"La Patria Contratista": Public procurement and Rent-Seeking in Paraguay*

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Abstract

We provide micro-level evidence of the cost of rent-seeking for economic development, by showing how entrepreneurs' economic incentives are distorted toward unproductive activities as the result of systematic favoritism in the allocation of public contracts in Paraguay. We start by building a model of entrepreneurial choices, which provides predictions along three dimensions. First, rent-seeking firms enjoy extra returns, so that this activity attracts the best entrepreneurs. Second, corruption in procurement generates a concentration of operations, both at the institution and the firm level. Third, this type of corruption has adverse industrial organization implications, leading to productive distorsions and lower aggregate output. We then use a large scale microeconomic database, including all public procurement operations over a 4 year period, equivalent to annual spending of approximately 6% of the country's GDP, to corroborate these predictions.

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1 Introduction

Public procurement of goods and services is one of the main areas at risk of corruption, especially in developing countries where rules and legal enforcement are often weak. On top of the static cost of corruption and fund embezzlement in procurement, economic theory indicates that systematic departures from competition and economic efficiency in the attribution of markets are likely to have a devastating impact on economic agents' incentives and as a result may induce important long-term distortions in these countries' productive structure. This paper presents the first large scale micro-level evidence on the channels of rent-seeking and its impact on economic development, using a unique database of nearly 50,000 public procurement operations in Paraguay, covering the period 2004 to 2007. In a nutshell, we show that in Paraguay corrupt behavior in the allocation of public contracts is a key channel for rent-seeking. This large-scale network of favoritism, sometimes coined "la patria contratista"[1], has deeply damaging economic consequences: public institutions buy goods and services at inflated prices, and what's more the set of incentives facing potential entrepreneurs is distorted towards unproductive activities. Ultimately this bears a cost in terms of aggregate dynamism of the economy, which partly explains why Paraguay has had, over the last quarter century, a constantly declining industrial sector with dismal exporting performance, a booming import sector and sluggish growth.

To guide the analysis, we model the choice of potential entrepreneurs with idiosyncratic cost levels, between paying a fixed entry fee to become formal or remaining in the informal sector. Moreover, in the formal sector they face the additional choice between a productive segment, where they serve private consumers competitively, and a rent-seeking one, where they sell to public institutions. In this rent sector, contracts are attributed by corrupt officials who distort allocation rules in exchange for bribes. Firms willing to do business with the Government must therefore be profitable enough to cover their production costs as well as the formality fee and the bribes. We derive from the model three main sets of predictions that we take to the data.

First, firms making more business with the State, those in the so-called rent sector, enjoy above normal rates of returns and are the most efficient

[1] The "contracting homeland", see for example Alfredo Boccia Paz, Diario Ultima Hora, Asuncion, March 4th, 2009.

ones, a result that has a flavor of a misallocation of talents story. We provide evidence of these two aspects, by showing that firms selling more to the public sector have higher profit margins, despite the fact that they trade mostly in standard goods and should face competition for the market. In addition, we indirectly estimate firms' unobserved characteristics and show that indeed part of the extra profits linked to procurement activities result from higher productivity (lower cost in the model).

Second, corrupt procurement activity tends to be more prevalent in institutions managing larger procurement budgets, which also award on average larger contracts to their providers. We establish that the main channel for corruption in procurement in the period under study is the systematic use of an "exceptional" purchase mechanism. We show that this type of procedure, which bypasses legally required minimum standards of transparency and competition, is used more frequently by pairs of institutions-firms that trade in large volumes and/or represent a large share of each other's total procurement activity.

Third, the model also has a number of more general industrial organization implications. First, in sectors producing goods procured more intensively by corrupt institutions, the formal productive sector shrinks. In extreme cases, outside its rent-seeking part, productive activities become entirely informal. In addition, sectors in which a large fraction of production ends up being sold to the government are characterized by less competition. While formally testing these broader implications is beyond the possibility of this paper, we discuss in the concluding section a number of stylized facts that support the idea that procurement distortions, through their effect on the allocation of talents, are partly responsible for the poor performance of the Paraguayan economy over the last decades.

The rest of the paper is structured as follows. Section 2 reviews the related literature on rent-seeking, public procurement and corruption and spells out the contributions of the present paper. Section 3 describes macroeconomic stylized facts and the institutional environment in Paraguay. Section 4 develops the model and derives empirical predictions. Section 5 presents the data. Sections 6 and 7 present the results related to the first two sets of theoretical predictions. Finally, section 8 concludes by illustrating and discussing the long-run impact of rent-seeking in the procurement process.

2 Literature Review

The idea that rent-seeking behavior has important social and economic costs is a relatively long-standing one in the economic and political science literature. Early contributions, by Tullock (1967; 1971), Buchanan (1980), Krueger (1974) and Baghwati (1982) among others, were concerned, mostly in a theoretical framework, with the different types of costs associated with the transfer of rents and the waste generated by agents engaging time and resources in competing for rents, for example through political lobbying or corruption.

More recently, some papers have provided explanations for ways in which rent-seeking entails dynamic costs. Baumol (1990) and Murphy, Shleifer and Vishny (1991) focus for example on the resulting dysfunctional allocation of talents. In this approach, potential investments in physical or human capital are attracted to sectors characterized by the existence of rents (such as those stemming from political favors, corruption or natural resources), while investments in innovative activities, which have greater growth potential, become relatively less attractive and are discouraged. In these contributions, the supporting empirical evidence consists of anecdotal evidence and cross-country regressions on aggregate data. For example, Murphy et al. present cross-country growth regressions augmented with country level proportions of engineering and law students, where the former are said to correspond to investments in productive activities while the latter are considered rent-seekers. Baumol's evidence, on the other hand, is based on suggestive historical evidence from Rome, Ancient China and the Middle Ages.

Applications of rent-seeking to the industrial organization of markets are found in Parente and Prescott (1994), who build on the idea that incumbent firms with market power may invest in protecting their property rights and in discouraging potentially competing innovations. Related approaches are found in the theoretical work of Krusell and Rios-Rull (1996) and Belletini and Ottaviano (2005). Mokyr (1998) provides supporting historical evidence. Again, this line of thinking establishes a link with a potentially large dynamic cost of rent-seeking in terms of foregone innovation and lost growth.

Another related strand of literature is the one dealing with the resource curse, where the exogenous abundance of a source of rent (very often oil) is thought to constitute an obstacle to development rather than a blessing. This literature started with work by Sachs and Warner (1995), showing on the basis of cross-country regressions that countries endowed with more nat-

ural resources had lower average growth rates. A number of rationales have been used to explain these findings, including standard Dutch disease type of arguments, and indeed unproductive rent-seeking behavior by agents.[2]

To date, there is still very little micro-evidence on the actual channels and the consequences of rent-seeking in developing economies. Some papers have stressed the difference in performance between "captor" and "non-captor" firms in transition countries (depending on their ability to influence regulations or attract specific concessions), using either subjective answers on influence in firm surveys (Hellman, Jones and Kaufmann, 2003; Fries, Lysenko, and Polanec, 2003), or regional measures of preferential treatment received by a sub-sample of large firms (Slinko, Yakovlev and Zhuravskaya, 2004). Other contributions have documented the importance of political connections in securing access to key economic inputs. For example, Li, Meng, Wang and Zhou (2008) show that Chinese communist party members are more likely to obtain credit for their firms; Khwaja and Mian (2005) show how lending by public banks in Pakistan is systematically distorted towards firms with politicians on their boards; Hsieh, Miguel, Ortega and Rodriguez (2008) show that firms, which directors have signed the recall petition against Chávez in Venezuela (the "Maisanta"), have experienced significantly lower performance thereafter, in particular because of a rising tax burden and more difficult access to foreign exchange; Agrawal and Knoeber (2001) study how directors' political connections help secure better regulatory conditions in the US. Some papers have also documented the (aggregate) costs and benefits of these practices: For example Fisman (2001) computes the value of political connections for Indonesian firms, and Khwaja and Mian (2005) estimate the impact of related lending in terms of overall default rates and ultimately its cost in percentage of GDP.

Finally, note that at a more general level, the large literature on corruption that developed since the 1990s is also relevant here, and especially the strand of more recent papers using microeconomic evidence to directly measure corruption and its effects on outcomes.[3] A few contributions have

[2] The exact relevance of the resource curse effect is still a matter of controversy (see for example the synthesis in Lederman and Maloney, 2007, and Gelb and Grassman, 2008), and attention seems to be shifting to the effect of ressources on other development outcomes such as poverty and inequality (Stiglitz, 2007) and conflict occurrence (Azam, 2008).

[3] Authoritative surveys on corruption include Bardhan (1997), Rose-Ackerman (1999), Svensson (2005) and Pande (2008) among others. Micro-econometric papers include

dealt specifically with corruption in public procurement, including Di Tella and Schargrodsky (2003), who document the impact of a crackdown on corruption in Argentinean Hospitals; Hyytinen, Lundberg and Toinaven (2007), who study the effects of politics on municipal cleaning contracts in Sweden; and Bandiera, Prat and Valletti (2008), who disentangle the effect of passive (inefficiency) versus active waste (corruption) in Italy, finding that the former accounts for about four times the effect of the later.

With respect to this literature, our paper provides several original contributions. First, we have data not only on the expenses realized by public institutions, but also on the firms that are on the selling side. This enables us to capture the effect of large scale corrupt practices on the profitability of firms and hence on the industrial structure of the economy.[4] Second, we document precisely one of the most prevalent channels of corruption in procurement activity, namely the use of exceptional purchases, and uncover the characteristics of the institutions and sectors more prone to it. Third, we provide illustrative evidence of the distortive effects of rent-seeking in terms of economic efficiency, by showing both that it depresses production and inflates prices in sectors relying on significant public purchases, and that it implies an inefficient specialization of the more able entrepreneurs in imports activities.

3 Country overview

3.1 Economic and Political Background

Paraguay is a small landlocked country of 6 million inhabitants (2005) located in the heart of South America. With a per capita GDP of US$ 1,410 in 2006, it is a low-middle income country. Its main sources of growth are agrarian activities and local services,[5] while the industrial sector has experienced a steady decline since the 1970s, going from over 17% to less than 14% of GDP nowadays.

Reinikka and Svensson (2004), Olken (2007), Bertrand, Djankov, Hanna and Mullainathan (2007) and Ferraz and Finan (2007) to mention only a few.

[4] A related paper is Fisman and Sarria-Allende (2004), who present cross-country, industry level evidence of the effect of regulatory distortions on the industrial structure.

[5] Indeed, a few non-processed commodities constitute its very narrow export base: 50% of all exports are in 3 traditional products (soy, cotton and meat); adding other barely processed commodities makes up close to 90% of total exports.

The country also enjoys a unique source of rent in the form of revenues from big hydroelectric dams shared with its neighbors Argentina and Brazil. The biggest one is Itaipú, on the river Paraná between Paraguay and Brazil. Until the Chinese Three Gorges dam was built, Itaipú was the largest hydroelectric power plant in the world. It has 20 turbines, 1 of which provides 90% of all the energy used in Paraguay. The rest is channeled to Brazil in exchange for royalties, and covers approximately 20% of all the electricity consumed in this country of nearly 190 million inhabitants.[6] The dams' joint ownership means that Paraguay receives every year an enormous amount of royalties, amounting to US$ 366 millions in 2005 (resp. US$ 553 millions in 2006), equivalent to 4.9% (resp. 5.8%) of GDP. This is approximately 50% of the total government tax collection (from VAT, custom duties, and rent, by order of magnitude).

Politically, after enduring the dictatorship of Alfredo Stroessner between 1954 and 1989, Paraguay returned to democracy after a military coup in 1989. In April 2008, the Asociación Nacional Republicana, traditionally known as *Colorado Party*, which had managed to retain power for 61 years, including the 19 years elapsed since the 1989 coup, was finally defeated in the presidential election by an opposition coalition led by former Catholic bishop Fernando Lugo. Given this political context, the dams' providential source of income has shaped the growth of the Paraguayan "rent-seeking economy". First, the dams construction generated a culture of intense rent-seeking and corruption and allowed a few entrepreneurs that were in good terms with the dictator to become immensely rich.[7] Second, the free flow of resources to the government's budget meant that bureaucrats were in a position to favor friends through public expenses. One of the main channels that is of our interest here, is the allocation of public contracts to firms that in most cases are created with the purpose of supplying the state, often by selling a wide variety imported goods. This is where the distortion of entrepreneurship towards rent-seeking mostly occurs.

As a result, Paraguay has experienced very slow growth since the 1980s. After the construction of the Itaipú dam in the 1970s, which provided a temporary economic boost, per capita GDP growth has been low or negative

[6] Additionally, there is another huge dam, the Yacyreta one, lower down on the same river, on the border between Paraguay and Argentina. It is about one fourth the size of Itaipú. The construction of a third one, to be called Corpus, is under consideration.

[7] As a matter of fact, Juan Carlos Wasmosy, an engineer who subsequently became president of the country between 1993 and 1997, was one of the main Itaipú contractors.

since the beginning of the 1980s as shown in Figure 1.[8] As of 2005, over 38% of the population was under the poverty line, and 20% lived in conditions of extreme poverty.

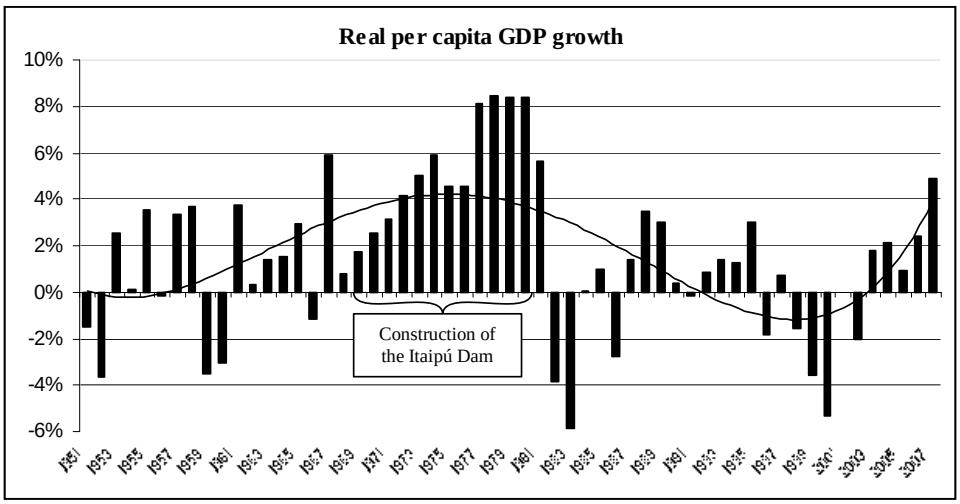

Figure 1

3.2 Corruption and Public Procurement

Paraguay is considered to be one of the most corrupt countries in the world.[9] Scandals of embezzlement, favoritism and other illegal practices of politicians and public officials are common currency in the national news. As mentioned above, the Colorado party enjoyed a monopoly over political power for 6 decades.[10] During the whole period the party effectively privatized public resources, using public employment and procurement to favor party members' interests.[11] The size of the civil service was hugely inflated and the bureaucracy highly inefficient, with a wage premium over the private sector of around 17% (compared with a 4% average in Latin America)[12], so that the

[8] See also Straub (1998) and Borda (2007) for an overview of the economic situation.

[9] It has lingered in the bottom 4% of surveyed countries included in Transparency International's Corruption Perception Index since its inclusion in 2002. It had for instance a score of 2.1 in 2005, placing it 144th out of 158.

[10] The splitting of the formerly 'granitic' party after 1989 led to an intensification of patronage and pork-barrel politics among rival factions within the party. See Pérez-Liñán et al. (2006) for a description of the political environment of Paraguay.

[11] See for example Nickson and Lambert (2002).

[12] See Panizza (1999).

government spent practically two thirds of its revenues on salaries, including those of numerous ghost workers. The party was partly financed by compulsory contributions expected from public employees in exchange for their job, or deducted directly from their payslip.[13]

Another important channel for corruption is the distribution of public company holdings and lucrative procurement contracts to party members. For example, during years, public tenders for tiles issued by the Ministry of Defense and the Itaipú company specified a particular brand name, which happened to be produced solely by a firm belonging to a prominent Colorado Senate member. Following complaints from competing firms, the name of the brand was removed but the specifications kept. In 2005 and 2006, a large scale bid-rigging scam in a school meal program was uncovered. The supplying firm, which belonged to the husband of the then-Minister of Education, was giving pupils colored water instead of milk and charging inflated prices for it.

There is therefore ample anecdotal evidence of corruption at all level of government, and in particular in public procurement. Numerous (importing) firms, belonging to political operators and members of the ruling elite are created with the main purpose of selling goods to the public sector. These are favored either through specifications tailored to them, bid rigging or the use of the exceptional purchase mechanism. In particular, this last practice appears to have been used on a very large scale by public institutions. Some cases have made headlines, such as the use of this procedure by the First Lady's Office to pay close to US$ 100,000 to a consulting firm formerly owned by the President, for the organization of the XIIIth conference gathering Americas' First Ladies in 2005 in Asunción.[14] Overall, close to one fourth of all the disbursements used this mechanism during 2004 and 2005.

The next Section builds a model of entrepreneurial choice, from which we derive testable predictions.

[13] In 2008 during the presidential election campaign, it was discovered that over 900 employees in the Asuncion Town Hall were systematically extorted half of their salary by members of the financial department, under the threat of dismissal. The case was brought to the attention of fiscal authorities following denunciation and the use of hidden footage, after an employee sick with cancer was sacked because she had failed to pay her contribution for a few months.

[14] Diario Ultima Hora, Asunción, June 7th, 2007.

4 The Model

The model focuses on the industrial organization of constant returns to scale industries (i.e. linear cost function). This assumption is consistent with existing evidence on manufacturing and service firms in developing countries, whether they belong to the formal or the informal sector (see Tybout, 2000). It is also consistent with the nature of activities, essentially services and manufactured commodities, included in our procurement database. We focus on a developing country economy, in which entrepreneurs have the choice between two sectors: the traditional (informal) and the modern (formal) sector. There is a continuum of potential entrepreneurs with different "abilities" (i.e., different education, physical capital, experience, attitude towards innovation, access to credit markets and so on). A higher ability translates into a lower constant marginal cost of production, denoted c, in the formal sector. We make the following assumption about marginal cost dispersion:

A1 c is independently and uniformly distributed in $[0, \overline{c}]$.

In the modern sector there are two types of activities: rent-seeking activities and productive ones. In the former, firms do business with the government (public procurement) and corruption occurs. In the latter, they produce commodities and services for private customers. For the sake of simplicity, we consider a linear specification of consumers demand:

$$D(p) = A - p. \tag{1}$$

where A is a scale parameter that indicates the depth of the market.[15]

The model aims at highlighting the way in which rent-seeking activities, related here to corrupt public procurement practices, distort entrepreneurs' choices and therefore a country's industrial structure. As a benchmark, we first briefly discuss the corruption-free equilibrium.

4.1 Corruption-Free Economy

In the absence of rent-seeking opportunities (no corrupt public demand), entrepreneurs specialize in productive activities. They serve market demand competitively and make no rent in equilibrium. Moreover, competition implies the selection of the best available technology (i.e., the lowest cost function).

[15] The results are robust to more general specifications of the demand function.

Entrepreneurs need to choose between formality and informality. This ultimately depends on the characteristics of the industry under scrutiny and on the tax system.

In the formal sector, firms pay entry fees/taxes that are collected by the government. Let $F \geq 0$ denote the exogenous sunk cost to enter the formal sector.[16] The total cost function of a producer operating in the formal sector, denoted by the superscript f, is thus made of two parts:

$$C^f(q) = F + cq \tag{2}$$

where $q \geq 0$ is the quantity produced by the firm and $c \in [0, \overline{c}]$ its marginal cost of production. Competition brings rents to 0 and leads to the selection of the best available technology so that $p^{f*} = A/2 - \sqrt{A^2/4 - F}$ (see Appendix).

In the informal sector, denoted by the superscript I, there is no entry fee or taxation, but firms are constrained in their production choices so that marginal cost is high.[17] We assume that informal firms producing a quantity $q \geq 0$ face the following cost function:

$$C^I(q) = \overline{c}q. \tag{3}$$

The sector being competitive, in equilibrium price is $p^I = \overline{c}$. Consumers purchase from the formal sector if $p^{f*} \leq p^I = \overline{c}$. Proposition 1 summarizes the industrial organization of this economy (see derivation in the Appendix).

Proposition 1 *In a corruption-free economy, formality prevails in a given industry if and only if*

$$A \geq \overline{c} + \frac{F}{\overline{c}}. \tag{4}$$

Proposition 1 implies that if F is small (and $A > \overline{c}$) the traditional technique of production disappears. Production occurs in the formal sector in

[16] We could add a linear tax t on operational profit without changing the equilibrium. In practice entry fees have low administrative cost and foster the emergence of large taxpayers. Developing countries rely on them to control the access to their formal economy and generate rents that are taxed by governments (see Auriol and Warlters, 2005). Entry fees are hence higher, in percentage of per capita GDP, in poor countries than in rich ones (Djankov et al., 2002).

[17] Informal producers are constrained because of their lack of education, savings, social network, and access to essential "infrastructure" (e.g., electricity, legal institutions). Empirical studies show that production in the informal sector is more labor intensive than production in the formal sector and that it involves smaller size units (see Straub, 2005).

equilibrium. On the other hand, in countries where barriers to entry are higher there is a segmentation between formal and informal sectors based on types of business or industry. The sector is organized formally if demand is strong (i.e., A large), and if the difference in productivity between traditional and modern methods of production, $c^I - c^f = \overline{c}$, is large enough. For example, we expect $c^I - c^f$ to be relatively small for services such as car washing or fruit selling (which do not suffer large productivity losses due to the poor infrastructure or the inability to enforce contracts in courts). As a result, these activities are generally informal in developing countries. On the contrary, sophisticated commodities such as medicine, computers or cars, which require a warranty or a certification process, are likely to be characterized by larger values of $c^I - c^f$, justifying that firms choose formality.[18]

4.2 Rent-Seeking

We now turn to the more realistic framework where there is a rent sector in the formal economy. Based on the stylized facts presented in the introduction, the rent sector is generated by government public procurement activity. We assume that individuals managing public institutions' purchases aim at maximizing the total amount of bribes they extract from the firms supplying commodities and services. While this assumption cannot be directly tested, because in practice corruption is rarely observed, the model based on this null hypothesis will generate a number of testable predictions discussed below.

We assume that the quantity to be purchased by the public officials, denoted Q, is fixed.[19] Independently of the type of commodity, Auriol (2006) shows that a corrupt procurement official favors limited tendering procedures to circumvent competitive bidding and to maximize the price of the purchase, and thus his potential bribe. Under asymmetric information, a firm in a monopoly position asks for the highest possible price. Since the firms' cost parameters are independently and uniformly distributed in $[0, \overline{c}]$,

[18] For more on the informal/formal sector choice, see Auriol and Warlters (2005) and Straub (2005).

[19] Since we focus on a continuous model, Q is a normalized quantity. It corresponds to a per capita quantity. That is, if all potential entrepreneurs enter the rent sector and get an equal share of the market, they will each produce Q. In a discrete model with N potential entrepreneurs, Q would be replaced by Q/N.

the monopoly price is $\overline{c}$.[20] With limited tendering, a contract of size q costs

$$T(q) = \overline{c}q. \tag{5}$$

The decision parameter of government officials is $b \in [0, 1]$, the share of $T(q)$ they take in exchange for giving the market to a firm without competition.[21] In doing so, government officials do not try to distinguish between different entrepreneurs. They simply split the total quantity in equally sized parts among them and get a fixed share of each of these contracts in bribes. By sharing the rents with many entrepreneurs the government creates a patronage economy and minimizes the probability of popular outcry and government overturn.

4.2.1 Entry decisions into the rent sector

In the rent sector, denoted by the superscript r, there is no competition between firms, as they pay bribes to avoid it. This lack of competition implies that, contrary to the efficient outcome, different levels of productivity coexist in equilibrium. In exchange for its monopoly position a firm pays a share b of the contract value in bribe. Therefore, in the rent sector the profit of a firm with marginal cost c is given by:

$$\Pi^r(c) = q^r((1-b)\overline{c} - c) - F \tag{6}$$

where $q^r \geq 0$ is the quantity procured by the firm. It is clear from equation (6) that not all potential entrepreneurs find it profitable to enter the rent sector. Only those who are efficient enough can profitably do so. Let $c^r(b) \in [0, \overline{c}]$ denote the firm that is indifferent between the rent and the productive sector (i.e., the one such that $\Pi^r(c^r(b)) = 0$). A firm enters the rent sector if and only if $c \leq c^r(b)$.

The quantity to be purchased is fixed at Q. Given our assumption that all procurement contracts are of similar size, we can write $\int_0^{c^r(b)} q^r dF(c) =$

[20] Thus, the fixed quantity Q also corresponds to a fixed amount of money allocated to public procurement.

[21] At this point, we refer indifferently to the government as a whole or to specific government officials. As will become clear when we turn to the empirical analysis, in practice procurement activities are decentralized at the institution level (ministries, state enterprises, etc.), so b is likely to be institution-specific.

$q^r \int_0^{c^r(b)} \frac{1}{\overline{c}} dc = Q$. We deduce that

$$q^r = \frac{Q\overline{c}}{c^r(b)}. \tag{7}$$

This means that the fraction of firms involved in the rent sector, $c^r(b)/\overline{c}$, and the size of their lots, q^r, are endogenous. Substituting (7) in (6) and rearranging, we find that the entrepreneur who is indifferent between entering the rent sector or the productive sector is such that:

$$c^r(b) = \overline{c}\ (1-b)\frac{\overline{c}Q}{\overline{c}Q + F}. \tag{8}$$

If there is no fixed entry fee to the formal sector ($F = 0$) then $c^r(b) = (1-b)\overline{c}$. In this case a fraction $1-b$ of entrepreneurs choose the rent sector. This fraction decreases with F: if $F > 0$ then $c^r(b) < \overline{c}(1-b)$. In the limit, if F is too large no entrepreneur chooses the rent sector. To rule out this possibility we assume that $F < \overline{c}Q$. It is straightforward to check that $c^r(b)$ decreases with b:

$$\frac{dc^r(b)}{db} = -\frac{\overline{c}^2 Q}{Q\overline{c} + F} < 0. \tag{9}$$

In the limit when $b = 1$, $c^r(b) = 0$ so that no entrepreneur finds it profitable to enter the rent sector. This result is fairly intuitive. The more greedy government representatives are, the more profitable the firms need to be to do business with them: they need to be able to cover the fixed cost of entry plus the bribes and still make some profit.

Finally, equations (8) and (6) imply:[22]

$$\Pi^r(c) = Q\overline{c}\left[\frac{c^r(b) - c}{c^r(b)}\right] \tag{10}$$

We deduce that $\Pi^r(c) > 0$ iff $c < c^r(b)$. Entrepreneurs that choose to do business with the government make rents. By contrast entrepreneurs with cost higher than $c^r(b)$ would make a loss. They do not choose the rent sector.

[22] Equation (8) implies that $\frac{Q\overline{c}}{c^r(b)} = \frac{F+Q\overline{c}}{(1-b)\overline{c}}$. Substituting this expression in equation (6), yields (10).

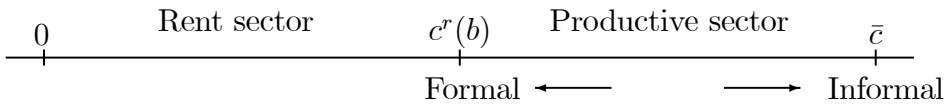

Figure 2

Figure 2 illustrates the distribution of entrepreneurs between the rent and the productive sector as a function of their productivity c. It illustrates the two possible industrial organization outcomes: a rent-seeking sector with $p^r = \overline{c}$ and a formal productive fringe with $p^f = \frac{A+c^r(b)}{2} - \sqrt{\frac{(A-c^r(b))^2}{4} - F}$, or a rent-seeking sector and an informal fringe, with $p^r = p^i = \overline{c}$. In both cases, rent-seeking has the consequence of pushing costs and prices up in the productive sector.

4.2.2 Government bribe rate

If one overlooks the possibility that corruption be detected, the total government bribe is $B = b\overline{c}\int_0^{c^r(b)} q^r dF(c) = b\overline{c}Q$. The amount B increases linearly with b, suggesting an unrealistic corner solution $b^* = 1$. In what follows, we assume that the government internalizes the risk of corruption being detected and punished.[23] This allows us to focus on an interior optimal bribe rate. We focus on weak punishment: in case of detection the bribe is simply lost to the government officials.[24]

We assume that the probability of detection for any procurement contract depends on the percentage of firms excluded from the rent sector $\frac{\overline{c}-c^r(b)}{\overline{c}}$. Indeed, with less firms in the rent sector, the probability of those left out complaining increases.[25] That is, the probability of detection is $g(\frac{\overline{c}-c^r(b)}{\overline{c}})$

[23] This is a common assumption in the corruption literature, going back to the Becker and Stigler (1974) crime-deterrence model. See for example Besley and MacLaren (1993) and Mookherjee and Png (1995). Di Tella and Schardgrosky (2004) is an empirical application.

[24] This is consistent with empirical evidence: infinite fines, which would solve the problem of corruption for small probabilities of detection, are rarely observed. In practice, in Paraguay corruption faces weak punishment because of limited liability of agents and lack of enforcement.

[25] Transparencia Paraguay and most national newspapers have set up call and drop in centers for the reporting of corrupt practices. Informants are generally people who have been most jeopardized by the illegal acts, such as competing firms or fired employees of public companies. Moreover, firms in the rent sector have bigger turnout and are easier to detect.

where $g(.)$ is a strictly increasing and convex function varying between 0 and 1. Under this assumption the bribe expected value is: $EB = b\overline{c}Q(1 - g(\frac{\overline{c}-c^r(b)}{\overline{c}}))$. For the sake of simplicity, we assume in what follows that $g(x) = x^2$. However our results are robust to more general functions.

The convexity of $g()$ implies that the probability of detection of the corrupted governments official is more sensitive to an increase in the number of entrepreneurs included in the rent sector when this number is low. When the number of entrepreneurs included in the rent sector is large, increasing their number does not reduce significantly the probability of detection. We deduce after straightforward computations that:

$$EB = bc^r(b)Q\left(2 - \frac{c^r(b)}{\overline{c}}\right). \tag{11}$$

There is thus a trade-off for the government, between the number of firms that are going to pay bribes and the amount of these bribes. The optimal level of bribe b^r maximizes EB. The first order condition of this problem yields:

$$c^r(b) + \left(1 - \frac{c^r(b)}{\overline{c}}\right)\left[c^r(b) + 2bc'(b)\right] = 0, \tag{12}$$

with $c^r(b)$ defined by (8).

As shown in the Appendix, Proposition 2 follows.

Proposition 2 *Let $x = \frac{F}{Q\overline{c}}$. The optimal government bribe rate is:*

$$b^r(x) = \frac{1}{3}\Big(\sqrt{3(1+x)^2 + x^2} - 2x\Big). \tag{13}$$

It is easy to check that $\frac{db^r(x)}{dx} < 0$ for all $x \in [0, 1]$ (see Appendix). Proposition 2 hence implies that the optimal bribe rate decreases with F. This is because corruption competes with taxation: firms that have to pay bribes are less able to pay taxes. Moreover, the optimal bribe rate also increases with the amount spend in public procurement $Q\overline{c}$. This implies that there should be empirically a positive correlation, at the institution level, between the amount of purchase and the level of corruption. Everything else being equal, big purchasers are endogenously more greedy. Institutions with large budgets are able to ask for a large share of contracts in bribes without increasing the risk of detection because they are able to distribute large lots to more firms. The adverse effect on the formal productive sector is of course stronger.

4.2.3 Market equilibrium

We are now ready to derive the global market equilibrium.

Proposition 3 *Let $x = \frac{F}{Q\overline{c}}$. In a corrupted economy entrepreneurs choose the rent sector if and only if $c \leq c^r(x)$:*

$$c^r(x) = \frac{\overline{c}}{3}\left(2 + \frac{1}{1+x} - \sqrt{3 + \left(\frac{x}{1+x}\right)^2}\right). \tag{14}$$

In the productive sector, formality prevails if and only if

$$A \geq \overline{c} + \frac{F}{\overline{c} - c^r(x)}. \tag{15}$$

Proposition 3 (see derivation in Appendix) indicates that the most productive entrepreneurs (i.e., $c \leq c^r(x) < \overline{c}$ for all $x \in [0,1]$) choose the rent sector where there is no competition and commodities are overpriced, while the less productive firms are left to serve private demand. Compared to a corruption-free economy, prices are hence higher both in the public and private segments of the economy so that the quantities consumed and produced in equilibrium are everywhere smaller leading to lower aggregate production. Moreover comparing condition (15) with condition (4), it is straightforward to check that the formal sector shrinks in a rent-seeking equilibrium. This effect is stronger in sectors where public purchases are large. Indeed deriving $c^r(x)$ with respect to x one can check that $\frac{dc^r(x)}{dx} < 0$ for all $x \in [0,1]$. Everything else being equal, the percentage of entrepreneurs who enter the rent sector increases with the volume of public purchase $\overline{c}Q$ and decreases with F.

4.3 Implications of the model

The model generates 3 main groups of testable implications.

1. *Profitability of firms.* First, entrepreneurs in the rent sector make profits that exceed the levels observed in normal competitive sectors (see (10)). These rents are derived from sales at inflated prices, because competition for the market is suppressed by corruption. However, only entrepreneurs that are efficient enough can afford to cover the cost of the related bribes. A corollary is therefore that these entrepreneurs are also the most able ones

(those with the highest intrinsic or acquired abilities, which translates into the lowest cost).

2. *Corruption and the structure of purchases.* The second set of implications relates to the structure of (corrupt) procurement activities. Institutions managing bigger procurement budgets are more greedy, in the sense that the bribe rate endogenously increases with the volume of purchase ($\frac{db^r}{dQ} > 0$, see (13)). Moreover, providers working with these more corrupt institutions get bigger individual shares ($\frac{dq^r}{dQ} > 0$, see (7)) on average and the fraction of firms entering the rent sector gets bigger when the volume of purchase increases ($\frac{dc^r(b^r)}{dQ} > 0$, see (14)).

3. *Economy-wide impact of rent-seeking.* Finally, the model also has a number of more general industrial organization implications. First, as illustrated in Figure 2, in sectors producing goods procured more intensively by more corrupt institutions, the formal productive sector shrinks. In extreme cases, productive activities become entirely informal outside the rent-seeking sector. In addition, sectors in which a large fraction of output is sold to the government are characterized by less competition. Finally, where there is corruption, prices are bid up in all sectors and quantities are depressed, leading to lower aggregate production.

5 The data

Under pressure from international organizations, a law regulating public procurement practices (law 2051/03) was enacted in 2003 by the government of the newly elected president Nicanor Duarte Frutos, with the announced intentions of promoting transparency and efficiency in public purchases.

The most significant of its provisions were the creation of a public procurement watch-dog (the National Directorate of Public Procurement, or DNCP), the design of a menu of purchase mechanisms to regulate procurement procedures, and the compulsion to make all information (calls, providers, award etc.) public. This last proviso was accompanied by the creation of the DNCP web site where this information is available, but in practice access is often intermittent and the interface is impractical.[26]

[26] The data we use was initially painstakingly compiled by Transparencia Paraguay (TP), the national chapter of the international NGO Transparency International, using the information published by the DNCP on its website.

There are also strong indications that improvements in the regulatory framework did not translate quickly into cleaner procurement practices, partly due to the inefficiencies of an inflated bureaucracy, partly because many officials did not comply with the new law and the wrongdoings continued. The World Bank's review of Paraguay's public expenditure in 2006 states that: "Operational efficiency is reduced by the existence of informal arrangements alongside formal rules. While spending control is highly centralized, with detailed rules concerning (...) procurement and other items of expenditure, these formal controls are often violated in practice [and] informal arrangements dictate how (...) procurement is contracted. When formal rules are unworkable and government operates through extralegal means, corruption rises although it often goes undetected or unreported."

The persistence of irregularities in the period of study offers a window on a network of systematic favoritism and corruption rooted in the previous modus operandi, in which no control mechanisms were enforced and public contracts were distributed arbitrarily to benefit friends and buy political support. As a matter of fact, our data reveals that practices changed only slowly after 2003. For example, the share of purchases made through the route of the exception,[27] which is designed to afford the institution complete discretion in the choice of provider in order to expedite purchases in exceptional circumstances, gradually decreased from 23% of the total procurement budget in 2004-05 to 13.6% in 2006-07, but is still much higher than international standards. This relative decrease, which coincided with the diffusion in 2006 of a public report by Transparencia Paraguay stressing frequent abuses through this procedure, is consistent with our prior belief that corruption is widespread in public procurement operations.[28] To a large extent, the results in our paper exploit this unique combination of information availability, imposed by the new legal framework, and practical inertia in rooting out wrongdoings in public procurement by effectively enforcing the whole set of new legal requirements.[29]

[27] An overview of this and the other legal purchase mechanisms follows, and a more detailed description can be found in the Appendix.

[28] Anecdotal evidence suggests that this was due more to a displacement effect towards alternative means of bypassing regulations than to a cleansing of public procurement. Bid rigging, specifications adjusted to favor certain firms, and quality dumping stand out as some of the practices that deserve further research.

[29] The formal analysis of the change in behavior of different public institutions over the period, and of whether it is due to a learning process or to the gradual adjustment to a

Procurement data

The main data set tracks all the procurement transactions made over the period 2004 to 2007 between 73 public entities (representing over 90% of total Paraguayan public spending and employment) and 5,517 different private suppliers. These 47,615 public purchases include all types of goods and services, from stationary to infrastructure building, oil purchases, food etc. There are good reasons to believe that no public procurement operations escape registration, as under the new system contracts need to be registered and executed before the corresponding funds are released. The total public spending amounts to Gs. 12,400 bn. (approx. US$ 2,235m), which represents 5.5% of Paraguay's GDP in 2004, 5.6% in 2005, 6.3% in 2006 and 6.9% in 2007.

Each observation in the procurement data set contains the name and type of the public entity, the name and legal registration number (RUC) of the supplying firm and its owner, and information on the purchase including the nature of the good or service categorized in 16 different groups[30], the total cost reported in local currency units and in multiples of the legal minimum daily wage (mdw), and the purchase mechanism used.

Purchase mechanisms are a key provision of the 2003 public procurement law, regulating the procedures to be followed in allocating contracts depending on their total value.[31] There are five legal purchase mechanisms with gradually increasing constraints on the minimum number of offers, the mode and length of publication of the call for offers, etc. For contracts of a value above 10,000 minimum daily wages (mdw), a national or an international public tender must be organized.[32] Between 2,000 mdw and 10,000 mdw, a so-called competitive bidding process is required. Below a value of 2,000 mdw, a direct purchase is allowed.[33] Public institutions are legally compelled to have offers from at least three different firms for direct purchases (those of no more than 2,000 mdw), but for public tenders above this value, the

better and more effective set of controls, is the subject of another paper.

[30]Note that certain items can enter in various groups. The classification is given in Appendix.

[31]See the Appendix for more details.

[32]The mdw varied between Gs. 37,401 and 51,607 over the period, while the dollar/guarani rate varied between 6,178 and 5,021; see Table A1 in Appendix.

[33]Fixed Funds are used for values below 20 mdw. This mechanism has no specific requirement on the number of offers, publication of the call for offers, etc. We include it as a direct purchase.

call for offers must be published in advance and the minimum number of suitable offers is five. The pivotal threshold is therefore 2,000 mdw (equivalent to between 12 and 20 thousand dollars), as any purchase for a larger amount should give rise to an open bidding procedure. Finally, these guidelines can be disregarded in cases of emergency, defined as periods following a natural disaster, health epidemic (for example the dengue fever outbreak of 2007 or the yellow fever outbreak in 2008), for the purchase of patented and copyrighted goods, or for purchases requiring defense secrecy. In those extraordinary circumstances, public officials can skip all formal purchase requirements through the so-called exceptional purchase mechanism. Figure 3 shows that exceptional purchases are quite common for certain categories of goods or services, such as rentals, publicity, consultancy and transport.

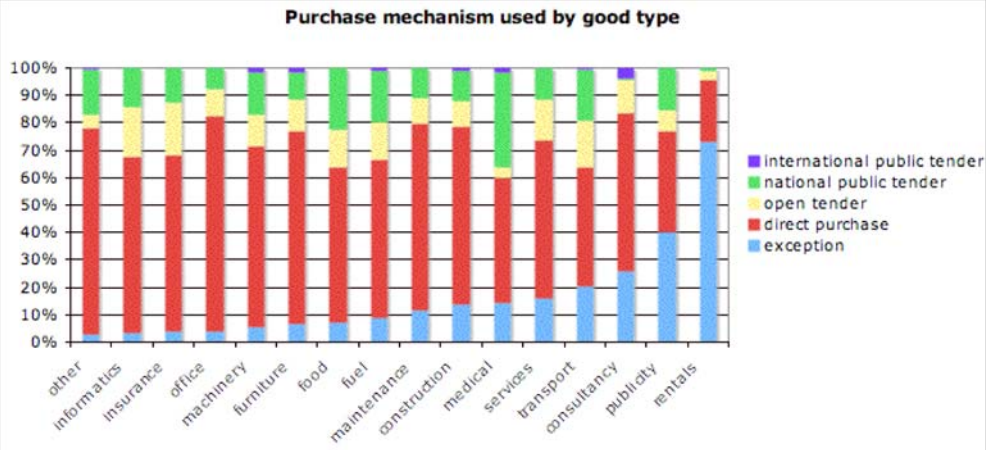

Figure 3

The distribution of contract values has a fat left-hand tail (84% of purchases cost less than 2000 mdw.), while 5.5% of contracts costing over 10,000 mdw. make up 86% of the total spending (see Figure 4). The sample mean is approximately US$ 47,000, equivalent to 36 times the national per capita GDP at the time.

While there are a bit more than 200 contracts with a value superior to US$ 1 million and the largest contract is worth US$ 184 million[34], more than 2,800 purchases cost less than US$ 100.

[34] The 10 largest procurement contracts are oil purchase by the State Monopoly Petropar.

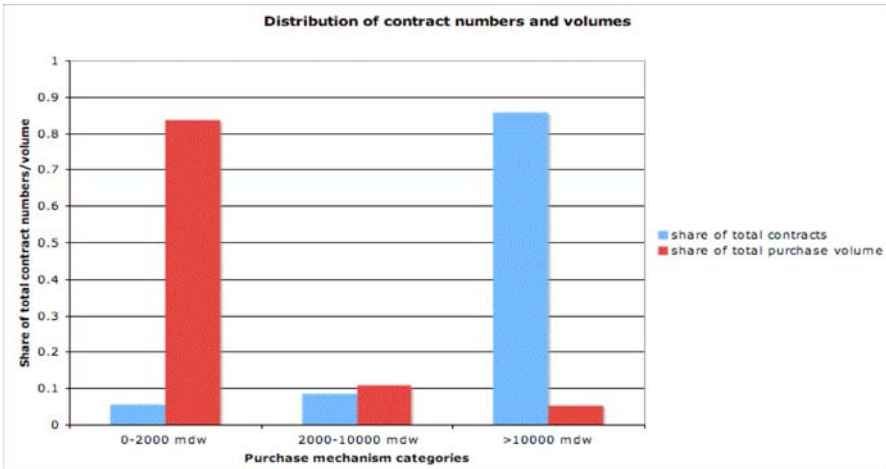

Figure 4

Firms' profits

We use annual rankings of top taxpayers published on the Ministry of Finance's web site. Firms' ranks are determined by their total payments on all taxes. Once public firms are excluded, we have this data for 748 firms in 2004, 459 firms in 2005, 482 firms in 2006, and 478 firms in 2007.

We use the information on total tax disbursement to approximate firms' profits, exploiting the fact that the tax on income gains had a flat rate of 30% in 2004, 20% in 2005 and 10% thereafter. Issues related to the inclusion of other taxes and to possibilities of evasion are discussed in the empirical section below.

Import-export data

We also include annual rankings from the Customs' *SOFIA* official data bank to complete the database. These include rankings of the full universe of importers from 2004 to 2007, including the total FOB (free on board) value imported, and rankings of the whole universe of exporters for the same period, including the CIF (cost, insurance, freight) value exported.

Institution-level corruption and efficiency indices

We introduce institution-level corruption and efficiency indices for a subset of 13 institutions in our sample. These indices were developed by the NGO Transparencia Paraguay between 2004 and 2008. The institutions are Customs, the Senate, the Ministry of Education, the Supreme Court, the Social Prevision Institute, the Ministry of Agriculture, the National Housing Council, the Ministry of Justice, the Ministry of Health, the Superior

Tribunal for Electoral Justice, the National Institute for Rural Land Development, the Public Ministry (Public Prosecutors' Office), and the Police (which falls under the Ministry of Interior). In total, this covers 15,640 of our initial observations, equivalent to 32.8% of the total.

Three of the original indices are tentative measures of corruption: the news index, which counts the number of newspaper articles referring to corruption cases involving each specific institution, published in the 3 main national newspapers each year; the control index, based on the Comptroller General's (the "contraloria") evaluation of each institution; and the trial index, summarizing the number of outstanding administrative corruption cases in any given administration. The three other indices capture dimensions of administrative efficiency: the procedure index, constructed on the basis of a field experiment in which representatives of TP realize administrative procedures in each institution and rate the efficiency of the service; the web index, based on an evaluation of the quality of the information and services available through the web sites of each institution; and the information index, constructed by addressing information requests to each institution and evaluating the timeliness and quality of the answers. We rescale all indices on a 0-10 scale, with 10 representing more corruption or lower efficiency.

The appeal of these indices is the objectivity of the criteria from which they are constructed, compared with subjective appreciations of economic agents that are likely to be endogenously determined by public information on the behavior of specific institutions, particularly regarding public procurement. In that regard, the news index is most subject to caution, as press coverage of specific institutions, based for example on journalists inquiries or on denunciations, is likely to be influenced by the nature of the institutions, their past behavior in procurement or other activities, etc. In general, we will leave this index out to mitigate these concerns, although, as we mention below, it does not significantly affect our results. Another worry is that measures such as the Comptroller General's reports may capture enforcement intensity rather than corruption. Such a concern would be especially relevant in a cross-country setting where enforcement efforts may vary across borders. However, here we consider a set of institutions under a single control unit, so variations in the Comptroller General's assessment of institutional transparency are unlikely to reflect differences in its enforcement of the rules.

Industrial Census

Finally, we use the 2003 Paraguayan Industrial Census, conducted by the

national General Directorate of Statistics, Surveys and Censuses (DGEEC). This is the most recent available of its kind, and it includes general information about a dozen different sectors in 2002 (including the number of firms, their costs and revenues, workers etc.) and more detailed data on investments in technological innovation and their outcome (new management organization, proportion of trained staff, marketing of new improved product etc.). We focus on 8 industrial sectors that match the classifications of purchased items in the procurement data. These are:

- Publicity, communication, edition,
- Food and drink,
- Office tools and stationary,
- Drugs, Hospital machinery and chemical products,
- Combustibles and lubricants, minerals,
- Furniture,
- Construction, upkeep and repairs,
- Equipment and machineries.

6 The Profitability of Firms

The model predicts that entrepreneurs doing business with public institutions are more profitable than their counterparts serving private consumers. Moreover, the most able entrepreneurs should self-select into procurement activities, as only they are efficient enough to afford both the entry cost to formality and the bribes for public officials.

The distribution of contracts amongst firms is skewed. Table 2 shows that firms actively involved in public procurement are well represented in top taxpayer rankings, suggesting a link between sales to the government and profit. Below, we examine this link formally.

	2004	2005	2006	2007
share of state providers in top taxpayers list	20.7%	23.7%	21.4%	21.8%
of which importers	91.0%	96.5%	94.2%	96.2%
of which exporters	38.7%	45.1%	46.6%	43.3%
share of importers in top taxpayers list	87.4%	96.1%	93.2%	94.6%
share of exporters in top taxpayers list	34.0%	40.5%	35.5%	37.9%

Table 2

Between 20% and 24% of the top taxpayers are also state providers. Moreover, between 91 and 97% of these major state providers are importers. As

a matter of facts, a huge majority of top taxpayers are also importers (over 87%).

6.1 Methodology

We first analyze the effect of selling to the state on firms' profits. The amount of taxes paid provides a reasonable proxy for profits because the tax rate on gains is flat and uniform in each period (30% in 2004, 20% in 2005, 10% in 2006 and 2007). While the inclusion of other taxes, in particular custom duties, introduces some noise in the mapping between profits and taxes paid, we control for total imports in all estimations to minimize this issue. Additional controls include dummies for importers and exporters, as well as the amounts exported.

The distribution of profits resulting from the available data is truncated at a strictly positive point. To estimate the determinants of firms' profits, we therefore fit a tobit estimation for each year, adjusting the level of left truncation to the lowest value of profits in the relevant sample.

Technically, the model we want to estimate is:

$$G_i = \alpha + \beta_1 V_i + \beta_2 n_i + \beta_3 M_i + X_i \beta_4 + \varepsilon, \tag{16}$$

where G_i denotes the net gains of firm i, V_i its total sales to the state and n_i the number of contracts, M_i is the total amount imported, and X_i is a vector of control variables.

However, the gains tax and a series of other taxes are amalgamated in the tax data, so we really observe:

$$T_i = xG_i + \delta_i M_i + \nu, \tag{17}$$

where $x = 0.3$ for 2004, $x = 0.2$ for 2005, and $x = 0.1$ for 2006 and 2007.

In order to obtain the firms' net gains we therefore divide the total amount paid in taxes by the corresponding tax rates. So we end up estimating:

$$T_i/x = \gamma + \lambda_1 V_i + \lambda_2 n_i + (\lambda_3 - \delta_i/x) M_i + X_i \lambda_4 + \varepsilon + \nu, \tag{18}$$

under the assumption that V_i is uncorrelated with ν.

The main concern with these estimations is that unobserved firm characteristics might be correlated both with the amount of taxes paid (and therefore the level of profits it proxies for) and with the amount sold to the

state. For example, more efficient entrepreneurs might be more successful in general, hence pay more taxes, and also win more procurement contracts. To address such issues we also perform estimations with firm-level fixed effects, exploiting the panel dimension of the data, to wash out any time invariant firm-level unobserved characteristics. Another concern is related to firm size. Indeed, bigger firms may have larger overall profits and also be in a better position to win procurement contracts. While we do not have additional firm-level data to control for such general characteristics, fixed effects will take care of this issue as long as firm size is reasonably constant over the period of study.

Ideally, we would perform a tobit fixed effect panel regression, but this method is not well defined (see Wooldridge, 2002). Moreover, because the set of firms for which we have non-zero tax data is not constant over time, there is a risk of multiple errors in measuring the variations in net gains used as dependent variable. These measurement errors can be positive (if for example a firm's tax observation is out of the sample and therefore set at zero for one year and is positive the following one), negative (in exactly the reverse case), and more generally can go either way for firms that do not make it to the ranking of top taxpayers. This practically forces us to restrict the panel to the subset of strictly positive tax observations, forming an unbalanced panel of 2167 observations for 1017 private firms.

Using this subsample, we fit standard ordinary least squares (OLS) regressions for each year separately, and fixed effects for the whole panel after adjusting for price index variations. Comparing the cross-section with the fixed effects coefficients for the explanatory variables of interest, we approximate the effect of firm-level unobserved characteristics.

6.2 Results

Looking first at the year by year tobit estimations, the results in Table 3 show that firms selling larger amounts to the public sector also make higher gains, and so do firms that deal with the government more frequently (firms that have more contracts). The results in terms of amounts are statistically significant for the 2006 and 2007 sample, while those in terms of the number of contracts are consistently significant across all four years.[35]

[35]We introduce these variables separately because they are strongly correlated. The coefficients of correlation in each year between amounts and number of contracts vary

[insert table 3 here]

Looking now at the OLS estimations in the lower panel of Table 4, we see again that in 2006 and 2007 profits increase significantly for firms that sell more to the State. We also get a positive and significant coefficient for the number of contracts in the 2006 sample. Column 5 addresses specifically the unobserved effect concern discussed above, by using the panel structure of the data. The results are striking. Both the amounts sold and the number of contracts are strongly significant, and the effects are larger than the corresponding cross-section ones, giving credit to the idea that there is a selection effect of the most talented firms towards the procurement sector.

In terms of marginal effects, in the cross-sectional results every additional Gs. sold to the state translates into an increase of between Gs. 0.04 to 0.08 in gains. Therefore in comparison with a firm that has no contracts with the government, if a firm that made sales to the state for an amount close to the sample mean (US$ 47,000) were to double these sales, it would make additional gains of between US$1,880 and US$3,760. This effect shoots up to 0.34 in the fixed effects regression, corresponding to a rate of return of procurement operations of nearly 35%.[36]

Looking now at the effect of the number of contracts, taking results for 2005, a firm realizing an additional contract would increase its profits by Gs. 150 millions (approx. US$ 30,000), while in the fixed effect regression the corresponding magnitude is Gs. 161 millions (approx. US$ 32,200).

A final concern has to do with tax evasion. Indeed, it is likely that Paraguayan firms do not report all of their sales for tax purpose. This could introduce different kinds of biases in our estimations. First, it may be the case that well-connected firms also use their influence to escape tax obligations. In this case, our estimates should be considered as a lower bound on the true returns of these firms, and the fact that we still find an effect is significant. Alternatively, one could think that sales to the State, because they are publicly registered, imply lower rates of evasion than other sales, in which case we may be facing an upward bias in our estimations. However, in this case it is worth pointing out that firms' decision to enter the rent sector (take procurement contracts) and to pay higher taxes on these operations is

between 0.12 and 0.74, significant at the 1% level, for firms that have strictly positive sales to the State.

[36] Results, available from the authors, from the sample restricted to firms making strictly positive sales to the State, yield very comparable results.

a joint one. If firms wish to do it while facing a higher effective tax rate, it means that they still find this more profitable than the alternative of staying in the private competitive sector.

Note again that these results suggest that part (but not all) of the extra returns from selling to the State are linked to firms' omitted attributes (entrepreneurial skills, efficiency, etc.), and therefore support the idea that a corrupt allocation of procurement contracts induces a misallocation of talents in the economy. The next section documents the corruption in public purchases and elucidates some of its channels.

7 Corruption and the Structure of Purchases

In this section, we address the second set of predictions, regarding the relationship between institution budget size, corruption and the size of purchases. After showing a set of institution-level correlations that corroborate the model's broad conclusions, we test for the relevance of institution-firm pairs' size of purchases in explaining the most prevalent form of irregularity in the context of Paraguayan public procurement, namely the use of exceptional purchases. Note that this mechanism amounts to putting the firm in a monopoly situation, as assumed in the model above.

The model predicts that public institutions with larger procurement budgets are involved in more bribery ($\frac{db^r}{dQ} > 0$). It also predicts that their providers get larger contracts ($\frac{dq^r}{dQ} \geq 0$). Figure 5 shows that this is indeed the case in our sample, as the average size of an institution's contracts is clearly increasing in its total budget.

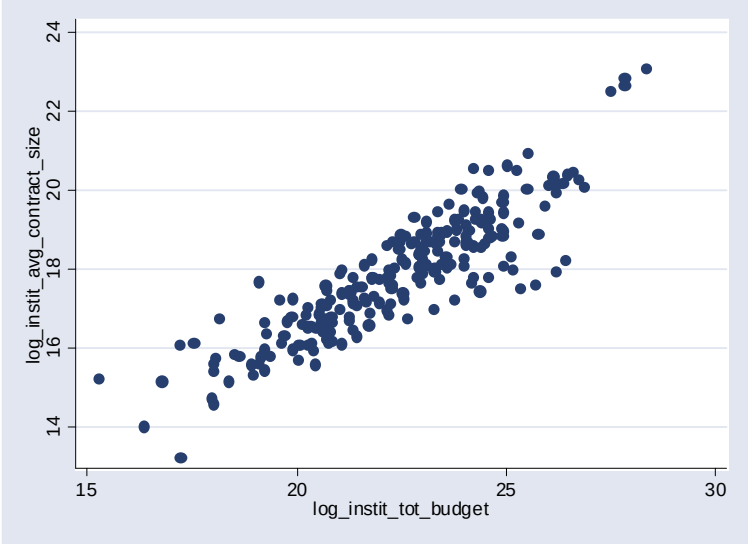

Figure 5

Table 4 displays the empirical correlations along these two dimensions for 230 institution-year pairs, as well as institutional quality indices. The correlation between the total amount procured by institution-year and the average size of the contracts is positive (0.95) and strongly significant, indicating that institutions with bigger budgets do indeed offer larger lots to their providers. Moreover, for the subset of institutions for which they are available, average indexes of corruption and efficiency (computed as the arithmetic mean of the respective indices defined above) display the expected correlations with total institutional budget. A positive correlation is found with the average corruption index, supporting the idea that large buyers are more corrupt, while the correlation with the efficiency index is negative, indicating that these institutions also tend to be slightly more efficient.

		Average contract size	Corruption measures	Efficiency measures
Institution total budget		0.95[a]	0.19	-0.003
	N	230	37	37

[a] Significant at the 1% level.

Table 4

To document more precisely the link between concentration and corruption in procurement, we now turn to an econometric analysis of the determinants of exceptional purchases.

7.1 Methodology

Purchases made through the "exceptional" procedure are very frequent and amount to nearly 17.3% of the total procurement spending over the period. Looking at specific goods, one can see for example that during 2004 and 2005 public firms awarded close to 90% of their publicity contracts through exceptions. As for specific institution, the Office of the First Lady spent respectively 40% and 93% of its budget in these two years using the exceptional mechanism. Similarly, the Superior Tribunal of Electoral Justice channeled 23% of its total 2006 spending through exceptions, while for the public enterprise "Cañas Paraguayas"[37] the corresponding figure was 59%. In 2007, an electoral year, the Presidency spent 16% of its budget through exceptional contracts. In all these cases, it is difficult to argue that the use of the exception responded either to situations of emergency or to non-competitive markets.

As mentioned above, there has been a steady decrease in the use of the exception, from 23% of total spending in 2004-2005 to 13.6% in 2006-2007. This is a noteworthy trend, which we briefly address further, but is not our primary interest here. Instead, we want to investigate systematically what determines the use of exceptions. To do so, we collapse the time component of the procurement data and exploit cross sectional variations at the firm-institution level over the entire 2004-2007 period.

Each of the 47,615 individual purchases corresponds to a pair ij composed of a firm i and an institution j. The data set includes 73 institutions and 5517 firms, and in total there are 13,693 different "active" pairs, with an average number of contracts equal to 3.5 (std. dev. of 10.5), a minimum of 1 (for 7215 pairs) and a maximum of 460.

The first model that we estimate is:

$$exc_{ijk} = 1[exc^* = \theta_i + \theta_j + \theta_k + X_{ij}\beta + \varepsilon_{ijk} < 0], \tag{19}$$

where 1[.] is an indicator function equal to 1 if the statement in brackets is true, exc is a binary variable equal to 1 if the contract is made through the exception, $\theta's$ are firms (i), institutions (j), and goods (k) fixed effects, and X_{ij} is a vector of characteristics for each specific firm/institution pair. This includes the total value (labelled $firm\_instit\_val$ in the output) and total number ($firm\_instit\_num$) of that pair's transactions, the

[37] The State alcohol-producing firm.

share of the institution's transactions done with that particular provider as a percentage of the total number ($instit\_firm\_num\_share$) and total value ($instit\_firm\_val\_share$) of its purchases, as well as the share of the firms's transactions done with that particular institution as a percentage of the total number ($firm\_instit\_num\_share$) and total value ($firm\_instit\_val\_share$) of its sales to the State.

The inclusion of fixed effects allows us to capture any systematic determinant of the exceptional purchase that would correspond to characteristics of the firms (competitive advantage, exclusive dealing on a specific good), the goods (patented or monopolistic goods) and the institutions (specifically dedicated to attend emergencies, involved in defense deals, etc.). Once these fixed effects are introduced, we expect no additional features to be significant. In particular, we want to test whether specific characteristics of the links between firms and institutions have an impact on the likelihood that an exceptional mechanism is used, and inquire whether this constitutes evidence of favoritism.

We use a linear probability model to estimate the model above. The inclusion of fixed effects prevents us from using a probit estimation, while a conditional logit would imply eliminating any pair for which there is no within variation, therefore reducing the final sample by approximately half.[38]

7.2 Results

Table 5 contains the results from six different specifications, each including one of the X_{ij} variables to mitigate multicollinearity concerns, since they are strongly correlated with each other.

[insert Table 5 here]

The overall results strongly support the idea that firm-institution pairs that do more business together also use the exceptional purchase mechanism more often. Doing more business together must be understood here both in terms of absolute amounts and number of contracts, and in terms of the shares of the total activities of firms and institutions. It is important to stress again that this result holds once unobserved characteristics of the firms, institutions and goods purchased are controlled for.

[38] Note that we still obtain similar results in this case.

To get an idea of the magnitude of the effects, consider for example the coefficient for $instit\_firm\_val\_share$ in column (6). It implies that an institution that allocates to a particular firm a fraction of its total procurement volume equal to one standard deviation above the sample mean (that is 3.8% of its portfolio rather than 0.9%, which in case of equal lots would mean sharing it between 26 firms rather than 111), makes use of the exception for approximately 22.3% of its contracts with that particular firm, compared to 17.3% for the average pair. A pair with a volume of contracts two standard deviations above the sample mean (that is 6.7% of the institution's portfolio rather than 0.9%, which in case of equal lots would mean sharing it between 15 firms rather than 111), would use the exception for 27.4% of its contracts.

Although the results that frequent interactions lead to more contracts through the exception can be attributed to a pattern of irregular contracting, alternative interpretations are plausible. Indeed, one could argue first that a "reputation" effect is at play. In circumstances where public institutions need to use exceptional mechanisms, for example because of some social emergency, they naturally turn to firms they have had frequent interactions with, because they know these are more reliable. Yet another explanation would involve simple inefficiency, or passive waste as Bandiera et al. (2008) document in the case of public procurement in Italy. Here, the argument is that procurement officials may simply award contracts to firms that are already known to them, because they do not internalize the new rules (they may be badly informed about the regulations and fail to respect deadlines or to advertise the calls for applications) or because they are lazy and it is the solution that requires less effort.

To evaluate both the "reputation" and the "efficiency" arguments and compare them to the "corruption" story, we need additional empirical elements. To this end, we use the institution-level corruption and efficiency indices described in the data section. In particular, following our previous discussion, we measure corruption with a synthetic index equal to the arithmetic mean of the two original indices that are not subject to endogeneity worries, namely the evaluations based on the Comptroller General's report and on the number of administrative indictments in any given institution.[39]

To disentangle favoritism from reputation, we introduce the following specification:

[39] However, using the news index yields very similar results.

$$exc_{ijk} = 1[exc^* = \theta_i + \theta_j + \theta_k + X_{ij}\beta_1 + (X_{ij} * Inst\,Index_j)\,\beta_2 + \varepsilon_{ijk} < 0]. \quad (20)$$

If the corruption story is relevant, we expect β_2 to be positive. The effect of efficiency is less clear-cut: for example β_2 would be positive if it leads officials to allocate contracts to firms they already deal with (a "laziness" effect) but negative if that prevents them from justifiably relying on firms' reputation. Moreover, we expect irregular practices and inefficiencies to be especially prevalent in the first years after the enactment of the law. In 2006, Transparencia Paraguay published a report with descriptive statistics on each institution's procurement operations. The focus of this report was the excessive use of exceptional procedures, which was clearly identified as one of the main irregularities in the procurement process. The report was given ample coverage in the local media and through public presentations. We expect that, as a result, officials in charge of procurement in public institutions would have become more cautious in the use of this procedure, consistently with the marked decrease observed in the average amount of exceptional purchases. For these reasons, we split the data into two samples and run separate estimations for 2004-2005 and 2006-2007.

[insert Table 6 here]

The results from 2004-2005 in panel 1 of Table 6 strongly support the corruption hypothesis. In all 6 specifications, β_2 is positive and significant, while β_1 is now systematically negative (and significant in 4 cases). This confirms that the link between frequent interactions and exceptional purchases is explained by corruption. For example, comparing the coefficient in column 6 with the result from Table 5 discussed above, we see that an institution that is at the top of the corrupt scale (10) and allocates to a particular firm a fraction of its total procurement volume equal to one standard deviation above the sample mean, now has 470% more contracts by exception than the sample mean, i.e. it would use it for 81% of its total purchases with that firm. On the other hand, if an institution were perfectly free of corruption (index of 0), the probability that it uses the exceptional purchase mechanism would now be smaller with firms with which it interacts more frequently. Consistently with our learning/public scrutiny stories, the variables measuring firm-institutions frequency of interactions are much less significant for the years 2006-2007, and the corruption effect also disappears.[40]

[40] Results, not shown here to save space, are available from the authors.

Finally, the effect of institutional inefficiency in panel 2 of Table 6 is interesting, as it is systematically negative and significant in 5 out of 6 cases. The fact that it has the opposite sign to the corruption index suggests that inefficiency introduces noise in the procurement process, dampening the role of corruption. If anything, institutional inefficiency therefore leads to smaller average procurement contracts, weakening what we found to be a crucial channel for corrupt favoritism. As in Bandiera et al (2008), greater inefficiency does not necessarily imply more corruption.

8 Economy-wide impact of rent-seeking

We have illustrated the common view that rent-seeking is costly to development, by showing how entrepreneurs' economic incentives are distorted toward unproductive activities as the result of favoritism in the allocation of public contracts in Paraguay. After building an industrial organization model of entrepreneurial choices, we have used a large scale microeconomic database including all public procurement operations over a 4 year period to test the predictions of the model. In particular, we have shown that state providers are more profitable than other firms, even when controlling for their unobserved characteristics, and more importantly that the most able ones disproportionately end up being State providers. We have also documented the fact that institutions with larger budgets are endogenously more corrupt, that these corrupt practices go hand in hand with a greater average size of contracts with the providers, and presented micro-evidence on the actual channels of rent provision through public procurement. Specifically, in Paraguay a firm has a greater probability of obtaining a contract directly through an exceptional procedure from an institution with which it has a strong contractual relation, both in terms of the total value and frequency of transactions, particularly when dealing with more corrupt State entities.

In terms of economy-wide effects, three general predictions emerged from the model. While it is beyond the possibility of the paper to formally test these predictions, we provide some suggestive stylized facts consistent with these implications by combining data from our procurement database, the latest industrial census and some long term macroeconomic figures.

First, in sectors producing goods procured more intensively by more corrupt institutions, the formal productive sector shrinks. Secondly, sectors in which a large fraction of production is sold to the government are charac-

terized by less competition. Supportive evidence can be found in the most recent industrial survey (2003) conducted by the Paraguayan General Directorate of Statistics, Surveys and Censuses (DGEEC). This survey shows the low degree of development of the Paraguayan industry: it identified only 476 manufacturing firms of 20 employees or more, representing a total of at most 90,000 workers (0.45% of the economically active population). We construct a sector-level Herfindahl-Hirschman Index (HHI) that measures the concentration of revenue across firms, to proxy for the degree of competition in a sector.[41] Correlations between this HHI, the size of total procurement demand as a share of sector revenue, and the share of a sector's production in public institutions' total purchases[42], are significant: sectors for which total procurement demand represents a larger share of sector revenue are significantly more concentrated (correlation coefficient of 0.23, significant at the 1% level), and so are sectors in which institutions spend a larger average share of their procurement budget (correlation coefficient of 0.27, significant at the 1% level).

Finally, aggregate production is depressed and prices inflated in sectors more exposed to corrupt public intervention, as the more productive entrepreneurs self-select into the rent sector. Over the long run, the Paraguayan industry has performed very poorly. It represented over 17% of GDP in the 1970s, but less than 14% of GDP in the mid 2000s, and this despite recurrent bailouts of virtually bankrupt firms. In the period 1997-2006, the manufacturing sector grew only at a annual rate of 1.8%, and this goes down to 0.9% if the meat and vegetable oil productions, which correspond mostly to exports of scarcely processed products, are excluded. The Paraguayan entrepreneurial class is in its overwhelming majority imports-oriented (as Table 2 shows, over 90% of the top 500 taxpayers are importers). Over the decade 1996-2005, the commercial balance displayed an average deficit of 8.5% of GDP. Large rents linked to the resale of imported goods to the State, the existence of a flourishing and illegal reexportation business to the neighbors

[41] The sector-level HHI is the sum of the squares of firms' shares of total revenue within each particular sector. Data limitations lead us to compute a "group-averaged" index by summing the average squared shares of total revenue of large (20+ employees), medium (11 to 19 employees) and small (1 to 10) firms.

[42] Specifically, these two measures are computed as (total public spending in sector k / total revenues of sector k), and the average of (total spending of institution j in sector k / total spending of institution j) over the set of the 73 institutions, respectively.

Brazil and Argentina,[43] and the historical absence of a import-substitution strategy have all contributed to make Paraguay one of the most open and less industrialized economy in South America as, apart from the soybean and meat sectors, its entrepreneurs have systematically specialized in commercial intermediation rather than in production.

The costs of this industrial atrophy and biased specialization are in part reflected in the poor record of economic growth that we mentioned in Section 3. After a period of significant growth in the 1970s and early 1980s, linked in particular to the massive construction projects including the hydroelectric dams, the rate of growth of per capita income was only 0.8% in the 1980s and strictly negative after that. Over the last two decades, the Paraguayan Central Bank indicates that 92% of growth fluctuations were due directly to fluctuation in agricultural production and exports. As a result, per capita income was lower in real terms in 2005 than it was at the beginning of the 1980s.

Our analysis thus leads us to conclude that arbitrary public interference through procurement in certain productive sectors has played an important part in distorting the industrial structure of Paraguay, with significant costs in terms of economic growth. This overall picture embodies the consequences of a systematic misallocation of talents à la Murphy et al. (1991), where the more productive entrepreneurs end up in a sector sheltered from competition, where heterogeneous levels of productivity coexist and there is no incentive for innovation and no convergence towards some efficiency frontier. In that sense, rent-seeking is particularly costly because it destroys the development potential of the best entrepreneurs. Finally, the existence of the huge exogenous source of rent from hydroelectric dams implied that successive governments did not have to worry about preserving a healthy productive sector from which they could raise taxes to finance their activities. This certainly had a reinforcing effect on the corrupt behavior of public institutions, since these were never at risk of undermining seriously their resource base.[44]

[43] See Masi (2007) and Straub (1998) for more details on this.

[44] This is an often neglected effect of resource abundance, that we address in a related paper (Auriol and Straub, 2009).

9 Appendix

Proof of proposition 1

The traditional method of production is less efficient than the modern method, so in the absence of entry fee the informal sector disappears. Indeed, when $F = 0$, the best technology prevails so that in equilibrium $p^* = \underline{c} = 0$ and $q^* = A$. However this outcome is upset when $F > 0$, as firms need a mark-up to cover F. More generally let $c \in [\underline{c}, \overline{c}]$. Under competitive pressure the smallest possible price compatible with a firm breaking even is so that $(p - \underline{c})D(p) = F$. Setting $\underline{c} = 0$ and $D(p) = A - p$ yield $p(A - p) = F$. Solving this second order equation in p we obtain $p^{f*} = A/2 - \sqrt{A^2/4 - F}$. Proposition 1 follows. QED

Proof of proposition 2

Since by virtue of equation (9), $\frac{dc^r(b)}{db} < 0$ and $\frac{d^2c^r(b)}{db^2} = 0$, it is easy to check that EB defined equation (11) is concave in b: $\frac{d^2EB}{db^2} = 4c'(b)(1 - \frac{c^r(b)}{\overline{c}}) - 2b\frac{c'(b)^2}{\overline{c}} < 0$. Hence the function (12) admits an interior solution. Let $x = \frac{F}{Q\overline{c}}$. Substituting $c^r(b)$ by its value from (8) and $\frac{dc^r(b)}{db}$ by its value from (9) yields in equation (12): $(1 + x)(1 - b) + (x + b)(1 - 3b) = 0$. Solving this second degree equation in b yields the result in proposition 2. One can then check that $3\frac{db^r(x)}{dx} = \frac{4x+3}{\sqrt{6x+4x^2+3}} - 2$. Since $\frac{4x+3}{\sqrt{6x+4x^2+3}}$ is strictly increasing in x, a sufficient condition for $b^r(x)$ to be decreasing in $x \in [0, 1]$ is that $\frac{db^r(x)}{dx}$ is negative at $x = 1$: $\frac{db^r(x)}{dx} \mid_{x=1} = -0.0195$. QED

Proof of proposition 3.

Let $x = \frac{F}{Q\overline{c}}$. Substituting $b^r(x)$ from equation (13) in equation (8) yields $c^r(x)$ as defined equation (14). In the formal productive sector, under the pressure of competition the best available technology prevails. The price in the formal economy is such that $(p - c^r(x))D(p) = F$ which is equivalent to $(p - c^r(x))(A - p) = F$. Substituting (14) in this equation yields: $-p^2 + [A + c^r(x)]p - [F + Ac^r(x)] = 0$. Solving this second degree equation in p yields the value of the price in the formal sector (i.e., the lowest roots): $p^f = \frac{1}{2}\Big[A + c^r(x) - \sqrt{[A - c^r(x)]^2 - 4F}\Big]$. Finally the formal productive sector prevails in equilibrium if and only if $p^f \leq p^I = \overline{c}$. One can check that this is equivalent to equation (15).

Classification of goods

Following the classification used on the DNCP web site, we categorize the goods and services purchased in the following 16 groups:

1- Transport
2- Upkeep of equipment, vehicles, spare parts, etc.
3- General services and qualifications (courses, training...)
4- Rentals (offices, sheds, sound or computer equipment...)
5- Consultancy (audit, judicial advisory...)
6- Insurance
7- Publicity and communication
8- Food
9- Office tools and stationary
10- Drugs and Hospital machinery
11- Fuel and lubricants, minerals
12- Furniture
13- Construction, upkeep and repairs
14- Equipment and machinery
15- Informatics
16- Other

Legal requirements for public procurement purchases

The 2.051/03 law of Public Procurement aims to promote competition among state providers and transparency in the procurement process. To this end, it regulates purchases differently according to their value, so that the loss in efficiency caused by extra regulation is proportional to the diminished risk of bribery or corruption.

The largest contracts are made through a Public Tendering. Calls for offers on such contracts must be published in the national press for a minimum of three days on top of the usual publication in the official newsletter and web site. The requirements and criteria for evaluation must be restricted to technically indispensable requisites. Grounds for disqualification must concern the failure to comply with substantial requisites, such as threatening the legality or solvency of the proposal. In this way calculus mistakes or mistakes in the layout of the offer, which were often used to justify dismissal of an offer are no longer considered valid grounds. If two or more offers comply with the technical requirements the offer with the lowest price wins. Bids and the winning offer are published on the web site.

The competitive bidding process does not require a call for offers in the national press. However five different firms have to make offers and the call must be published on the web for any further firm who might qualify to participate in the bidding.

When the value of the contract does not reach 2,000 mdw, the contracting institution can allocate the contract directly to a firm without organizing an auction. It must however have published the call on the official web site and have received at least three official offers from different firms. In order to bypass these costly administrative procedures in cases of contracts worth less than 20 mdw a 'fixed funds' mechanism was created to allow institutions to purchase directly from a single supplier without justification. For larger contracts, the exceptional purchase mechanism described in the text was created. Under this regime, institutions can purchase as much as they want from a firm of their choice. The law stipulates that a report explaining the reasons of the purchase and justifying the choice of provider should be supplied to the national watchdog within a month after the date of purchase. In practice, this is rarely done.

Table A1 summarizes the evolution of the Paraguayan minimum daily wage, the Guarani/US$ exchange rate, and the value of the thresholds defined above in US$.

	Until April 2004	**April 2004 to March 2006**	**March 2006 to September 2007**	**Since September 2007**
Mdw in Gs.	Gs. 37,401	Gs. 41,889	Gs. 46,915	Gs. 51,607
Mdw in US$	6.28	6.78 - 7.47	8.37 - 9.34	10.28
Exchange rate bounds	1$ = Gs. 5,955	Gs. 5,608 < 1$ < Gs. 6,178	Gs. 5,021 < 1$ < Gs. 5,608	1$ = Gs. 5,021
		Procurement thresholds (US$)		
20 mdw	125.6	135.6 – 149.4	167.4 – 186.8	205.6
2,000 mdw	12,560	13,560 – 14,940	16,740 – 18,680	20,560
10,000 mdw	62,800	67,800 – 74,700	83,700 – 93,400	100,280

Note: Average exchange rate provided by BCP (Paraguay Central Bank), 1US$ = Gs. 5955 in 2004, 1 US$ = Gs.6178 in 2005, 1US$ = Gs. 5608 in 2006, 1 US$ = Gs.5021 in 2007.

Table A1

Panel 1

	(1)	(2)	(3)	(4)
	Tobit	**Tobit**	**Tobit**	**Tobit**
	Gains 2004	**Gains 2005**	**Gains 2006**	**Gains 2007**
Amounts contracts 2004	0.005			
	(0.007)			
Amounts contracts 2005		0.015		
		(0.013)		
Amounts contracts 2006			0.066	
			(0.023)***	
Amounts contracts 2007				0.036
				(0.017)**
Observations	15004	15004	15004	15004
Number contracts 2004	17.809			
	(6.894)***			
Number contracts 2005		22.968		
		(13.916)*		
Number contracts 2006			202.933	
			(38.074)***	
Number contracts 2007				219.630
				(44.711)***
Observations	15004	15004	15004	15004

Panel 2

	(1)	(2)	(3)	(4)	(5)
	OLS	**OLS**	**OLS**	**OLS**	**Fixed effect 2004-07**
	Gains 2004	**Gains 2005**	**Gains 2006**	**Gains 2007**	**Gains**
Amounts contracts 2004	-0.010				
	(0.023)				
Amounts contracts 2005		-0.026			
		(0.030)			
Amounts contracts 2006			0.043		
			(0.004)***		
Amounts contracts 2007				0.079	
				(0.013)***	
Amounts contracts					0.343
					(0.117)***
Observations	748	459	482	478	2167
R-squared	0.27	0.52	0.18	0.28	0.12
Number contracts 2004	4.413				
	(7.369)				
Number contracts 2005		-4.305			
		(13.770)			
Number contracts 2006			149.560		
			(85.210)*		
Number contracts 2007				232.508	
				(157.457)	
Number contracts					161.772
					(67.134)**
Observations	748	459	482	478	2167
R-squared	0.27	0.52	0.18	0.27	0.12

Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 3

	(1)	(2)	(3)	(4)	(5)	(6)
	Exc. purchase	**Exc. purchase**	**Exc. purchase**	**Exc. purchase**	**Exc. purchase**	**Exc. purchase**
firm_instit_num	0.000					
	(0.000)					
firm_instit_num_share		0.037				
		(0.013)***				
instit_firm_num_share			0.235			
			(0.186)			
firm_instit_val				0.000		
				(0.000)		
firm_instit_val_share					0.045	
					(0.006)***	
instit_firm_val_share						0.291
						(0.114)**
Firms F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Instit. F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Goods F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	47615	47615	47615	47615	47615	47615
R-squared	0.52	0.52	0.52	0.52	0.52	0.52

Robust standard errors in parentheses, clustered at the institution level. * significant at 10%;
** significant at 5%; *** significant at 1%.

Table 5

Panel 1	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	Exc. Purch.	**Exc. Purch.**	**Exc. Purch.**	**Exc. Purch.**	**Exc. Purch.**	**Exc. Purch.**
firm_instit_num	-0.009					
	(0.005)*					
numij_corrupt	0.002					
	(0.001)**					
firm_instit_num_share		-0.334				
		(0.192)*				
sharei_numij_corrupt		0.107				
		(0.035)***				
instit_firm_num_share			-5.889			
			(4.107)			
sharej_numij_corrupt			1.858			
			(0.695)***			
firm_instit_val				-0.085		
				(0.044)*		
valij_corrupt				0.027		
				(0.009)***		
firm_instit_val_share					-0.376	
					(0.136)***	
sharei_valij_corrupt					0.087	
					(0.029)***	
instit_firm_val_share						-1.542
						(1.306)
sharej_valij_corrupt						0.624
						(0.301)**
Firms F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Instit. F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Goods F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3474	3474	3474	3474	3474	3474
R-squared	0.60	0.61	0.60	0.61	0.61	0.60
Panel 2	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	Exc. Purch.	**Exc. Purch.**	**Exc. Purch.**	**Exc. Purch.**	**Exc. Purch.**	**Exc. Purch.**
firm_instit_num	0.003					
	(0.001)**					
numij_effic	-0.000					
	(0.000)*					
firm_instit_num_share		0.654				
		(0.186)***				
sharei_numij_effic		-0.086				
		(0.024)***				
instit_firm_num_share			5.603			
			(2.663)**			
sharej_numij_effic			-0.488			
			(0.473)			
firm_instit_val				0.178		
				(0.057)***		
valij_effic				-0.019		
				(0.007)***		
firm_instit_val_share					0.512	
					(0.186)***	
sharei_valij_effic					-0.076	
					(0.021)***	
instit_firm_val_share						4.040
						(1.720)**
sharej_valij_effic						-0.677
						(0.309)**
Firms F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Instit. F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Goods F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3474	3474	3474	3474	3474	3474
R-squared	0.60	0.61	0.60	0.61	0.61	0.60

Robust standard errors in parentheses, clustered at the institution level. * significant at 10%;
** significant at 5%; *** significant at 1%.

Table 6

10 References

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