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# Has Corruption in Paraguay Contributed to Slow Economic Growth?

## A. Introduction

Paraguay has long-standing problems with corruption and contraband. It figures as the most corrupt country in Latin America and the third most corrupt out of 133 countries, according to the 2003 Transparency International *Corruption Perception Index*. Various articles and surveys report evidence of widespread contraband.<sup>1</sup> Paraguay scores third from last out of 125 countries in the Economist Intelligence Unit country risk rating for investors, in particular owing to its low score on political effectiveness.<sup>2</sup> The World Bank's Governance Indicators 2002<sup>3</sup> show Paraguay particularly low in the subcategories of "government effectiveness" (the capacity of the government to manage resources effectively) and "control of corruption" (the degree of compliance with rules by citizens and the state) (Table 1.1).

This chapter will explore to what extent these endemic governance problems have affected economic growth. With the exception of a favorable period between 1962 and 1981, Paraguay has not been a fast grower. The average per capita growth rate since 1938 has been 1.1 percent. While much of Latin America recouped the output decline of the "lost decade" of the 1980s, Paraguay's per capita GDP continued to decline (by an average of 0.6 percent per year in the two decades before 2002).

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<sup>1</sup>See reports by Sciscioli (2003), Smith (2003), Tobar (2002), and U.S. Department of Commerce (1999).

<sup>2</sup>Economist Intelligence Unit (2003).

<sup>3</sup>Kaufmann, Kraay, and Mastruzzi (2003). The 2002 indicator included 195 countries.

Table 1.1. World Bank's Governance Indicators for Paraguay

Governance Indicator	Percentile Rank, 1998	Percentile Rank, 2002	Latin America and the Caribbean, 2002	Number of Surveys/Polls
Voice and accountability	41	32	61	4
Political stability/ no violence	35	15	51	4
Government effectiveness	9	7	53	4
Regulatory quality	35	31	58	3
Rule of law	23	12	53	6
Control of corruption	9	4	55	5

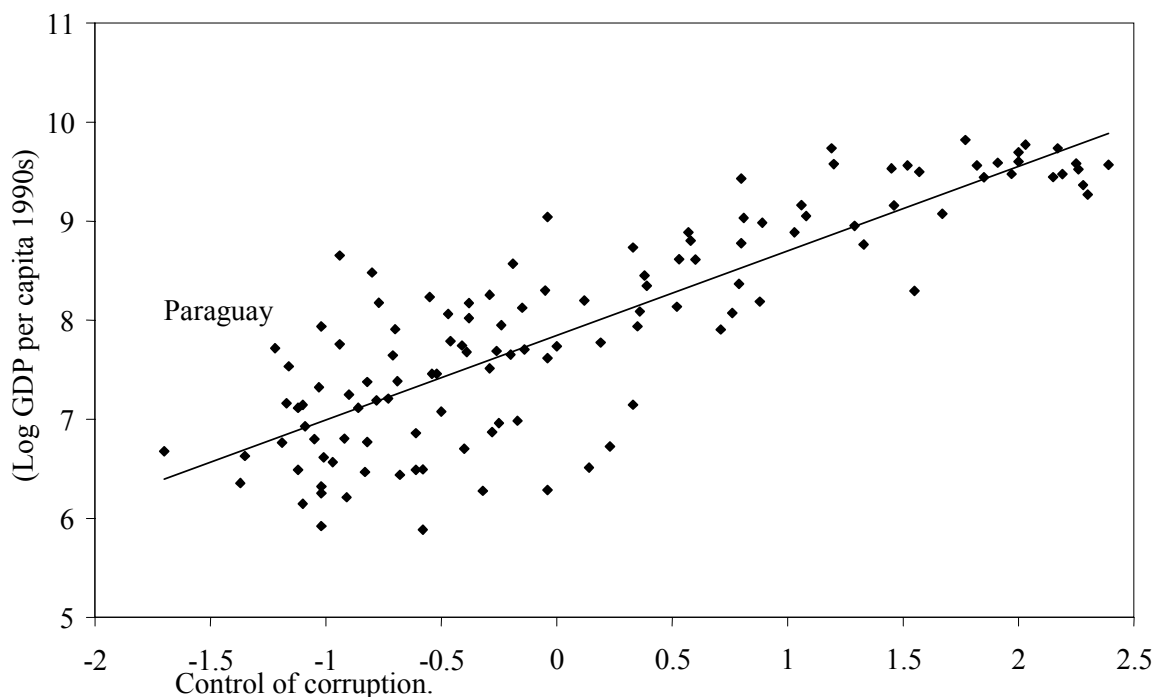
Sources: Kaufmann, Kraay, and Mastruzzi (2003); and Governance Indicators (2002).

Recent empirical research has shown that good governance and low corruption are highly correlated to per capita income (Figure 1.1). However, this simple relationship is just the manifestation of complicated underlying factors. Research on corruption and growth has focused on the channels through which corruption creates a large disincentive for productive investment and economic growth. However, cross-country growth studies that have conducted rigorous robustness tests (in particular Levine and Renelt, 1992; Sala-i-Martin, 1997; and Doppelhoffer, Miller, and Sala-i-Martin, 2000) do not find that the standard indicators of corruption or lack of political rights (which affect government effectiveness) have a direct effect on economic growth after controlling for other factors, and Barro (1999) shows that electoral democracies have not necessarily grown faster than dictatorships during the postwar era. Indeed, Paraguay’s growth in the 1970s was the highest in Latin America, at the height of Alfredo Stroessner’s dictatorship. Conversely, GDP growth in the 1990s was one of the lowest in the region.

This chapter will argue that both corruption and low output growth were caused primarily by weak institutionalism, which has persisted throughout most of Paraguay’s history. The direct causality is not from corruption to growth, as corruption is not a significant variable in econometric estimates once we control for other standard growth determinants. Instead, low growth and corruption are jointly determined by various outcomes that resulted from the weak institutional quality. In turn, the institutions in Paraguay were shaped by a politico-economic and historical process, and it was the weakness of these institutions that bred corruption.

Following some historical background, the chapter describes how corruption is manifested in Paraguay. The chapter distinguishes between factors that explain the growth performance of Paraguay since 1960 (where corruption does not directly enter as a significant factor) and factors that explain the relative level of income of Paraguay in the past 40 or 50 years compared with other countries.

**Figure 1.1. Relationship Between GDP per Capita and Corruption**



Source: Kaufmann, Kraay, and Mastruzzi (2003).

Measured from the viewpoint of institutional development, 40 years could be considered a relatively short period. Indeed, recent seminal research on the subject has shown that institutional quality and corruption levels are important determinants of the level of per capita income today, as well as 40 years ago. The chapter then illustrates, via a reduced-form version of a politico-economy model by Acemoglu (2003), how Paraguay's weak institutions may have led to long-term growth below its potential. Finally, we briefly consider how Paraguay could improve its institutional process. To the extent that prudent policies and the opening up to the international rules of the game will exert pressure for changes in the economic power base, a gradual improvement of institutional quality will ensue, which is necessary for sustained long-run growth.

The chapter is divided as follows. Section B describes the sources of corruption in Paraguay in a historical context. Section C looks at the determinants of growth in Paraguay, extrapolating from recent cross-country empirical work. Section D considers recent research on corruption and growth. Section E describes how a model by Acemoglu aptly depicts the processes that led to a low-quality institutional base in Paraguay and thus low growth, and considers how better policies in Paraguay could lead to sustainable growth. Section F concludes.

## B. Corruption in Paraguay

Corruption is the manifestation of a weak institutional base, where institutions could be broadly defined as the organization of society, or the de facto rules of the game in the economic, political, and social spheres. To understand how the institutions of Paraguay came about, it is important to look at the historical context. Much of its history was similar to that of other countries of the region; here we focus on what was unique to Paraguay.

### Historical roots

Historically, Paraguay has held together through a cohesive system of informality, always susceptible to the political and economic stability of its two large neighbors, Argentina and Brazil. Without access to the sea, Paraguay was forced to maintain a delicate diplomatic balance between the two countries, while distinguishing itself through a strong national identity.<sup>4</sup> When the balance was not maintained or there was regional instability, the consequences were devastating. When President Solano Lopez declared war on Argentina, Brazil, and Uruguay in 1865, a brutal five-year conflict started—The Triple Alliance War, which left Paraguay poverty-stricken, after losing 75 percent of its population and making large concessions to its victors. As some recent research has suggested (see Section D, below), the fact that Paraguay was landlocked by itself did not hinder its development. Its relationship with its neighbors, which affected its access to the sea, became one of the most important factors in shaping its institutions.

The intentions of the groups in power in Paraguay determined the nature of institution building. The mode of colonization in Paraguay before independence has been characterized by historians as extractive, as the Spaniards showed little interest in settling and building high-quality institutions, which may have compromised the establishment of solid property rights and the rule of law.<sup>5</sup> These settlements contrast with the Jesuit settlements in the mid-1700s in Paraguay, which were well organized, democratic, and highly productive missions until their disappearance shortly after 1767.<sup>6</sup> Even after independence, following

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<sup>4</sup>This is manifested through the guaraní language, which, even to date, is spoken by more than 80 percent of Paraguayans.

<sup>5</sup>See for example Engermann and Sokoloff (1994) and Acemoglu, Johnson, and Robinson (2001).

<sup>6</sup>The Jesuits settled in what is now the southeastern part of Paraguay, as well as in southwestern Brazil and northeastern Argentina. The society was then principally concerned with improving its well-being and protecting property rights. King Carlos III expelled the Jesuits from the Spanish colonies, and shortly thereafter the missions lost their value, became badly administered, and were eventually abandoned by the guaraníes. See Baruja, Perez Paiva, and Pinto Schaffroth (2003, Chapter 3).

the Triple Alliance War, the Brazilians and Argentines sent to administer the country in shambles granted themselves prized pieces of land and joined the elite to follow a relatively extractive policy thereafter.<sup>7</sup> Since then, Paraguay became, and continues to be, an oligarchic society with the political and economic power in the hands of a few leaders. Until fairly recently, the government continued to shift back and forth between unelected military governments of the two rival political parties: the Liberal Party and the Colorado Party.

Between 1904 and 1936 the Liberal Party governed the country, a period characterized by extreme instability in governance (there were 22 presidents in total), thus setting the stage for the consolidation of the power of the executive branch starting in 1940. Policymaking was conducted by a fractionalized political oligarchy with low administrative competence, and corruption weakened the capacity of the state to deliver services. Ironically, Paraguay's victory over Bolivia in the 1935 Chaco War led to protests by the population, particularly veterans, about the worsening social conditions at home. The liberals thus briefly lost power to the Febrerista Party, headed by the Argentine colonel Franco. However, Franco was unable to deliver land reforms for fear of expropriating powerful landowners, many Argentines, and soon the military gained back the power for the Liberal Party. In its quest for a strong and credible leader, in 1939 the Liberal Party chose General Estigarribia as their presidential candidate, a war hero who had led Paraguay to victory in the Chaco War. Estigarribia gave himself temporary dictatorial powers as he aggressively pursued reforms. A plebiscite by a population hungry for order ratified the constitution of 1940, which disproportionately expanded the power of the executive branch. To some extent this set the stage for partly legitimizing the dictatorships that would follow.

The art of rent seeking became highly developed during the dictatorship of Stroessner (1954–89), an era when resources were channeled to Colorado Party interests.<sup>8</sup> Party loyalists were made the main administrators of the government regardless of their competence. The power network was so tight that there was no distinction among the party, the military government, and the public sector. Most businesspeople who showed their allegiance to the regime could operate unrestricted and with complete impunity, while most activities outside of the power group's control, including investments, were repressed.<sup>9</sup> In the 1970s, the border town of Ciudad del Este, the hub of high-growth activities, developed as an almost anarchic frontier where large-scale smuggling, counterfeiting, arms

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<sup>7</sup>See Baruja, Perez Paiva, and Pinto Schaffroth (2003) for an excellent recount.

<sup>8</sup>As discussed in World Bank (1996, Chapter 1).

<sup>9</sup>See World Bank (2003b). Also based on conversations with Pilar Callizo from the organization *Transparency Paraguay*.

trading, and narco-traffic coexisted side by side without restrictions.<sup>10</sup> Public investment projects in Paraguay, including those built in the 1990s, consisted of large-scale infrastructure projects (the largest being the binational Itaipú and Yacyretá dams). There were numerous reports of diverted and misused funds, as well as the use of the state by those involved in the contracts to enrich themselves.<sup>11</sup> To this day, the Yacyretá hydroelectric dam, built jointly with Argentina, is known in the region as “a monument to corruption,”<sup>12</sup> barely finished and facing serious legal and financial problems.

The remnants of Paraguay’s past still influence the socioeconomic structure today. The high level of informality that was inherited from the Stroessner era, defined in this context as a form of decision making that is highly discretionary, confined to a tight group of loyalists, and lacking in legal documentation, remains prevalent in many areas. Moreover, the perceptions of informality related to corruption remain: a 2002 study by the Centro de Información y Recursos para el Desarrollo (CIRD) showed that people still believed organized crime had almost as much power as the central government, as “they are allowed to conduct their business of contraband and delinquency with total impunity.”<sup>13</sup>

The weak institutional base Paraguay faces is particularly acute in four areas, to be discussed below. These are (1) the judicial system, (2) tax and customs administration, (3) government expenditures, and (4) patronage in the public sector. As will be noted, the government that took office in August 2003 has taken serious measures to combat these corrupt forces by taking the first important steps toward improving accountability and transparency of the public institutions.

### The judicial system

Various studies have shown that the judiciary has been mired by political influence and has therefore been unable to enforce property rights. The 2003 *Index of Economic Freedom* (Heritage Foundation, 2003) gives Paraguay the lowest score in terms of enforcement of property rights, citing a U.S. Commerce Department report that noted, “Judges are often pressured by politicians and other persons whose interests are at stake.” It also noted that “there is little confidence in the legal system because cases routinely take several years, even as

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<sup>10</sup>See for example Arfield (2002) and United States Commerce Department (1999). It is noteworthy that many of the main businesses in Ciudad del Este were not run by native Paraguayans but by Brazilians or non-Paraguayans who may have had legitimate businesses elsewhere.

<sup>11</sup>See Baruja, Perez Paiva, and Pinto Schaffroth (2003) and Sciscioli (2003) for recent prominent examples.

<sup>12</sup>Term used in various local newspaper articles.

<sup>13</sup>Centro de Información y Recursos para el Desarrollo (2002). Information taken from World Bank (2003b).

long as a decade, to resolve, and because accusations of undue influence on judges are widespread.” The CIRD study showed that less than 1 percent of the population believed the judiciary was not corrupt.

Challenges to laws almost always prevail, thus making new laws difficult to apply and existing laws difficult to enforce. There are numerous laws in Paraguay, which tend to be long and sometimes contradictory. This aspect can make the application of the laws susceptible to the discretion of the judges, who can choose which law will prevail in a particular case. Public prosecutors are “inexperienced, understaffed, and function without basic equipment such as telephones and faxes,”<sup>14</sup> and in general judges and prosecutors are not well remunerated and thus are more susceptible to bribes. It has been almost impossible for the Paraguayan government to prevail when firing a civil servant or prosecuting a tax evader. For example, the Civil Service Law, passed in 2000, which placed more responsibility on civil servants to perform, has been mired by suits of unconstitutionality and is effectively inactive (the current civil service legislation contains no principles of ethical conduct for public officials). Suits of unconstitutionality continue to be filed disputing the 2003 Public Pension Reform Law, which restricted highly generous pension benefits for civil servants. The precedent has been that the challengers always won, however unreasonable the suit.<sup>15</sup> The state typically ended up paying more in legal compensation than it saved by withdrawing unearned benefits. In the case of prosecuting or fining tax evaders, the process took years and gave rise to high legal costs, so there was no incentive to prosecute.<sup>16</sup>

The protection of property rights is very difficult, as the lack of a property registry makes claims of land difficult to prove, so the ultimate decisions are made in a political contest. Expropriation of land is still possible in Paraguay,<sup>17</sup> as increasing pressure by peasants for land has led to the invasion of rural properties. The invaded landowner typically takes his or her case to the highest levels of government, with settlement of the case consisting of the state purchasing the land—sometimes at inflated prices—and giving it to the invaders.<sup>18</sup> The state therefore bears the cost, channeling its scarce resources to outside activities, while creating incentives for continued land invasions and deterring potential investors who see no guarantee of property rights.

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<sup>14</sup>World Bank (2003a, p. 5).

<sup>15</sup>Based on conversations with officials at the Paraguayan Ministry of Finance.

<sup>16</sup>See World Bank (2003a).

<sup>17</sup>See U.S. Department of Commerce (2002).

<sup>18</sup>Various stories of these land invasions have appeared recently. See for example “Amenaza de Invasiones Sigue Latente,” 2004 *Diario ABC*, Asunción, July 18.

The replacement of six of the nine Supreme Court justices in early 2004 was the first effort to attack this large source of corruption, and the move was widely supported by the population. This action was necessary for restoring the rule of law and creating an environment for renewed investment. Appointees should be chosen for their qualifications rather than their party affiliation.

### **Tax and customs administration**

Until mid-2004, the tax system suffered from major deficiencies in the form of multiple tax exemptions (included in 42 separate laws), which not only caused a revenue loss but also created opportunities for tax evasion and corruption. Most studies, including Paraguayan official reports, estimate Value-Added Tax (VAT) evasion at 45–60 percent.<sup>19</sup> A large problem with tax collection was the high level of corruption in the tax collection institutions themselves. Most officials owed their positions to patronage regardless of their ability to perform the duties, with minimum training and very low remuneration. In customs, there were networks of corruption composed of customs officials in partnership with members of Congress, dispatchers, and importers, who retained large parts of tax revenues for themselves.<sup>20</sup>

One measure of the extent of institutions' corruption is the increase in revenues that has resulted from the recent high-level appointments to the tax and customs administrations of competent officials known for their integrity. In September 2003, these administrators proceeded to close customs checkpoints and place tax officials and auditors suspected of corruption on leave with pay. This seemingly simple measure accounted for most of the 40 percent increase in tax and customs revenue for almost a year thereafter, in part because the organized corruption networks were ruptured, and in part because the tax authority gained more credibility with the public and was no longer considered an ally of the corrupt networks. The current administrators have stated that part of their daily work consists of keeping away individuals offering bribes.

### **Government expenditures**

Government spending in Paraguay has been characterized as a vehicle for channeling resources to government loyalists, rather than as the use of funds for the provision of public services.<sup>21</sup> Almost three-fourths of central government

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<sup>19</sup>See in particular IMF (1999).

<sup>20</sup>See Paraguayan newspaper reports: "Denuncian que Sigue Vigente en Hacienda el Famoso Maletín," 2004b *Diario ABC*, Asunción, July 16; "Faltante Detectado en Aduana ya Llega a Casi G4,000 millones," 2004b *Diario ABC*, Asunción, May 26, 2004).

<sup>21</sup>See World Bank (1996).



current expenditures go to civil servants' salaries or pensions. Until recently, they all had to be Colorado Party members. Until late 2003, public procurement in Paraguay was governed by outdated, rigid, and cumbersome legislation. The process of awarding contracts was so nontransparent that there were frequent cases of cost overruns and phantom subcontractors who submitted false bills.<sup>22</sup> A World Bank (2003b) governance diagnosis survey in 2000 found that contractors and suppliers who did not do business with the state cited the following reasons: (1) requests for bribes from public employees (62 percent), (2) the complexity of the contracting processes (47 percent), (3) lack of government contacts that would give them access to new contracts (37 percent), and (4) the high cost of participation (33 percent).

The budget process in Paraguay in the past has been characterized as highly discretionary and driven by political favoritism. The final allocation of funds across ministries or entities used to be largely a function of the political influence of the minister or regional leader, rather than the economic and social benefits of the specific projects. In the past it was common for the executive branch and Congress to inflate the tax revenue projections in the budget to unrealistic figures to increase simultaneously certain expenditure lines without having to propose compensatory cuts.<sup>23</sup>

Traditionally, there was low accountability regarding funds transferred to the rest of the public sector.<sup>24</sup> The scope of internal and external audits was limited, and it was rare for anyone to be held accountable. In practice, there is a complete lack of clarity regarding the responsibilities of subnational governments and some discretionary authority over transfers received from the central government. The few regulatory entities that receive funds are not independent of the executive branch. Moreover, the public banks are mired in nonperforming loans, owing to a tradition of offering lines of credit to preferred sectors that do not repay,<sup>25</sup> as well as highly subsidized mortgages and personal lines of credit to their employees.

### **Patronage in government**

Paraguayan public institutions were traditionally shaped by groups that "have finely developed the art of rent-seeking. The base of the system is the patronage

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<sup>22</sup>See the 2003 ABC news report on a recent Madame Lynch road project, "Desnudan Graves Irregularidades en Manejos de Proyectos de MOPC," *ABC News*, Asunción, December 23.

<sup>23</sup>World Bank (2003b, p. 38).

<sup>24</sup>See IMF (2003).

<sup>25</sup>See for example "Empresa con Deuda 'Pesada' en el BNF Son Urgidas a Pagar," 2004 *Diario ABC*, Asunción, April 27; article on Banco Nacional del Fomento (BNF).

politics of the Colorado party, which would ‘nominate’ party faithfuls to public institutions.”<sup>26</sup> Although there are now three parties with more or less equal representation in Congress, the culture of decision making still works on a very informal basis. A 2002 study described the political parties, which “once in government, would make the state a prize to be distributed through clientelism.”<sup>27</sup> Public institutions were largely formed by patronage jobs, many of which lacked a civil service career ladder. It was commonly accepted that “whoever came to power would “‘return favors’” by granting employment and or/benefits to their supporters, family and friends.”<sup>28</sup> Until recently, a large group of individuals would be hired with an incoming administration and placed on the payroll without a job description or a function, let alone qualifications.<sup>29</sup> There is no meritocratic system of promotions.<sup>30</sup> Organized groups rose within the ranks of the institutions to channel money either to the Colorado Party or as a payoff for employment.<sup>31, 32</sup>

It is important to note that Paraguayans are not innately corrupt, but that institutions were weakened to such a degree by the historical circumstances, as mentioned earlier, that the benefits from partaking in the established corrupt system outweighed the costs of not doing so. Many officials under a different institutional environment may have remained honest and performed their jobs, but under such an environment it was clearly more beneficial for most to go along with—or even partake in—the rent-seeking activities.<sup>33</sup> Moreover, the ruling political classes had no incentive to give up their power base and change the status quo because there was no benefit for them. The following section looks at the factors that determined GDP growth in Paraguay since 1960.

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<sup>26</sup>World Bank (2003a, p. 4).

<sup>27</sup>Prats (2002).

<sup>28</sup>See World Bank (2003b, p. 34).

<sup>29</sup>In some public enterprises there are cases of people not showing up to work for months at a time while remaining on the payroll. See World Bank (2003b).

<sup>30</sup>Even in the central bank, one of the best-run public institutions in Paraguay, pay is based on the highest professional level ever reached, not on the functions of a post. Some technical professionals choose to work as drivers but continue to receive the salary of a technical professional.

<sup>31</sup>The conclusion of the CIRD study (cited in footnote 13) was that “it is ominous for democratic governance that most of the public believes that the State is controlled or infiltrated by an association dedicated to crime and illegality and there is no action with respect to this.”

<sup>32</sup>In late 2003, the president of the Social Security Institute (IPS) was replaced with a technically competent administrator who uncovered small organized crime groups operating within the institution. The new IPS president noted that these mafias had created parallel, undocumented accounting systems to siphon funds to their respective groups.

<sup>33</sup>This situation is widely described in the economic literature of corruption (see Mauro, 2004; and Schleifer and Vishny, 1993). Once the institutional system crosses a threshold where a critical mass of people are involved in the corruption, the penalty for being punished becomes minimal compared with the gains from partaking in the corruption and it becomes a vicious cycle difficult to break.

## **C. Growth in Paraguay**

Paraguay's per capita real GDP over the past 65 years (since 1938) has grown by 1.1 percent per year on average, with a surge of growth in the 1960s and 1970s followed by a declining trend starting in 1981 (Figure 1.2). The main growth activities consisted of reexporting business to neighboring countries (so-called "triangular trade"), small cotton cultivations, and public sector employment. Since 1982 per capita output has declined by an average of 0.6 percent per year.

The sources of growth during the high-growth period of 1961–81 came from activities that would become unsustainable with globalization. A large part of the growth in the 1960s and 1970s followed the prosperity of the region. However, growth in the 1970s was particularly high in Paraguay, fueled by smuggling (which took advantage of the protectionist trade policies of Brazil and Argentina), as well as the initiation of the Itaipú dam construction, which increased gross capital formation almost 10 percentage points of GDP between 1970 and 1975. The Itaipú project has been generally beneficial to Paraguay; however, it was a one-time investment project with little or no transfer of technology to the rest of the economy. Thereafter, growth through smuggling became unsustainable as average tariffs fell in neighboring countries. Triangular trade, in particular, has fallen significantly as a result of the successful implementation of the *Mercosur* free-trade agreement and greater border controls. This and the underlying structural weaknesses led to an exhaustion of Paraguay's economic paradigm in the 1980s and 1990s.

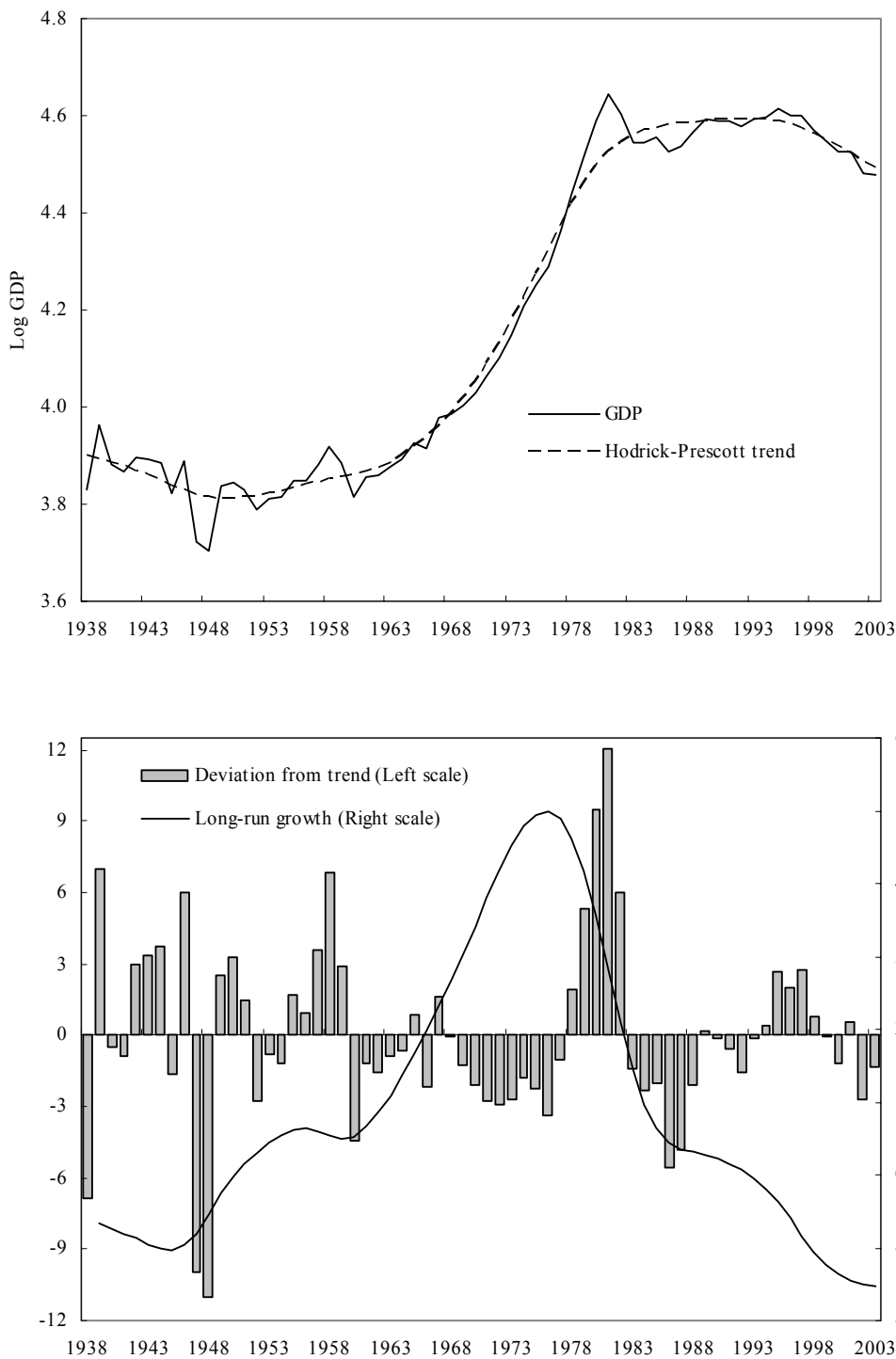
The still-large domestic informal sector, a remnant from the past, is one of the main sources of inefficiencies of the economy and is likely contributing negatively to growth. Informal activities account for almost 50 percent of Paraguayan economic activity in trade and services,<sup>34</sup> and consist of mostly small-scale family businesses and commerce intensive in low-skilled labor. To the extent that these activities are less able to take advantage of economies of scale, they are less able to demand the protection of property rights and to attract foreign investment. They also tend to be less productive in new technologies and can result in higher taxes for the formal economy (compared with a system where there are no incentives for informality).<sup>35</sup> An Inter-American Development Bank (IDB) report in 2003 estimated that the high level of

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<sup>34</sup>See estimates of the informal sector in IMF (2000).

<sup>35</sup>Of course, it is better to have an informal sector that can provide services more efficiently than a corrupt formal sector, than to not have one at all. Indeed, Schleifer and Vishny (1993) characterize the rise of the unofficial sector in any country as the rational response of producers to a system where the formal rules and regulations are de facto nonexistent. The relevant benchmark being used here is a hypothetical situation in which Paraguay were completely formal.

Figure 1.2. Long-Run per Capita Output Growth



Source: Central Bank of Paraguay; and IMF staff estimates.

informality could generate up to 60 percent lower annual profits for the formal sector in Paraguay as a result of illegitimate competition.<sup>36</sup>

In very recent years large cultivations of soy and other grains, and to a lesser extent cattle-rearing, have proven to be relatively profitable activities. Nonetheless, they currently exist as an enclave with a strong foreign investment component. The narrow tax base and level of informality have prevented the economic benefits of these activities from quickly spreading to other sectors of society.

While capital investment contributed greatly to growth in the 1970s, negative total factor productivity (TFP) explains the decline of output over the past two decades. Figure 1.3 shows the Solow decomposition of output growth in Paraguay taken from Loayza, Fajnzylber, and Calderón (2002), where the estimates are derived using a quality-controlled labor-input variable (adjusted for human capital). TFP contributes negatively to growth, by 3 percent in the 1980s and 1.6 percent in the 1990s. While labor input's contribution to growth has been relatively stable, the contribution of capital to growth declined substantially in the 1990s. However, Paraguay's capital investment has been relatively high since the early 1980s compared with other countries' (ranging between 23 and 25 percent of GDP; see Figure 1.4). This suggests that the negative total factor productivity reflects the very inefficient investments, perhaps in part as a result of the high levels of informality of the economy.

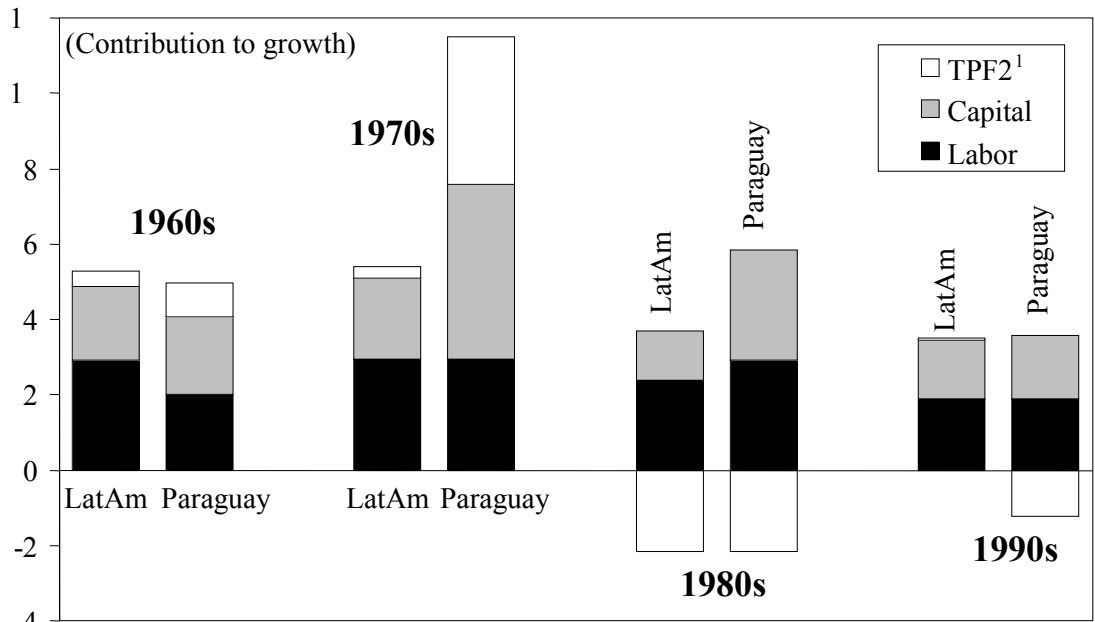
Inefficient infrastructure investment could also explain the very small contribution of capital accumulation to growth in the 1990s. Investment of the general government, which consists of social and physical infrastructure, has been quite small compared with that of other countries (Figure 1.4). Investment by public enterprises has also been small and relatively inefficient, barely covering replacement investment. With the exception of the Itaipú dam, the low levels of infrastructure investment may also be hindering growth: the return to infrastructure investment has been quite high in other South American economies.<sup>37</sup> However, more infrastructure investment does not imply more infrastructure output if the projects are mired with inefficiencies and corruption. Tanzi and Davoodi (1997) have shown how large public investment projects can be associated with corruption: even though the ex-ante return of the project may be high, the ex-post return can be quite low. A notoriously large investment in

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<sup>36</sup>Report to the incoming president, Nicanor Duarte, July 2003. See also the report, "BID Estima Que el 50 Percent de la Economía es Informal," 2003 *Diario Ultima Hora*, July 16.

<sup>37</sup>A study on growth in World Bank (2003b) cites research that reports GDP elasticities with respect to infrastructure stocks of about 0.15 for Bolivia, Colombia, Mexico, and Venezuela; 0.23 for Argentina; and more than 0.3 for Brazil.

Figure 1.3. GDP Growth and Components

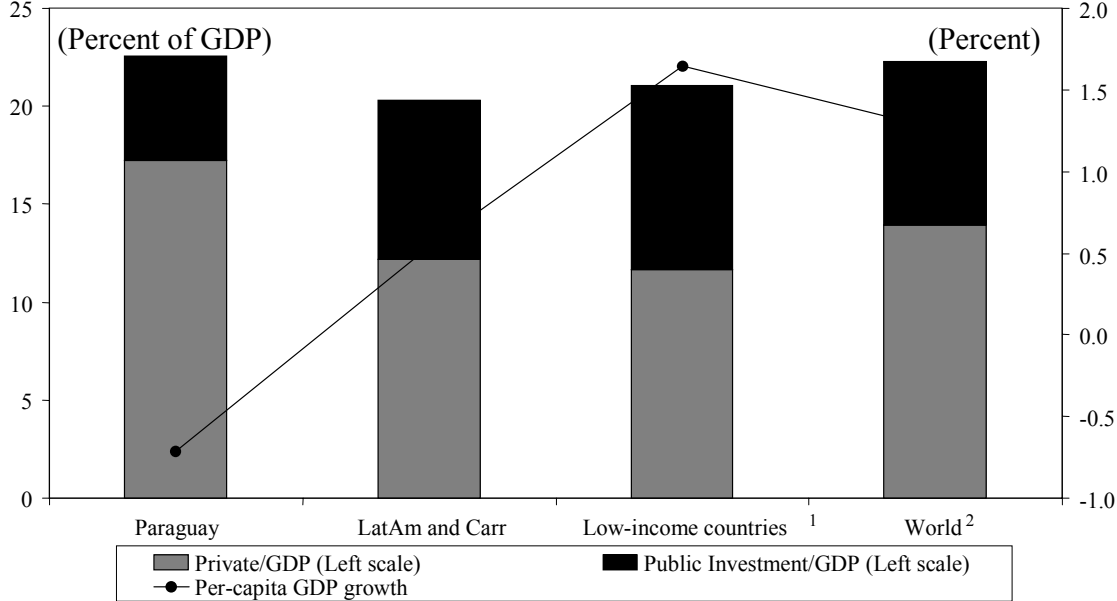


Source: Loayza, Fajnzylber, and Calderón (2002).

<sup>1</sup>TFP2 = total factor productivity adjusted by human capital.

<sup>2</sup>LatAm=Latin America.

Figure 1.4. Investment and Per Capita GDP Growth. 1982–2001



Source: World Development Indicators.

<sup>1</sup>84 countries.

<sup>2</sup>121 countries.

### **Box 1.1. ESSAP Investment Project**

ESSAP is responsible for the provision and sanitation of water for about 2.9 million people, most of them in Greater Asunción. It received loans from official sources of roughly US\$70 million in the mid-1990s for two large projects. According to the current president of ESSAP, about 50 percent of the funds were spent on auditing and administration of the projects, much higher than what would be warranted. World Bank (1996) noted that this amount was given in the context of past irregularities in the award and control of construction contracts, which had substantially wasted investment funds. The first project consisted of building a water-filtration terminal in a relatively poor and sparsely populated urban area, which already had small wells providing water relatively efficiently. The result was very low-capacity utilization, as there was limited demand from a pool of very poor customers. The second project was a US\$20 million water tunnel under the city of Asunción, which was designed to widen the network capacity. However, the feeder tubes were never completed; therefore, there is no way to get the water to the outlying areas, so the tunnel lies idle. ESSAP's debt-service obligations are projected to exceed its net income every year through 2020 as a result of this loan, so the central government, as guarantor, will have to pay the difference. Without this debt ESSAP would have a small surplus. The indebtedness that resulted from this project has made it very difficult for ESSAP to perform maintenance investment, let alone attract badly needed private investment.

the public water and sewage company, ESSAP, in the mid-1990s illustrates how a project with a very high ex-ante rate of return, when mired in inefficiency and irregularities, left Paraguay worse off than without the project (see Box 1.1).

### **Cross-country comparisons**

Recent research on the determinants of growth across countries has narrowed substantially the set of robust explanatory variables, and governance variables have not generally proven to be robust. Doppelhoffer, Miller, and Sala-i-Martin (2000) (henceforth DMS) recently devised a test of robustness of cross-country growth determinants, the Bayesian Averaging of Classical Estimates (BACE). They construct regression estimates as a weighted average of ordinary least squares (OLS) estimates for every possible combination of included variables on a set of 98 countries. Of 32 standard variables, they find 12 to be partially correlated to growth (i.e., their sign and significance do not change more than 97 percent of the time when other variables are included or excluded). Another five variables are found to be marginally correlated. With regards to variables that may be relevant for the Paraguayan case, DMS finds the real exchange rate distortions variable to be negatively related to income growth but barely making it to the first category. The variable denoting the lack of political rights is marginally correlated to growth. Moreover, DMS find that *government spending to GDP* is important but not particularly robust, as the sign of its coefficient changes for different specifications. Other variables related to corruption and governance are not significant.

A cross-country OLS regression using the most robust specification reported by DMS and using their data set and time period was estimated. The purpose was to consider whether such an equation could explain economic growth in Paraguay. Table 1.2 shows the variable definitions and results using the DMS data set. The variables in equation (1) are the 12 independent variables that passed the BACE test, where the dependant variable is per capita GDP growth between 1960 and 1992 (denoted  $Gr$ ). This regression should give a well-specified equation of the determinants of growth, at least for the countries in the sample and the time period studied. The question is whether the predicted value of the dependant variable for Paraguay (denoted  $\hat{Gr}$ ) varies significantly from the actual value ( $Gr$ ).

Two variables are added to the cross-country regression. Equations (2) and (3) add to this set governance and corruption variables, respectively. Equation (2) includes *PRIGHTSB*, the variable denoting the lack of political rights from the Barro and Lee data set (see DMS), and equation (3) includes in *C.CORRUPTION* a measure of the extent of control of corruption in 2002 (from the *Governance Indicators III* data set; see Kaufmann, Kraay, and Mastruzzi, 2003).

The governance and corruption variables are insignificant, and their inclusion does not contribute to explain Paraguay's growth performance. Equation (1) is a robust and significant equation with all coefficients significant at the 95 percent level, except for the Latin America and the Sub-Saharan Africa dummy variables. The regression predicts Paraguay's average annual per capita GDP growth during the period to be 0.71 percent, whereas the actual value was 1.9 percent. Nonetheless, the difference ( $\hat{Gr} - Gr$ ) is within 1 standard deviation. The coefficient values and significance of the regressions do not change when we include the lack of political rights variable (*PRIGHTSB*) and control of corruption variable (*C.CORRUPTION*). Moreover, the coefficients of the newly included variables are insignificant (less so for the latter), and the predicted values barely differ from those in equation (1) and move in the "wrong" direction:  $\hat{Gr} = 0.69$  percent and 0.61 percent, respectively, compared with 0.71 in equation (1). This underprediction of Paraguay's growth rate in cross-country work, at least between 1960 and 1980, has also been found by Loayza, Fajnzylber, and Calderón (2002) in their study of Latin America.

There are three possible and related reasons why the growth equations underpredict Paraguay's growth: exports may have been underestimated, the triangular trade was not accounted for, or the growth spur from unofficial sources in the 1970s could not be explained by the long-run model.

The first possibility is that the variable denoting primary exports to total exports (*PRIEXP70*), which contributed negatively to growth, was de facto much lower during the period considered. Unofficial trade (smuggling) during the 1970s could have been as large as 30 percent of GDP (see IMF, 2000). Since 1995 reexports are still estimated at over 60 percent of total exports, many of these nonagricultural in nature. If a more reliable estimate, which included the



**Table 1.2. Results from the DMS Growth Regressions**  
**Dependent Variable: Per Capita GDP Growth 1960–1992 (*Gr*)<sup>1</sup>**  
**(*t*-statistics in italics)**

Equation	(1)	(2)	(3)
C	5.18 <i>5.87</i>	5.39 <i>5.25</i>	5.57 <i>5.93</i>
GDP60	−0.78 <i>−5.69</i>	−0.79 <i>−5.63</i>	−0.81 <i>−5.82</i>
Mining	5.13 <i>6.09</i>	5.08 <i>5.95</i>	5.06 <i>6.01</i>
YrsOpen	0.86 <i>4.17</i>	0.85 <i>4.02</i>	0.80 <i>3.78</i>
CONFUC	6.79 <i>8.23</i>	6.88 <i>7.99</i>	6.82 <i>8.29</i>
LIFEE60	0.04 <i>2.63</i>	0.04 <i>2.47</i>	0.03 <i>2.03</i>
PE60	0.93 <i>2.05</i>	0.93 <i>2.05</i>	0.97 <i>2.14</i>
SSAFRICA	−0.06 <i>−0.25</i>	−0.05 <i>−0.21</i>	−0.09 <i>−0.39</i>
MUSLIM	0.49 <i>1.86</i>	0.49 <i>1.87</i>	0.45 <i>1.73</i>
LAAM	−0.30 <i>−1.39</i>	−0.30 <i>−1.4</i>	−0.26 <i>−1.22</i>
PROT	−0.97 <i>−3.39</i>	−0.97 <i>−3.37</i>	−1.06 <i>−3.58</i>
PRIEXP70	−1.39 <i>−4.56</i>	−1.37 <i>−4.45</i>	−1.29 <i>−4.08</i>
RERD	−0.004 <i>−2.41</i>	−0.004 <i>−2.35</i>	−0.004 <i>−2.07</i>
PRGHTSB		−0.02 <i>−0.41</i>	
C. CORRUPTION			0.13 <i>1.17</i>
Adj. R-sq	0.858	0.856	0.859
Standard error of regression	19.62	19.57	19.26
Number of observations	88	88	88
<i>Memo item:</i>			
( $\hat{G}\tilde{r}-Gr$ ) value for Paraguay	1.19	1.21	1.27

<sup>1</sup>The dependant variable's mean is 1.106 and the standard deviation is 1.357.

**Variable Definitions (from DMS)**

*C* is a constant

*C. CORRUPTION* is corruption.

*GDP60* is log of GDP per capita in purchasing power parity terms in 1960.

*Mining* is the fraction of GDP in mining (from Hall and Jones, 1996).

*YrsOpen* is the number of years the economy has been open between 1950 and 1994 (index computed by Sachs and Warner, 1995).

*CONFUC* is the fraction of the population that follows the Confucian religion.

*LIFEE60* is the life expectancy in 1960.

*PE60* is the primary school enrollment rate in 1960.

*SSAFRICA* is a dummy for Sub-Saharan Africa.

*MUSLIM* is the fraction of the population that is Muslim.

*LAAM* is the Latin American dummy.

*PROT* is the fraction of the population that is Protestant.

*PRIEXP70* is the fraction of primary exports to total exports in 1970 (Sachs and Warner, 1995 data set).

*RERD* is the measure of the real exchange rate distortions (from Levine and Renelt, 1992).

*PRGHTSB* is lack of political rights.

manufacturing (smuggled) exports were included, the predicted growth rate,  $\hat{G}_t^*$ , may have been higher.

Another possibility is that the model specified by DMS is not capturing the profitability from the triangular trade. We note that the value of  $YrsOpen$  for Paraguay, which captures the degree of openness, is relatively low, even though Paraguay was quite open in the black market. The country took advantage of the very high protectionism of its large neighbors, Brazil and Argentina, during that time, as measured by the trade distortion index<sup>38</sup> of these two countries, making smuggling and reexporting very profitable.

Finally, the very high growth rate observed was transient and not sustainable, given Paraguay's initial income and other characteristics. Because Paraguay's growth model was based largely on more temporary sources of growth during the period studied, this growth pattern was unsustainable and unlikely to persist.<sup>39</sup>

It is not surprising that the governance variables are not significant, since the variables that are important in determining growth to some extent embody the weak institutionalism. In other words, these 12 variables in the regression reflect the politico-economic process and in turn determine the low per capita income levels. The strong negative correlation between corruption and *levels* of income shown in Figure 1.1 does not imply causation. Recent research on the subject has found that the omitted variable from this relationship is the institutional quality (i.e., how well society organizes itself). Indeed, Paraguay's relatively low per capita income and low institutional quality have persisted for almost a century.

The recent literature on determinants of countries' income levels (Hall and Jones, 1999; and Rodrick, Subramanian, and Trebbi, 2002) has distinguished between explaining the level of income of a country and explaining the rate of growth over the past few decades. This literature has found that levels of income are strongly correlated to institutional and geographical factors (for example, the legal system, the form of colonization, access to the sea). Moreover, this relationship has persisted. In other words, most countries that were rich in the 1900s tend to stay rich and vice versa, and their institutions have changed very little. For the few notable exceptions, in particular countries in East Asia, the move from low income to high income has resulted from a very strong process

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<sup>38</sup>A common trade distortion index is the inverse of the overall trade openness indicator (from Levine and Renelt, 1992). Argentina and Brazil rank fourth and fifth lowest, respectively, from a sample of 51 countries, with values of -13 percent and -11 percent compared with a mean for the sample of countries of 3.1 percent.

<sup>39</sup>Loayza, Fajnzylber, and Calderón (2002) also measure the persistence of growth across decades since 1960, and Paraguay is consistently underpredicted in the 1960s and 1970s, but the model predicts accurately the decades of the 1980s and 1990s.

of transformation and industrialization. The next section surveys more recent research on the subject.

## **D. Explanation of Effects of Corruption on Levels of per Capita Income**

This section considers how recent literature may shed some light on the relationship between corruption and the level of income in Paraguay. Taken together, the results suggest that the corruption of Paraguay today cannot be explained solely by the policies it failed to pursue over the past few decades, but that the explanation came about through a much longer cumulative historical process.

### ***Corruption is persistent and evolves from a system with weak institutions.***

Despite increased awareness by policymakers all over the world of the costs of corruption, it has proven to be remarkably persistent. Mauro (2004) develops a model of strategic complementarities to show how some countries seem to be stuck in a “bad equilibrium” of high corruption, low investment, and low growth, whereas others experience minimal corruption and persistently so. The model develops the idea that when corruption is widespread, it does not make sense for individuals to attempt to fight it, even if everyone is better off were corruption eliminated. By contrast, in bureaucracies that are generally honest, a real threat of punishment deters individual civil servants from behaving dishonestly. Sah (1988) presents a learning model of crime participation in which it is easier to observe how members of one’s own group operate, thus illustrating how present behavior is affected by that of past generations. Moreover, in many cross-country studies, indices of corruption or institutional strength available for the past two or three decades have been very stable over time.

### ***Corruption is costly.***

Extensive literature, notably by Krueger (1974), and Murphy, Schleifer, and Vishny (1993), has analyzed the relationship between rent-seeking behavior and economic inefficiencies. More recently, empirical studies (such as Kaufmann, Kraay, and Zoido-Lobaton 2002) have used corruption indices and concluded that the economic costs of corruption and weak governance are substantial.

### ***The institutions chosen in a society came about as a result of conflict within a political and historical process.***

Several recent politico-economy models have shown how the institutions that were chosen were likely the result of social conflict, which benefited some groups of the economy. It is difficult for those in power as a result of the weak institutions to give this up, even if to do so would be pareto-optimal. This is

because there is a time-inconsistency problem: those who would benefit from a better power-sharing system cannot credibly commit ex ante to fully compensate those who give it up because there is no way to enforce such a contract. Engermann and Sokoloff (1994) have emphasized the disadvantageous consequences for institutional development of certain patterns of factor endowments, which engender extreme inequalities and enable the entrenchment of a small group of elites.

***Institutional quality is a strong determinant of per capita income: countries that began with a set of low-quality institutions tend to have relatively lower income.***

Acemoglu, Johnson, and Robinson (2001) present results that show institutions' significant effect on income, that is, that institutional differences explain most of the gap between rich and poor countries. They use mortality rates of colonial settlers as an independent instrument for institutional quality, arguing that settler mortality had an important effect on the type of institutions that were built in lands that were colonized by the main European powers. Additional results from Acemoglu, Johnson, Robinson, and Thaicharoen (2003) show that countries with worse institutions because of historical reasons suffer more volatile output growth, bigger crises, and lower growth. Other seminal economics research (for example, North, 1981; and Hall and Jones, 1996) has pointed out the importance of historical factors in creating institutions where producers' property rights are enforced, which is an essential ingredient for successful long-run economic performance.

***Other factors such as trade openness, while important, do not have as strong a direct effect on the level of income as does institutional quality.***

Some recent literature has emphasized the importance of trade, as well as the importance of geographical factors such as access to the sea, on economic growth (notably Sachs and Warner, 1995). These factors are less important when explaining levels of income. Rodrick, Subramanian, and Trebbi (2002) find that the quality of institutions trumps these other effects. Once institutions are controlled for, trade integration has no direct effect on incomes, while geography has at best weak effects. They find that trade integration (trade openness) has a positive indirect effect on a country's income to the extent that it helps improve institutions, as the coefficients of trade and institutional quality exert a positive impact on each other (i.e., integration can have an indirect effect on incomes via its effects on institutional quality).

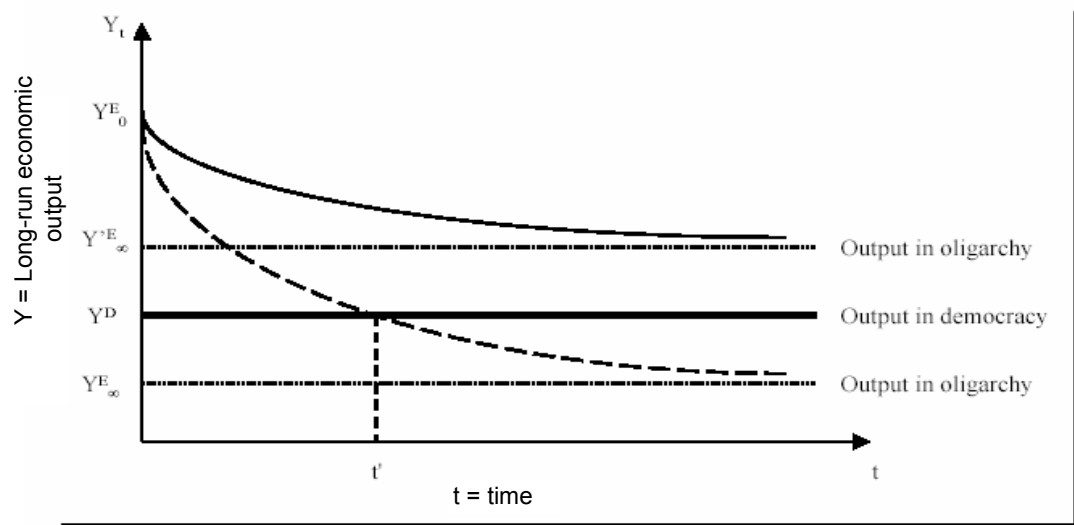
## E. Modeling the Political Economy of Growth

The results from the recent literature and the stylized facts of Paraguay's economy indicate the importance of explaining how weak institutionalism over a long period of time can lead to lower-than-potential long-term growth, even though there may temporarily be short spurts of high growth. The results also suggest why a minority group with the economic power will choose to erect high entry barriers over successive generations to maintain the status quo from which it benefits.

The model, presented in detail in the appendix to this chapter, shows the trade-off between a democratic and an oligarchic society. There are two types of agents (productive and nonproductive), and two policy distortions are presented: taxation (which tends to be higher in a democracy) and entry barriers (which tend to be higher in an oligarchy). Taxes at time  $t$  ( $\tau_t$ ), which redistribute income from entrepreneurs to workers, are distortionary because they discourage entrepreneurial investment. However, the government uses the proceeds to make transfers to all agents ( $T_t$ ), thereby improving income distribution. Entry barriers ( $k_t$ ), which redistribute income toward the entrepreneurs who have a certain degree of monopoly power (through reducing labor demand and depressing wages), distort the allocation of resources because they prevent the entry of more productive agents into entrepreneurship. In a democracy, the most productive agents become entrepreneurs, whereas in an oligarchic society, only those who inherit firms can become entrepreneurs. Figure 1.5 shows the paths of output over time that result from the model, where  $Y_t^E$  and  $Y_t^D$  represent output under an oligarchy and a democracy, respectively. Initially, entrepreneurs in an oligarchic society have more productivity; however, as successive generations of less productive entrepreneurs produce the output—because those with the talent are being excluded—then entry barriers create more costs and inefficiencies. So of two otherwise identical societies, the oligarchic one will at first be richer but later will tend to fall behind the democratic society (as represented by the dashed lower curve of Figure 1.5). Whether it does so depends on whether the difference in the productivities of agents is high enough such that the cost to society of the entry barriers outweighs the cost of potentially burdensome high taxes under a democracy. The general results of the model also suggest why a democratic system may be better for long-run growth, as it allows agents with a comparative advantage in new technologies to enter entrepreneurship.

The model has many implications quite relevant for explaining the weak institutional quality in Paraguay and the low level of sustained growth. Since 1960, the small ruling oligarchy was the Colorado government, and the mostly agrarian economy generated high output with low taxation. Therefore, the distribution of resources to the rest of the population,  $T_p$ , was relatively small, and access to credit and education was limited mainly to the elite. Thus, Paraguay fell behind relative to its potential. A ruling political class has kept the system of

Figure 1.5. Long-Run Output Under a Democracy and Under an Oligarchy



Source: Acemoglu (2003).

informality, that is, discretionary decision making, as an entry barrier (high  $k_e$ ), which has bred corruption at all levels; there was corruption within the oligarchy because there was no incentive to break up the informal system that benefited it, and there was corruption within the rest of the population because wages were low enough and entry barriers for business high enough that the only way to increase income was to partake in the informality.

The model also predicts some stylized facts of the Paraguayan economy. It predicts the low tax rates and low hiding costs, making it easier to evade taxes. It predicts the unequal income distribution and a politically powerful, mostly agrarian productive class that is not very technologically innovative. Finally, it shows how output has fallen not only relative to its potential, but also in absolute terms since 1982, reflecting declining efficiency (negative total factor productivity). Naturally, certain aspects of Paraguay's initial conditions could be considered exogenous factors (such as the form of colonization, its natural resource endowment, and the fact that it is landlocked). However, other endogenous aspects contributed to the cycle of weak institutions and thus corruption, such as the high level of informality and the slow rate of implementation of structural reforms.

To the extent that there is greater transparency and a strengthening of democratic institutions in Paraguay, it will be easier to implement policies that broaden the tax base and reduce the costs of investment for those outside the traditional economic elite. This will lead to increased pressure to improve the

institutions that favor a more productive base. Institutions will not change overnight, and, as mentioned earlier, institutions that breed corruption tend to persist. However, improved policies can set the stage for change in the right direction. One way of thinking of policies and their relationship to institutions is to consider the policies as the flow of the stock variable of institutional quality,<sup>40</sup> so that institutions are the cumulative outcome of past policy actions. Let  $p_t^i$  denote policy dimension  $i$  (where  $i$  = fiscal, trade, monetary, and so forth),  $I_t$  denote institutional quality at time  $t$ , and  $\mu$  the rate at which institutional quality decays absent countervailing action, which is larger the greater is corruption. Then the evolution of institutional quality over time can be written as:

$$I_{t+1} = I_t + \eta_i^t p_i - \mu I_t,$$

where  $\eta_i^t$  denotes the impact of policy  $i$  on institutional quality. To the extent that higher institutional quality comes with higher income, then better policies will positively affect economic growth. At some point the second term of the equation overtakes the third and institutional quality improves. There is some empirical evidence of this. Loayza, Fajnzylber, and Calderón (2002) decompose growth in Paraguay in the 1990s into four determinants: initial conditions, structural policies, stabilization (or lack thereof), and external conditions. They find that structural reforms, in particular education reforms, were the only determinant to contribute positively to growth while also building on the stock of institutions.

### **Recent initiatives**

The current government has made some important steps toward breaking the vicious cycle of corruption so as to catalyze positive institutional change. Leaders of the main public sector areas have been replaced by competent and honest technocrats, renowned for their administrative abilities and not their affiliation to the ruling Colorado Party. This is the first important change. Moreover, the economic program is based on better transparency and efficiency of the public sector, which benefits investment (i.e., helps lower the entry barriers,  $k$ ). At the same time, a sweeping fiscal reform and initial reforms in the banking sector will allow the channeling of resources to sectors of the economy that could be more productive (increasing the number of productive agents that could have firms, and increasing the level of  $T$ ). The diffusion of the traditional Colorado Party power base has been more evident with the greater debate during congressional discussions over 2004 fiscal legislation aimed at broadening the tax base and raising tax revenues, although entrenched interests of the economically powerful elite exerted pressure to oppose sections that did not benefit them.

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<sup>40</sup>See Rodrick, Subramanian, and Trebbi (2002).

## F. Conclusions

Corruption in Paraguay is the manifestation of the weak institutionalism that resulted from a long historical politico-economic process and has prevented Paraguay from developing productive activities, which engender sustainable long-term growth. This chapter illustrates how corruption has been an endemic aspect of the political economy of Paraguay for a long time. The direct causality is not from corruption to growth, as corruption is not a significant variable in econometric estimates once we control for other standard growth determinants. Instead, low growth and corruption are jointly determined by various outcomes that resulted from the weak institutionalism, which in turn came from its economic history. Weak institutions may breed a vicious cycle of corruption that is difficult to break, and can reduce growth by inhibiting the productive elements of a society from investing.

Paraguay is starting from a low stock of institutional quality, so it will take longer to reach a critical level that is consistent with sustainable growth. Policies that increase openness and international accountability may also be particularly effective catalysts. It will be a challenge to put in place good policies and improve governance for a long enough time to allow sustained growth to be firmly established. With enough time, however, new factions of society outside of the traditional oligarchy may begin to demand better education and a better redistribution of resources, and join the productive class.

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## 1

## A Political Economy Model of Output Growth

The following reduced-form model, developed in detail in Acemoglu (2003), presents the tradeoff between an oligarchic and a democratic society. Under each society, agents vote for the level of taxes at every period  $t$  ( $\tau_t$ ), which redistribute income from entrepreneurs to workers, as well as the level of entry barriers ( $k_t$ ), which redistribute income toward the entrepreneurs who will have a certain degree of monopoly power as a result, thus preventing the entry of more productive agents into entrepreneurship.

Each agent  $j$  can either be employed as a worker or set up a firm to become an entrepreneur. While all agents have the same productivity as workers, their productivity in entrepreneurship differs. To become an entrepreneur, an agent needs to set up a firm, or, alternatively, he could inherit the firm from a parent. The agent chooses the occupational choice  $i = 0$  (a worker) or  $i = 1$  (an entrepreneur). Setting up a new firm will be costly because of the entry barriers created by existing entrepreneurs. Each agent therefore starts period  $t$  with a level of bequest (income)  $b_t^j$ ; entrepreneurial talent  $a_t^j \in \{A^H, A^L\}$ , where  $A^H > A^L$ ; and  $s_t^j$ , which denotes whether he either inherits or does not inherit a firm (where  $s_t^j \in \{0, 1\}$ ). By definition, if agent  $j$  at time  $t$  sets up a firm, then his offspring inherits the firm, so  $s_{t+1} = s_t^j$ . All agents in the economy work in the firm and receive wages, but only some become entrepreneurs. They must choose the amount of investment effort ( $e_t^j$ ), employment ( $l_t^j$ ), and tax evasion technology ( $b_t^j$ ) to maximize profit, given the other parameters.

Society as a whole every period chooses a tax rate  $\tau_t$  (a tax on output), which determines aggregate  $T_t$  (the level of lump-sum transfers to all agents) and  $K_t > 0$  (the fixed cost to set up a new firm). If the cost of hiding/evading taxes is  $\delta$ , then taxes will be non-zero as long as  $0 < \delta < \tau_t$ . If  $s_t^j = 0$  for an agent  $j$  (he has not inherited a firm), then in the presence of entry barriers he must incur a cost  $k_t = K_t/\lambda$  to run a firm (where  $\lambda$  is the maximum capacity per firm). The net gain from becoming an entrepreneur for an agent of type  $(s_t, a_t)$  as a function of the policy vector  $\{\tau_t, k_t\}$  and wage rate  $w_t$  is:

$$\Pi(k_t, \tau_t, w_t / s_t^j, a_t^j) = \text{Max}_{l_t^j, e_t^j} (\tau_t, l_t^j, e_t^j, a_t^j, w_t) - (1 - s_t^j) k_t \lambda.$$

Acemoglu specifies a Markov process to determine the talent distribution across time, hence the productivity of agents across generations. The productivity of an agent  $j$  at time  $t + 1$  can be either high or low ( $A^H$  or  $A^L$ ) according to the following probabilities:

$$a_{t+1}^j = \begin{cases} A^H \text{ with probability } \sigma_H & \text{if } a_t^j = A^H, \\ A^H \text{ with probability } \sigma_L & \text{if } a_t^j = A^L, \\ A^L \text{ with probability } 1 - \sigma_H & \text{if } a_t^j = A^H, \\ A^L \text{ with probability } 1 - \sigma_L & \text{if } a_t^j = A^L. \end{cases}$$

where  $\sigma^H$  is the probability that an agent has high productivity conditional on his parent being productive. It is also assumed that workers are the majority of the population and that investment decisions are made before taxation decisions. Then, under reasonable parameters and a stationary Markov process, it turns out that agents with  $a_t^j = A^L$  and  $s_t^j = 0$  (unproductive agents without an inheritance) will always find it optimal to become workers and vote for a high tax. Conversely, if  $a_t^j = A^H$  and  $s_t^j = 1$ , the productive agent is always better off being an entrepreneur.

Aggregating, two different types of equilibrium are defined and shown to exist. First, an “entry” equilibrium, in which only productive agents become entrepreneurs (they have  $a_t^j = A^H$ ). This equilibrium holds if the following condition is true:

$$\frac{\alpha}{(1 - \alpha)} (1 - \tau)^{1/\alpha} (A^H - A^L) \geq K_t,$$

where  $\alpha$  is the (Cobb-Douglas) production function coefficient. Second, if the inverse holds true, we obtain a “sclerotic” equilibrium, defined as an equilibrium where only those who inherit firms ( $s_t^j = 1$ ) become entrepreneurs, regardless of their productivity. The equilibrium wage rate  $w_t$  and levels of labor  $l_t$  can therefore be determined based on labor demand by entrepreneurs under each type of equilibrium, given an inelastic labor supply (since entrepreneurs also work).

In a politico-economic context, a *democracy* is defined within the model as a society where the entry barriers and tax levels  $k_t$  and  $\tau_t$ , respectively, are determined by majoritarian voting (one agent, one vote), and an *oligarchy* is defined as a society where the outcome  $k_t$  and  $\tau_t$  are determined by majority voting by the elite only, where an agent is a member of the elite at time  $t$  if he inherited a firm ( $s_t^j = 1$ ).

Under a democracy, it turns out that taxes are chosen to maximize per capita transfers, in large part because workers are in the majority and can maximize

their income ex post, given wages, by having higher taxes. They will choose a tax rate  $\tau_t = \delta$ , the maximum level possible given the tax evasion technology, and eliminate entry barriers ( $k_t = 0$ ). Under an oligarchic society, the only heterogeneity within the elite is between high- and low-productivity agents. Acemoglu (2003) shows that under reasonable parameters, both low- and high-productivity elites will have the same preferences and will vote for high entry barriers ( $k_t = k^E$ ) and low taxes ( $\tau_t = 0$ ). This results in the equilibrium wage rate  $w_t^E = 0$ . One feature of the equilibrium under an oligarchy, therefore, is that there is a high degree of earnings inequality.

The following equations compare output over time under a democracy ( $Y_t^D$ ) and under an oligarchy ( $Y_t^E$ ). It turns out that output under a democracy in the model is constant, whereas output under an oligarchy depends on the productivity states over time:

$$Y^D = \frac{1}{(1-\alpha)} (1-\delta)^{\frac{(1-\alpha)}{\alpha}} A^H < Y_0^E = \frac{1}{(1-\alpha)} A^H.$$

Aggregate output in the first period under an oligarchy ( $Y_0^E$ ) is always greater than under democracy. However,  $Y_t^E$  declines over time, while  $Y^D$  is constant. Consequently, the oligarchic economy subsequently falls behind the democratic society. Whether it does so ( $Y_\infty^E < Y^D$ ) depends on the following condition:

$$(1-\delta)^{\frac{1-\alpha}{\alpha}} > \frac{A^L}{A^H} + \left( \frac{\sigma_L}{(1-\sigma_H-\sigma_L)} \right) \left( 1 - \frac{A^L}{A^H} \right).$$

In other words, democracy's output eventually overtakes an oligarchy's output if the taxes  $\delta$  set under a democracy are not too high to stifle investment ( $Y_D$  is not too low), and the difference in the productivity of agents ( $1 - A^L/A^H$ ) is high enough that forgoing having productive agents to run firms is not too costly to society. This is illustrated by the upper curve in Figure 1.5.