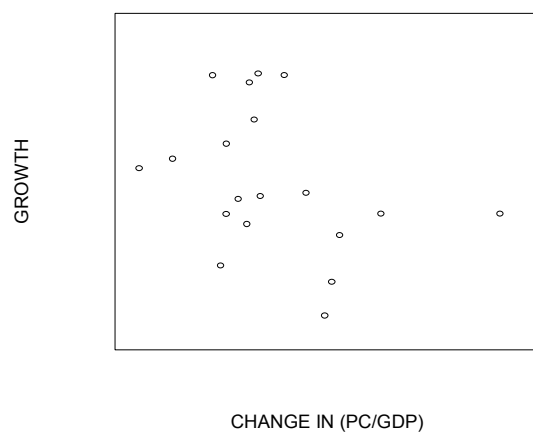
**Figure B.4.A. Private Cons/GDP, Unfiltered Data**



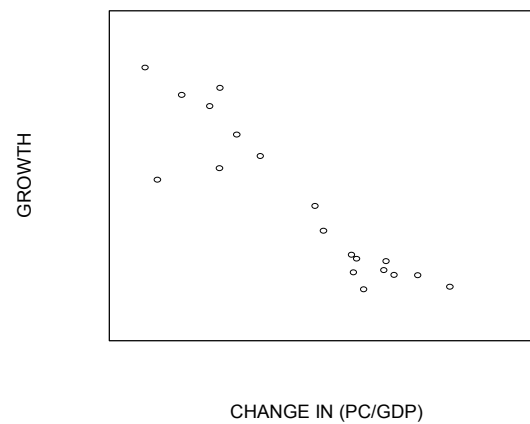
**Figure B.4.B. Private Cons/GDP, Filtered Data**



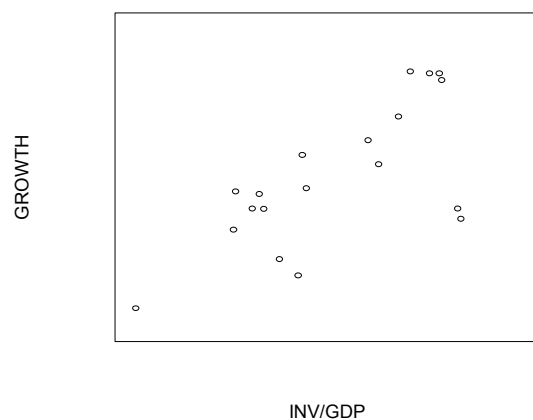
**Figure B.5.A. (Private Cons/GDP), Unfiltered Data**



**Figure B.5.B. (Private Cons/GDP), Filtered Data**



**Figure B.6.A. Investment/GDP, Unfiltered Data**



**Figure B.6.B. Investment/GDP, Filtered Data**

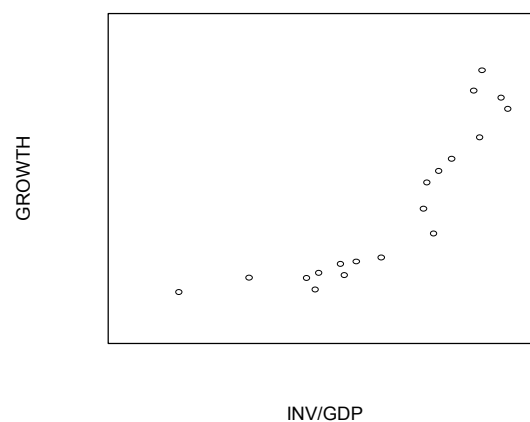


Figure B.7.A. Terms of Trade, Unfiltered Data



Figure B.7.B. Terms of Trade, Filtered Data



Figure B.8.A. Exports, Unfiltered Data

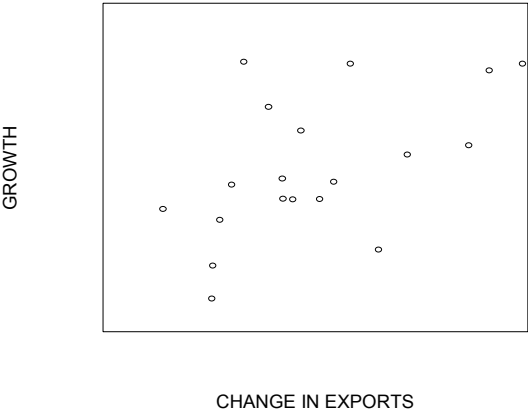
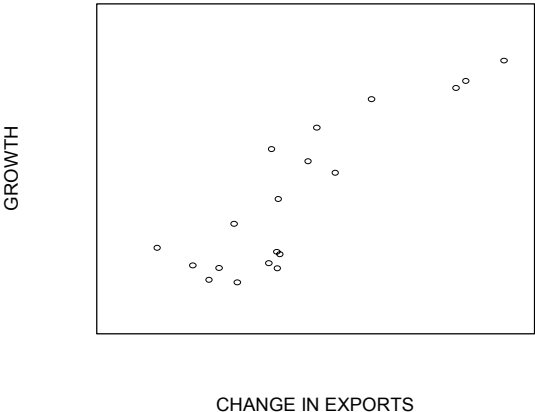


Figure B.8.B. Exports, Filtered Data



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