Public Procurement and Rent-Seeking: The Case of Paraguay

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Abstract

A model of entrepreneurial choices in an economy with a corrupt public procurement sector is built, providing predictions along two dimensions. First, corrupt public institutions operate by offering contracts without competition and more corrupt entities channel larger share of their budget in this way. Second, these firms enjoy extra returns, so that procurement related activities attract the best entrepreneurs. A large scale microeconomic database, including all public procurement operations over a 4 year period in Paraguay, amounting annually to approximately 6% of the country's GDP, is then used to corroborate these predictions.

keywords: Procurement, Corruption, Rent-seeking, Development

JEL codes: H57, D73, D72, O5

1   Introduction

Public procurement of goods and services is one of the main areas at risk of corruption in developing countries where regulations and legal enforcement are weak. On top of the static cost of corruption and fund embezzlement, systematic departures from competition in the attribution of public markets are likely to have a devastating impact on economic agents' incentives and as a result on 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 the set of incentives facing potential entrepreneurs is biased towards unproductive activities.

To guide the analysis, we model the choice of formal entrepreneurs with idiosyncratic cost levels, between serving private consumers competitively, or joining a rent-seeking sector, 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 bribes. We derive from the model two main sets of predictions that are sustained by the data, revealing the following story.

First, we establish that in Paraguay the main channel for corruption in procurement is the systematic use of an "exceptional" purchase mechanism, which bypasses legally required minimum standards of transparency and competition and is used much more frequently than what should be expected from international best practice. Using the whole panel dimension of the data, we show that this type of corruption is used more by institutions-firms pairs that trade repeatedly and in large volumes. Moreover, we exploit a natural experiment, linked to an exogenous change in public monitoring following the widely publicized release midway through our period of study of an NGO report flagging up exception as a key channel for corruption, and show that its use decreased significantly for these pairs boasting frequent interactions. Finally, we also provide evidence that this channel dominates other more "traditional" ways to rig procurement contracts, such as the breaking down of lots in amounts that escape the obligation for open tenders.

Second, this implies that firms making more business with the State, those in the so-called rent sectors, enjoy above normal rates of return and are the most efficient ones. We provide evidence of these two aspects, by showing that firms selling more to the public sector, as well as those selling more through the exception channel, have higher profit margins, despite the fact that they trade mostly in standard goods and should face competition for the market.

As a result, public intervention in markets distort firms' incentives by inducing additional entry in activities with an important procurement component. To the extent that this self-selection process pushes some of the best potential entrepreneurs towards rent sectors, it generates a misallocation of talents across the economy. Indeed, we document this strong selection bias by exploiting an original econometric strategy using firms' names.

The paper concludes that in the case of Paraguay, the release of the 2006 TI report and the subsequent change in exposition to public scrutiny had an important positive impact on the overall efficiency of the public procurement process. As it made obvious the involvement of the civil society in monitoring the use of public funds, and spurred an increase in the interest of the media, it generated a change in the behavior of the public sector with respect to the use of exceptional procedures, especially so where the use of exception was motivated by corrupt deals.

The rest of the paper is structured as follows. Section 2 reviews the main strands of related literature and spells out the contributions of the paper. Section 3 describes the Paraguayan institutional environment and reviews procurement practices over our period of study. Section 4 develops the model and derives empirical predictions. Section 5 presents the data. Sections 6 and 7 present the results related to the two main sets of theoretical predictions, and Section 8 concludes.

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 such as Tullock (1967; 1971), Buchanan (1980), Krueger (1974) and Baghwati (1982), 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 directed to rent-abundant sectors (such as those stemming from political favors, corruption or exploitation of natural resources), while investments in innovative activities, which have greater growth potential, become relatively less attractive and are discouraged. As supporting empirical evidence, Murphy et al. (1991) 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 historical accounts from Rome, Ancient China and the Middle Ages.

To date, there is still limited micro-evidence on the actual channels and

consequences of rent-seeking in developing economies. Following Fisman's (2001) seminal contribution, some papers have stressed the performance premium of connected firms (Hellman, Jones and Kaufmann, 2003; Fries, Lysenko and Polanec, 2003; Slinko, Yakovlev and Zhuravskaya, 2004). Other contributions have documented the importance of political connections in securing access to key economic inputs, such as credit (Li, Meng, Wang and Zhou, 2008; Khwaja and Mian, 2005), tax advantages or foreign exchange (Hsieh, Miguel, Ortega and Rodriguez, 2011), or favorable regulations (Agrawal and Knoeber, 2001). 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.[2]

A few contributions have dealt specifically with public procurement. Hyytinen, Lundberg and Toinaven (2007), who study the effects of politics on municipal cleaning contracts in Sweden, show that the lowest bidder does not win 58% of the time and that the choice of the winner is subject to political considerations; Goldman, Rocholl and So (2013) show that US companies connected, through the composition of their boards, to the winning party in both legislative and presidential elections (in 1994 and 2000) are significantly more likely to have experienced an increase in procurement contracts. References dealing explicitly with corruption include Di Tella and Schargrodsky (2003), who document the impact of a crackdown on corruption in Argentinean hospitals, and Bandiera, Prat and Valletti (2009), 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 latter, and Mironov and Zhuravskaya (2012), who analyze the link between corrupt procurement and campaign financing in Russia. Relatedly, Davis (2004), and Deiniger and Mpuga (2004) analyze the impact of corruption on public service delivery in South Africa and Uganda respectively.

With respect to this literature, our paper provides two main 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.[3] We provide evidence of the distortive effects of rent-seeking in terms of economic efficiency, by showing that it implies an inefficient specialization of the more able entrepreneurs in imports and procurement activities. Second, we document one of the most prevalent channels of corruption in procurement activity, namely the use of purchase mechanisms circumventing standard competitive rules, and uncover the economic characteristics of the institutions and sectors more prone to it.

3   Rent-Seeking and Corruption in Paraguayan Procurement

Paraguay is considered to be one of the most corrupt countries in the world.[4] Our period of study is part of a non-interrupted 61 years spell, including the 1954-1989 Stroessner dictatorship, in which the Colorado party governed the country. At the heart of the system was the distribution of public employment and contracts to its supporters, and the exclusion of its opposition.[5] An important channel for corruption, which we focus on here, was the allocation of public contracts to firms that in most cases were created with the sole purpose of supplying the state, often by selling a wide variety of imported goods. As a result of the ample anecdotal evidence of corruption in public procurement, and 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 intention of promoting transparency and efficiency in public purchases. The most significant of its provisions were the creation of a public procurement watchdog (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.

There are strong indications however that improvements in the regulatory framework did not translate quickly into cleaner procurement practices, partly because many officials did not comply with the new law and the wrong-doings continued. The main mechanism through which firms were favored is the use of the exceptional purchase mechanism, by which specific regulations, such as the obligation to organize public tenders above certain amounts, were disregarded (see details in Section 5 below). In 2006, Transparencia Paraguay (TP), the local chapter of Transparency International, published an extensive report sponsored by the Inter-American Development Bank (IDB) focusing on the excessive use of exceptional procedures, which was clearly identified as one of the main irregularities in the procurement process.[6] The Electricity State-owned enterprise ANDE has for instance been pointed out for buying large numbers of electric transformers in this way over the years, despite the fact that these are routinely required by the firm for network repairs. Firm officials recognize that this practice usually generates excess pricing of between 17 and 27%.[7]

Because the report was given ample coverage in the local media and through public presentations, and its recommendations were subsequently relayed by the IDB-World Bank Paraguayan public procurement evaluation panel, the officials in charge of procurement in public institutions and firms became more cautious. Indeed, in 2004 and 2005 purchases made through the "exceptional" procedure amounted to nearly 24% of the total procurement spending. In the period 2006-2007 the share of purchases made through

the "exceptional" procedure decreased to 13%. We exploit this "natural experiment", by showing that the specific pairs of institutions and firms that we identify as irregularly using exception in the first subperiod, subsequently experienced the largest reduction in its use.

The next Section builds a model of corrupt procurement, from which we derive predictions that we exploit to conduct an empirical analysis of corruption in public purchases in Paraguay.

4 The Model

The model focuses on the formal sector of the economy as formal firms are the only ones allowed to compete for public markets. The production functions involve constant returns to scale technologies.[8] The cost function of a producer operating in the formal sector is $C(q) = cq$, where by assumption

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

Entrepreneurs in the formal sector have the choice between procuring commodities for the public sector, where, as corruption prevails, they make rents, or doing business in the private sector where they serve consumers competitively. As a benchmark, we first briefly discuss the corruption-free equilibrium. In the absence of rent-seeking opportunities, entrepreneurs serve market demand competitively and make no rents. Competitive pressure helps to select the best available technology so that in equilibrium the price equates the lowest marginal cost, $p^* = 0$, and quantities traded in the private sector

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are $D(p^*)$. Welfare is maximized.

Rent-Seeking: We now turn to the case, denoted by the superscript r, where corruption prevails in public purchase. While in practice corruption and bribes are not observed, the model based on assuming the existence of corruption will generate a number of testable predictions discussed below.

Optimal procurement rules specify that for large purchase above given thresholds it is mandatory to organize a competitive tender (see Auriol 2006), and to advertise the calls to encourage submissions by firms. In practice it is not always possible to organize a competitive tender, for instance because the commodity is patented, or there is an emergency. To deal with these specifics cases, public procurement rules include an "exceptional purchase" procedure. When they rely on this type of procedure, public purchasers are able to bypass the competition phase. This is the easiest way to favor a firm in exchange of a bribe. Auriol (2006) shows that for large purchases a corrupted procurement official favors limited tendering procedures (i.e., exceptional purchase), thereby maximizing the price of the purchase and his bribe.[9] We thus expect corrupt Paraguayan public institutions to rely on the exceptional purchase mechanism to collect bribes over large purchases.

Firms selection in the rent sector: The public purchaser chooses how many firms should be included in the rent sector and creates a lot for each of them out of his/her total budget. A firm invited to procure one of these lots through exceptional purchase is in a monopoly position. It can ask for the highest possible unit price $\bar{c}$. In the rent sector a contract of size $q > 0$

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hence costs $\bar{c}q$. The government officials choose $b \in [0, 1]$, the share of $\bar{c}q$ they take as a bribe in exchange for giving this market to a firm without competition.[10] We deduce that, in the rent sector, the profit of a firm with cost $c \in [0, \bar{c}]$ and lot size $q > 0$ is:

$$\Pi(c) = q(\bar{c} - c) - b\bar{c}q \tag{1}$$

To access the rent sector the firm must pay $b\bar{c}q$. Since $b\bar{c}q$ is independent of the cost of the firm, the bribe is equivalent to a fixed cost which screens out the less efficient firms. Let $c^r(b) \in [0, \bar{c}]$ denotes the firm that is just indifferent between the rent and the private sector: $\Pi(c^r(b)) = 0$. Since the bribe is a fraction of the market value (i.e., it is linear in $\bar{c}q$), the value $c^r(b)$ is independent of q. It is straightforward to check that

$$c^r(b) = \bar{c}\,(1 - b). \tag{2}$$

We deduce that if $c < c^r(b)$ then $\Pi(c) = q[c^r(b) - c] > 0$. In the public sector rents are made and different types of firms coexist because corruption creates artificial barriers to entry. By contrast entrepreneurs with costs higher than $c^r(b)$ would make a loss, and so prefer to serve private demand. It is intuitive that the share of firms in the rent sector, $\frac{c^r(b)}{\bar{c}} = 1 - b < 1$, decreases with b. The more greedy government representatives are, the more profitable firms need to be to do business with them: they need to be able to cover their cost plus the bribes and still make non-negative profit.

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Optimal bribe rate: By choosing $b \in [0,1]$ the public purchaser chooses how many firms enter the rent sector. Then she attributes to each firm with a marginal cost lower than $c^r(b)$ a lot. In our database the lots $q_{ij} > 0$ vary depending on the identity of the purchaser (institution j) and of the seller (firm i). As shown by equation (2) our results are independent of the exact size of the lots and on their distribution among the firms in the rent sector, so we leave them unspecified. The only constraint is that the lots are positive in value and that their sum is equal to the available budget. To compute the optimal bribe rate, public officials internalize the risk of corruption being detected and punished.[11] We assume that the greedier the public purchaser (i.e., the higher b the bribe rate) the higher the risk of detection.[12] That is, the probability of detection is $G(b) \in [0,1]$, where $G(b)$ is a distribution function and $g(b) = G'(b) > 0$ is the associated density function defined over $[0,1]$ satisfying the monotone hazard rate property:[13]

A2 $\qquad\qquad\qquad\qquad \frac{1-G(b)}{g(b)}$ is decreasing in b

Consistently with empirical evidence we focus on weak punishment: in case of detection the bribe is lost to the officials.[14] For a purchase of total size Q, the net expected rent of the public purchaser then writes $B = b\bar{c}Q\,(1 - G(b))$. To avoid being excluded from the lucrative bribes business, the public purchaser needs to split the budget among enough firms (i.e., to choose a low enough b). This captures in a simple way the fact that Paraguay at the time of the study was a patronage economy. Indeed, the Colorado party was able to maintain itself in power for 61 years by sharing

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among its followers the windfall from power through corrupted deals.

We deduce the next result.

Proposition 1 *The bribe rate, $b^r \in (0, 1)$, is solution to:*

$$\frac{1 - G(b)}{g(b)} = b \tag{3}$$

Entrepreneurs choose the rent sector if and only if

$$c < \overline{c}(1 - b^r) \tag{4}$$

Under assumption A2 it is easy to check that b^r solution of (3) exists and is unique.[15]

Proposition 1 indicates that the most productive entrepreneurs choose the rent sector where there is no competition and commodities are overpriced, so that they make rent (i.e., $\Pi(c) = q[c^r(b) - c] > 0$ for all $c < (1 - b^r)\overline{c}$). The model captures the essence of the redistribution mechanism among the Paraguayan elite: only the firms with the lowest cost are included in the corrupted deals. Firms with high cost (i.e., those with little physical and social capital, run by poorly educated and connected managers, etc) are left to serve private demand. We deduce that entrepreneurs who choose to do business with the government are the most efficient ones and they make rents. Compared to a corruption-free economy, prices are higher so that the quantities consumed in equilibrium are smaller, leading to lower aggregate

production.[16]

In practice procurement activities are decentralized at the institution level (ministries, state enterprises, etc.), so for the empirical analysis b should be thought of as institution-specific. Corruption detection varies from one institution to another. They differ in their level of exposure to public scrutiny, depending for example on how many people are harmed by corruption or on how politically sensitive their activities are. They also differ in their capacity to realize and hide corrupt acts. A simple way to formalize this in the context of the model is in terms of hazard rate dominance, which implies stochastic dominance.[17] We deduce easily the next result.

Proposition 2 *Let $G(.)$ and $K(.)$ be two distributions of probability of corruption detection such that $\frac{g(b)}{1-G(b)} \leq \frac{k(b)}{1-K(b)}$ $\forall b \in [0,1]$. Let b_G^r and b_K^r be defined in equation (3) with distributions $G(.)$ and $K(.)$ respectively. Then $b_G^r \geq b_K^r$.*

Institutions characterized by a lower probability of detection (i.e., lower hazard rate) will be less cautious to hide corruption and will ask for more bribes. It implies that the average lot size, $q = \frac{Q}{1-b}$, which increases with b, will be larger for those institutions.[18] It is intuitive that when the public officials are more greedy there are less firms that are able to survive in the rent sector and that their lots size is then larger. At the institution level, we hence expect a correlation between the frequency of exceptional purchases, which is our marker for corruption, and the average market shares attributed

to providers.

Summary of empirical predictions: Our theoretical results lead to two main sets of predictions that we take to the data in the following order, using several complementary empirical strategies.

- First, according to proposition 2, institutions characterized by a lower probability of detection rely more heavily on exceptional purchase and have larger lots size attributed to their providers. In Section 6, we test this prediction in two steps. In the first one, we discuss in details why in Paraguay the use of exceptional purchase mechanisms can be considered a marker for corruption. We then establish that more corrupt institutions do indeed attribute larger lots to their providers through the exceptional purchase mechanism.

- Second, following proposition 1, entrepreneurs who enter the procurement sector are the most efficient ones and they are making positive rents. We test this prediction in Section 7.

5 The Data

Procurement data[19]

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.[20] These 47,615 public purchases include all types of goods and services, from stationary to machinery, oil purchases, food, services, 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. Total public spending over the whole period amounts to Gs. 12,400 bn. (approx. US$ 2,235m),[21] which represents between 5.5% and 6.9% of Paraguay's yearly GDP.

The distribution of contract values has a fat left-hand tail with 84% of purchases costing less than 2000 minimum daily wage (mdw), while 5.5% of contracts costing over 10,000 mdw make up 86% of the total spending. The sample mean is approximately US$ 47,000, equivalent to 36 times the national per capita GDP at the time.[22]

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 25 different groups, the total cost in local currency, 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. 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, and the attribution procedure.

Finally, these guidelines can be disregarded in cases of emergency, such

as natural disasters or health epidemics, 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. In our sample, exceptional purchases are quite common for certain categories of goods or services, such as rentals, advertisement, consultancy and transport.

Tax ranking data

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.[23] Once public firms are excluded, we have information for 748 firms in 2004, 459 firms in 2005, 482 firms in 2006, and 478 firms in 2007.

Import-export data

We also include annual rankings from the Customs' *SOFIA* official data base. These include the full universe of importers from 2004 to 2007, including the total free on board (FOB) value imported, and of exporters for the same period, including the cost, insurance, freight (CIF) value exported.[24]

Institution-level corruption indices

We introduce institution-level corruption indices for a subset of 13 institutions in our sample. In total, this covers 15,640 of our initial observations, equivalent to 32.8% of the total. These indices were developed by the NGO Transparencia Paraguay between 2004 and 2008.

6 Corruption and the Structure of Purchases

It is useful to discuss the claim that the use of exceptional purchases is the main channel for corruption in the context we study. Three aspects are relevant here. First of all, as mentioned in Section 3, there is ample anecdotal evidence supporting this claim, in particular the report by Transparencia Paraguay (2005), which has been widely publicized. Second, the use of such procedure in the Paraguayan context vastly exceeds comparable figures from around the world. For instance, in a sample of Brazilian health procurement contracts between 2004 and 2009, exceptions amount to approximately 9%.[25] Similarly, from 2006 to 2010, only 7% of EU procedures were "negotiated without publication", corresponding to 5% of the value share of total procurement contracts above the EU threshold for mandatory call for tender.[26] By means of comparison, the equivalent figure in Paraguay in the two years period before the publication of Transparencia Paraguay (2006), looking at contracts above the 2,000 mdw threshold for mandatory call for tender, is 20.4% of all awards. In terms of share of total contract value, it climbs to 23.8%.

Finally, it is worth noting that estimations not shown here to save space provide evidence that none of our results go through when using as a marker of corruption an other commonly mentioned channel for corruption in procurement, namely the practice of breaking down contracts in smaller lots so that they can be attributed without competition. This is true using as depen-

dent variable an indicator of whether the contract lies in a 10 or 20% value band just below the threshold that implies mandatory open tender. This shows that in the context of generalized corruption prevailing in Paraguay, public purchasers were careless and used the simplest procedure available to favor firms.

Going to the estimations, note that our unit of observation is the individual purchase. Corruption being in most cases not observed, our identification strategy, following the model, relies on documenting the link between the frequency of non-competitive procedures (i.e., exceptions), the intensity of firm-institution relationships (i.e., the lot size in the model), as well as institution-level detection proneness (i.e., the detection functions). Each of the 47,615 purchases available corresponds to a pair composed of a firm i and an institution j. Our sample of 73 institutions and 5517 firms generates a total of 13,693 different "active" pairs, with an average number of contracts equal to 3.5 (std. dev. 10.5), a minimum of 1 (for 7,215 pairs) and a maximum of 460.

We estimate the following basic model:

$$exc_{ijkt} = \theta_j + \theta_k + \theta_t + X_{ijt}\beta_1 + \varepsilon_{ijkt}, \tag{5}$$

where exc is a binary variable equal to 1 if the contract over good k procured from firm i by institution j in year t is made through the exception, and $\theta's$ are institution (j), good (k), and year (t) fixed effects. We use a linear

probability model to estimate the model above.[27]

The fixed effects allows us to capture any systematic determinants of exceptional purchase that would correspond to characteristics of the goods (patented or monopolistic goods, exclusive dealing) and the institutions (specifically dedicated to attend emergencies, involved in defense deals, etc., possibly with changes over time), as well as specific time fluctuations or trend in the use of exceptions. Once these fixed effects are introduced, we expect no additional features to be significant if procurement rules are applied correctly.

Our explanatory variables of interest X_{ijt} are firm-institution level ones: the total value of each pair's transactions and the proportion of an institution's transactions done with each particular provider, year by year. These are two measures of the lot size described in the model. Our model signals as a symptom of corruption the fact that institutions, which do more exception for that purpose do that through the attribution of larger lots to their providers (i.e., a more corrupt public purchaser asks for larger bribes which reduces the number of firms able to pay them, and increases their average lot size see Proposition 2).

Table 1 contains the results from (5). In column 1, which report the estimation with institution, goods and year fixed effects, the larger the share of an institution's transactions done with each particular provider, the higher the probability that the contract is made through exception, an effect significant at the 5% level. This is robust to adding both institution-year and goods-year fixed effects in column 2.[28] The marginal effect implies that an

institution increasing the share of its total procurement volume allocated to a particular firm from 0.9% to 3.8% of its portfolio (that is by one standard deviation above the sample mean), would increase the share of its contracts with that particular firm made through the exception by 36%.[29] In Column 3, where we add a full set of firm fixed-effect, the significance is lost, which is not very surprising considering the number of additional parameters (over 5,000).

[insert Table 1 here]

Proposition 2 suggests that institutions more exposed to public scrutiny use less exceptional purchase. We use the institution-level corruption indices described in the data section to proxy for this exposure. We measure corruption with a synthetic index equal to the arithmetic mean of three original indices, namely the evaluations based on the Comptroller General's report, the number of administrative indictments in any given institution, and the number of newspaper articles mentioning corruption in each institution.

We introduce the following specification, where we expect β_2 to be positive if the corruption story is relevant:[30]

$$exc_{ijkt} = \theta_j + \theta_k + \theta_t + \theta_{jt} + X_{ijt}\beta_1 + (X_{ijt} \times Inst\,Corr_{jt})\,\beta_2 + \varepsilon_{ijk}. \quad (6)$$

The results are in columns 4 to 6 of Table 1. In column 4, contract value becomes negative, while its interaction with corruption is positive and significant at the 1% level. This confirms that the link between frequent

interactions and exceptional purchases is mediated by corruption. This effect remains significant with institution- and goods-specific time trends in column 5 and, more strikingly, with firm fixed effects, in column 6.[31]

This first set of result support the corruption hypothesis and gives us more confidence that corruption is the relevant explanation. Of course, despite being more satisfactory than usual subjective indicators, we cannot completely rule out endogeneity of the corruption measure used here, and finding appropriate instruments appears difficult.[32]

Alternative interpretations for the results that frequent pair interactions lead to more contracts through the exception include first a "reputation" effect. In circumstances where public institutions need to use exceptional mechanisms, for example because of some social emergency, they may turn to firms they have had frequent interactions with, because they know these are more reliable. Another explanation involves simple inefficiency or passive waste, as Bandiera et al. (2009) document in the case of public procurement in Italy. Here, the argument is that procurement officials simply award contracts to firms they already know, because they do not internalize the new rules or because they are lazy and it is the solution that requires less effort.

To sort out the different explanations, our strategy is to exploit the shock created by the publication of the Transparency Paraguay report at the beginning of 2006, which attracted attention to what was considered the excessive use of exception in public contracting. This prompted debates and comments in the media and the political arena, as well as incentives for investigative

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journalism in the country to inquire specifically on procurement done through the exceptional procedure. Our hypothesis is that if exception is indeed a mean to make corrupt deals, the institution-firm pairs that were using exception frequently should display greater reductions in its use as a result of this shock. In other words, we hypothesize that where the use of exception was motivated by corrupt deals, the higher risk of being discovered and sanctioned brought about by increased public scrutiny should have generated a stronger decrease in its use than where it was motivated by justifiable reasons.

The resulting difference-in-differences strategy thus should display a positive coefficient based on this differential effect, even in the case where the report implied an overall reduction in exceptional purchase. From a theory point of view, this corresponds to the monitoring shock shifting the detection function for a subset of firm-institution pairs, as described in proposition 2 above. Alternatively, if the explanation for high levels of exception is simply inefficiency, or if the decrease results from a learning process, we should observe a reduction in its use across the board, and the diff-in-diff estimator should not be significant.

Table 2, in which we run the basic estimations of Table 1, columns 1 to 3, over the separate subperiods 2004-2005 and 2006-2007, provides a first illustration. Over the period 2004-2005, the variables proxying for frequent/intense firm-institution relationship, i.e., the total value of pair's transactions and the share of institutions' transactions done with each particular

provider, are significant 5 times out of 6, including in specifications with firm fixed effects, in column 3. On the contrary, they are almost never significant in the period 2006-2007, and even become negative with firm fixed effects in column 6.[33] In the first sub-period, a one standard deviation in value of pair's transactions reduces the average use of exception by between 3 and 4%, while the same effect is more than an order of magnitude smaller in the second sub-period. The magnitude of the effect is similarly smaller when looking at shares.

[insert Table 2 here]

In Table 3, we present the results from a formal differences-in-differences based on these insights. We estimate the following regression, where β_3 is the diff-in-diff estimator:

$$exc_{ijk} = \beta_0 + \beta_1 D_{0607} + \beta_2 D_T + \beta_3 (D_{0607} \times D_T) + \varepsilon_{ijk} > 0, \qquad (7)$$

For the sake of robustness, we consider three alternative ways to construct our treatment group of institution-firm pairs: based on high-volume, high share of institutions' budget, and high use of exception in the 2004-2005 period (see appendix for details).

[insert Table 3 here]

The results in table 3 are striking. In column 1, the treatment group includes institution-firm pairs with total transactions value above the me-

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dian in the first period; the diff-in-diff estimator is negative and significant at the 1% value, and indicates that the treatment group reduces its average contracting by exception by close to 4%. The result is more telling when translated in terms of amounts: for the treatment group, the value of transactions made by exception goes from representing 23.2% of the total in the first period to only 12.2% in the second period. This 9 percentage points (pp) reduction should be compared with that of the control group which is only 4.3 pp (from 16 to 11.7% of the total).

A similarly strong result emerges in column 2 when using instead the share of institutions' budget as our treatment criteria. There is a decrease between the two periods, significant at the 1% level. The size of the effect is similar, as the treatment group experiences a reduction in the value share of exception of 10.2 pp, while the corresponding control group reduction is of 3.4 pp.[34]

In column 3, we experiment with yet another definition of the treatment group, based on the use of exception in the base period. The result again strongly support our hypothesis: the diff-in-diff estimator is negative and significant at the 1% level, with a probability reduction of 14%. In terms of amounts, the treatment group value share of exception diminishes from 50.9 to 7.3%, while for the control group it experiences an increase from 1.4 to 19.9%.

Columns 4 presents the case where the treatment is defined on the basis of the share of exception in a pair's transaction being above the average.

Again, the diff-in-diff coefficient is negative and significant at the 1% level, indicating a probability decrease of 21%. The changes in terms of amounts are very close to those of column 3. Finally, column 5 provide an additional robustness check, by restricting the base sample to pairs that have strictly positive exception use in the period 2004-2005, with again very similar results: a probability decrease of 15%, significant at the 1% level.

Finally, in the last line of Table 3, we also report the results from similar specifications with a continuous version of the treatment variables. The complete set of results are on line with those of the discrete version.

Additional technical details and robustness tests, including the way treatment groups are constructed, and a comparison of pre-treatment trends between treatment and control groups, supporting the idea that the report's publication can be viewed as a natural experiment, are also provided in the Appendix.

In the next Section, we turn to show how the corrupt practices documented above distort the profitability of firms.

7   The Profitability of Firms

The model's second set of predictions is that, as a result of the corrupt practices unveiled above, entrepreneurs doing business with public institutions are more profitable than their counterparts serving private demand. Moreover, the most able entrepreneurs are expected to self-select into the more

profitable procurement activities, as only they are efficient enough to afford both the production cost and the bribes to public officials.

Profitability in the rent sector: We first perform a reduced form analysis of the effect on firms' profits of a number of variables, derived from the results in the previous section. As a proxy for the share of "favoured" contracts in the firm's portfolio, we use the share of a firm's contracts made through the exception, and the weighted average level of corruption of the institutions it deals with (where the weights are the share of the sales to these institutions in the firm's total sales). In addition, we also use firms' amount and number of contracts.

The amount of taxes paid provides a reasonable approximation 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 (among which custom duties are by far the largest component) introduces some noise in the mapping between profits and taxes paid, we control for total imports in all estimations to minimize this issue. The model we want to estimate is:

$$G_{it} = \alpha + \beta_1 Z_{it} + \beta_2 M_{it} + X_{it}\beta_3 + \theta_t + \varepsilon_{it}, \tag{8}$$

where G_{it} denotes the net gains of firm i in year t, Z_{it} is the variable of interest (alternatively, the share of sales through the exception, average corruption of buyers, total sales to the state, number of contracts), M_{it} is the total amount

imported, X_{it} is a vector of control variables, and θ_t are time fixed effects.

However, the income tax and other taxes are amalgamated in the tax data, so we only observe:

$$T_{it} = x_t G_{it} + \delta_i M_{it} + \nu_{it}, \tag{9}$$

where $x_t = 0.3$ for 2004, $x_t = 0.2$ for 2005, and $x_t = 0.1$ 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.

We thus test the following specification:

$$T_{it}/x_t = \alpha + \beta_1 Z_{it} + (\beta_2 + \delta_i/x_t)M_{it} + X_{it}\beta_3 + \theta_t + \varepsilon_{it} + \frac{\nu_{it}}{x_t}, \tag{10}$$

under the assumption that Z_{it} is uncorrelated with ν_{it}.

The distribution of profits resulting from the available data is truncated at a strictly positive point. Moreover, the set of firms for which we have non-zero tax data is not constant over time. This forces us to restrict the panel to the subset of strictly positive tax observations.[35] As a result, we obtain an unbalanced panel of 2167 observations across 4 years for 1017 private firms.

One worry is that unobserved firm characteristics might be correlated both with the amount of taxes paid and with some of the Z_{it} variables on the right hand side.[36] For example, more efficient entrepreneurs might be more successful in general, hence pay more taxes, and also win more procurement contracts or be more frequently favoured through exception because of their

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good reputation. 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 or to respond to emergency calls from public institutions. To address such issues, we add firm level fixed effects θ_i to (10), exploiting the panel dimension of the data to wash out any time invariant firm-level unobserved characteristics.[37]

The results in Table 4 support our hypotheses. Column 1 shows that firm's profits are significantly increasing in the share of its contracts made by exceptional purchase. The average marginal effect implies that a 1 percent increase in the share of contracts made by exception corresponds to Gs. 28 millions (US$ 5,600) additional profits.

In column 2, the correlation between the average level of corruption of public buyers and firms' profitability is positive but only nearly significant at conventional levels, which is not surprising given that the sample size is reduced to 261 since corruption indices are not available for all institutions.

[insert Table 4 here]

Finally, in columns 3 and 4, we look directly at the correlation between firms' profits and their procurement activity. The coefficients of both the amounts sold and the number of contracts are positive and significant. In terms of marginal effects, every additional Gs. sold to the state translates into a Gs. 0.29 increase in profits, i.e., a rate of return on procurement operations of nearly 29%, while a firm obtaining an additional contract increases its

profits by Gs. 154 millions (approx. US\$ 30,800).[38]

These results, together with those of the previous Section showing that firms with bigger procurement portfolios are more likely to enter in side deals, imply that average profitability should be higher in procurement than in private markets.[39] In turn, this is likely to distort firms' incentives and induce additional entry of potential entrepreneurs into these sectors. Next, we provide evidence of this self-selection process.

Misallocation of Talents: An important point of the model is that firms' unobserved attributes (entrepreneurial or networking skills, efficiency, etc.) should explain part of their increased profitability due to a self-selection process. Some of the best entrepreneurs are attracted to sectors where they can benefit from the corrupt allocation of procurement contracts, resulting in a misallocation of talents in the economy.

The following test explicitly addresses the process of self-selection into the procurement sector, using a procedure proposed by Wooldridge (2002, p 631).[40] This entails estimating first a probit model to explain the fact that firms intervene in the procurement sector or not:

$$Y_i = 1\left[Y_i^* = \theta_0 + X_i\theta_1 + S_i\theta_2 + e_i > 0\right], \tag{11}$$

where Y_i is a dummy variable equal to 1 if the firm sells to public institutions at any point during the sample period, X_i is a vector of firm-level observables, and S_i is a set of instruments. From (11), we derive $\widehat{\phi}$, the predicted density

and $\widehat{\Phi}$, the corresponding predicted cumulative density. We then estimate, for each year, the following tobit model:

$$G_{it} = \max \left[0, \alpha + \beta_1 Z_{it} + X_{it}\beta_2 + \beta_3 Y_i \frac{\widehat{\phi}}{\widehat{\Phi}} + \beta_4 \left(1 - Y_i\right) \frac{\widehat{\phi}}{1 - \widehat{\Phi}} + \varepsilon_{it} \right]. \quad (12)$$

Remember that G_{it} denotes the net gains of firm i in year t, Z_{it} is either total firm's sales to the state or its total number of contracts, and X_{it} is a vector of control variables. We are interested in the statistical significance of the two last regressors, as an indication of self-selection, as well as in how their inclusion will affect the coefficient β_1.

The crucial point is the availability of suitable instruments, that would predict access to the procurement sector, while being excludable from the second equation (12). To generate these, we exploit the fact that apart from raising the cost of procurement and changing the identity of sellers, corruption also distorts the sectorial abundance of firms. We capture this bias by exploiting firms' names, which are specific to the procurement categories where a large number of firms are active.[41]

The probit model shows that our names variables are very strong predictors of firms being active in procurement, while there is no reason to think that names influence firms' profitability directly, supporting the excludability requirements.[42]

Table 5 shows the results from estimating (12) on a sample of 12,759 firms. For each year, we first display the results from a standard tobit estimation

and then provide the results including self-selection correction terms, with bootstrapped standard errors. Panel 1 uses the total volume of procurement contracts as our variable of interest Z_{it}, while panel 2 uses the total number of contracts.

[insert Table 5 here]

The correction terms are strongly (jointly) significant (at the 1% level) in all estimations. Moreover, their inclusion systematically induces a reduction in the estimated coefficients of the variables of interest. The marginal effect of firms' contract volume on their profitability is reduced by between 9 and 19% (except in 2005, when it remains constant), and loses significance in the last three years. Similarly, the marginal effect of the number of contracts is reduced by between 19 and 42%, and becomes insignificant in the 2005 sample. There is thus a strong composition effect, meaning that the profitability advantage of better entrepreneurs stems from an unobserved ability differential.

We thus conclude that part of the link between procurement and firms' profitability relates to unobserved self-selection of the best entrepreneurs into activities that offer privileged access to the procurement sector. This provides the final element of our story, in which would-be entrepreneurs are likely to be disproportionately attracted to sectors in which strong demand from corrupt public buyers generate opportunities for rent-seeking.

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8   Conclusion

We have illustrated the fact that rent-seeking is costly to development, by showing how entrepreneurs' economic incentives are distorted toward less productive activities as the result of favoritism in the allocation of public contracts in Paraguay. After building an entrepreneurial choice model, 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. Firms have a greater probability of obtaining a contract directly through an exceptional procedure from an institution with which they have a strong contractual relation, both in terms of the total value and frequency of transactions, particularly when dealing with more corrupt State entities. This is supported by the evidence from a natural experiment, which exogenously increased public scrutiny over procurement practices, and especially exception, halfway through our period of study. Firms trading more with the public sector are more profitable, even when controlling for their unobserved characteristics. This overall picture embodies the consequences of a systematic misallocation of talents à la Murphy et al. (1991).

While the results must be qualified because of the intrinsic limitations of the data, in particular those related to corruption and to the profitability of firms, we think that the paper points to two main conclusions. First, rent-seeking is costly because it destroys the development potential of the best entrepreneurs. Indeed, the Paraguayan entrepreneurial class is in its large

majority imports-oriented, with over 90% of the top 500 taxpayers being importers. Over the period 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 and the historical absence of an import-substitution strategy have contributed to make Paraguay one of the least industrialized economy in South America as, apart from the soybean and meat sectors, its entrepreneurs have systematically specialized in commercial intermediation, often with the public sector, rather than in production.[43]

The costs of this productive atrophy and biased specialization are reflected in the poor record of economic growth. 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 average rate of growth of per capita income was only 0.8% over the 1980s and strictly negative after that (-0.1% and -0.6% over the 1990s and 2000s). 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.

Second, the release on an NGO report on the abuse of exceptional procedures, appears to have had a significant effect as it translated in an improvement in the following period. In that sense, civil society involvement in monitoring the public sector use of funds appears as a crucial check on corruption.

Notes

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

[2]Authoritative surveys on corruption include Bardhan (1997), Rose-Ackerman (1999), Svensson (2005), Pande (2008), and Olken and Pande (2012) among others. There is a large macro literature, staring with Mauro (1995), while micro-econometric papers include Reinikka and Svensson (2004), Olken (2007), Bertrand, Djankov, Hanna and Mullainathan (2007), Ferraz and Finan (2007), and Sequeira (2014) to mention only a few.

[3]Related papers are Rama (1993), who tracks the number of foreign-trade rent-seeking regulations over the XXth century in Uruguay and relates these to political and economic variables, and Fisman and Sarria-Allende (2010), who present cross-country, industry level evidence of the effect of regulatory distortions on the industrial structure.

[4]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, and the same score in 2009 (154th out of 180). See the online Appendix for general information on the country.

[5]See Straub (2014) for evidence on the change in the relevance of political connections for public procurement around the 2008 elections, in which the Colorado party lost power.

[6]For example during the period 2004-2005 public firms awarded close to 90% of their advertisement 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. Some cases have made headlines, such as the use of this procedure to pay close to US$ 100,000 to a consulting firm formerly owned by the President, for the organization of the $XIII^{th}$ conference gathering Americas' First Ladies in 2005 in Asunción (Diario Ultima Hora, Asunción, June 7th, 2007). See Mironov and Zhuravskaya (2012) for similar stories in the Russian context.

[7]Diario ABC Color, Asunción, January 3rd, 2010. These figures are consistent with

the estimation by Auriol (2006) and with the results in Section 7 below.

[8]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 included in our procurement database.

[9]Empirically Chong et al. (2013) find a positive relationship between the use of negotiated procedures without prior notification and the weakness of governance across the European Union: in countries more prone to corruption, public purchasers use more often exceptional purchase. This is consistent with earlier findings by Della Porta and Rose-Ackerman (2002) who show that in the 1990s in Italy public authorities were abusing emergency procurement procedures to bypass competition.

[10]For instance Tran (2011), exploiting an Asian trading firm's records of the bribes it paid over the year to secure public contracts, shows that the average kickback was 14.7 percent of the product cost when auctions were not required. Ufere et al. (2012) provides insights about the supply of bribes by firms.

[11]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. Wade (1985) is an early reference on the behavior of corrupt government officials, and Elbahnasawy (2014) looks at the impact of e-government in deterring corruption.

[12]Equivalently the probability of detection increases with the share of firms that are excluded from the rent sector, which by virtue of equation (2) is equal to $\frac{\bar{c}-c^r(b)}{\bar{c}} = b$. When the number of firms that are excluded from the rent sector b is large it increases the probability of outcry and detection $G(b)$.

[13]The monotone hazard rate property is equivalent to the log-concavity of the reliability function 1-G(b). It turns out that most reliability functions of standard random variable are log concave. This is true for distributions such as uniform, normal, logistic, extreme-value, Chi-Square, Chi, exponential, Laplace, Weibull, power function, gamma,

beta, Pareto, log-normal, Student's t, Cauchy and F distributions (Bagnoli and Bergstrom, 2005, and Borzadaran and Borzadaran, 2011).

[14]In Paraguay at the time of our study, there had been very few cases of prosecution or indictment for corruption leading to jail time or fines.

[15]Indeed under assumption A2, $\frac{1-G(b)}{g(b)}$ decreases in b, while b increases in $[0,1]$. Moreover $\frac{1}{g(0)} > 0$ and $\frac{1-G(1)}{g(1)} = 0 < 1$ so that these two functions cross once and only once in $(0,1)$.

[16]In the public segment, corruption implies that unit price is $\bar{c}$. In the private segment price is $p^r = \bar{c}(1 - b^r)$ as the less efficient firms are left to serve private consumers. Since $p^r > p^*$, quantities exchanged in the private sector fall so that the formal productive sector shrinks.

[17]Let $K(.)$ and $G(.)$ be two probability functions so that $\frac{g(b)}{1-G(b)} \leq \frac{k(b)}{1-K(b)}$ $\forall b \in [0,1]$, then it implies that $G(b) \leq K(b)$ $\forall b \in [0,1]$ (e.g., see Nanda and Shaked, 2001).

[18]For instance if all procurement contracts are of similar size, we have $Q = q \int_0^{c^r(b)} \frac{1}{\bar{c}} dc$, which by virtue of equation (2) is equivalent to $Q = q(1-b)$.

[19]See the Online Appendix for more details on the different types of data.

[20]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 on the DNCP web site.

[21]The Guarani-US\$ exchange rate over the period fluctuated in the range 5,021 to 6,178 Gs. for 1\$.

[22]As a way to index it to the general evolution of prices, contract values and thresholds are expressed in minimum daily wage (mdw) units, so for example a 1,000,000 Gs. contract expressed in multiples of a legal mdw of 50,000 Gs. would amount to 20 mdw. See the Online Appendix for more details.

[23]Systematic data on total sales, profits, etc., for the whole universe of firms could not be accessed due to confidentiality restrictions.

[24]FOB is the standard way to report import values without costs of transport and other taxes, while CIF is the standard way to report export values, including cost, insurance

and freight to the national border.

[25]Barbosa and Straub (2014).

[26]See European Commission (2011).

[27]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.

[28]Here, identification arises from both cross-sectional and time variation of the amount of exception used across institution-firm pairs, controlling for a time trend, and institution and goods time-invariant levels (column 1) as well as institution- and good-specific time trends (column 2).

[29]Note that the identification of the nature of the relationship between public buyers and suppliers is beyond the possibilities of our data. It maybe for example that public officials or their family members have direct stakes in the supplying firms, as the anecdotal evidence suggests, or that they operate at arm-length and share bribes.

[30]Note that institution-year fixed effects absorb the direct effect of corruption, which is measured year by year. The pairwise correlations between the $Corr_{jt}$ and the X_{ijt} variables are -0.003 and -0.04 respectively, so we are not worried by potential multicollinearity.

[31]Note that running the specifications of columns 1 to 3 on the smaller sample of columns 4 to 6 confirms a positive (approximately an additional 10% for a one standard value increase) and significant effect for the total pairs' contract value.

[32]The news index might be particularly 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 and their past behavior in procurement or other activities. Using only the mean of the evaluations based on the Comptroller General's report and on the number of administrative indictments in any given institution yields similar results though.

[33]The exception if the coefficient for the share of institutions' budget made with the firm, in column 5, which is significant at the 10% level.

[34]Note also that the other coefficients support our previous insights: the control group-specific trend β_1 is not significantly different from 0, supporting the idea that the meaningful reduction occurs in the identified treatment group, while β_2 is positive and significant, supporting our previous results on the fact that pairs with frequent/intense interactions make more use of the exception in the period 2004-2005.

[35]Using all the observations to measure the variations in net gains, we would have some positive measurement errors (when a firm's tax observation is out of the sample and therefore set at zero for one year and is positive the following one), some negative ones (in the reverse case), and more generally errors going either way for firms that do not make it to the ranking of top taxpayers.

[36]Note however that such endogeneity concerns are much less obvious for variables such as the average level of corruption.

[37]We do not have additional firm-level data to control for such general characteristics. Fixed effects will take care of the size issue as long as it is reasonably constant over the period of study.

[38]Results not shown here to save space indicate that the results in columns 1 and 2 are robust to systematically controlling for the amounts of firms' sales to the State.

[39]A technical concern has to do with tax evasion. Indeed, it is likely that Paraguayan firms do not report all of their sales for tax purpose, possibly biasing our estimations. 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, strong anecdotal evidence rather suggest that well-connected firms use their influence to evade a bigger share of their tax obligations. This leads us to think that our estimates should be considered as a lower bound on the true returns of these firms. In other words, the fact that we still find a positive effect of public contracts on profits leads us to consider that the true effect is probably even larger.

[40]The procedure, which aims to correct for the failure of the ignorability-of-treatment assumption, is a kind of extended Heckit, where sample selection is viewed as an omit-

ted variable bias, addressed by the inclusion of the Mills ratio as additional regressors. Fafchamps and La Ferrara (2012) apply this technique to control for individuals' self-selection into self-help groups based on unobservable characteristics.

[41]See the Appendix for the details on how the instruments are defined, descriptive statistics and first stage estimations.

[42]The dummies for the "construction" and "consultancy" categories correlate negatively with profits. Moreover, the results are robust to excluding the import-export category.

[43]This has also fueled a flourishing and illegal reexportation business to the neighbors Brazil and Argentina. See Straub (1998) for more details on this.

9 References

Agrawal, A., & Knoeber, C. (2001). Do some Outside Directors Play a Political Role? *Journal of Law and Economics*, 44, 179-198.

Auriol, E. (2006). Corruption in Procurement and Public Purchase. *International Journal of Industrial Organization.* 24(5), 867-885.

Auriol, E. & Warlters, M. (2005). Taxation Base in Developing Countries. *Journal of Public Economics*, Special Issue: Cornell - ISPE Conference on Public Finance and Development, 89(4), 625-646.

Bandiera O., Prat, A., & Valletti, T. (2008). Active and Passive Waste in Government Spending: Evidence from a Policy Experiment. *American Economic Review*, 99, 1278-1308.

Bagnoli, M. & Bergstrom, T. (2005). Log-concave Probability and it's Applications. *Economic Theory*, Springer, 26(2).

Barbosa, K. & Straub, S. (2014). *Revolving Doors in Brazilian Health*

Procurement. mimeo.

Bardhan, P. (1997). "Corruption and Development: A Review of Issues." *Journal of Economic Literature*, 35(3), 1320-1346.

Baumol, W.J. (1990). Entrepreneurship: Productive, Unproductive, and Destructive. *Journal of Political Economy*, 98(5), 893–921.

Becker, G. & Stigler, G.J. (1974). Law Enforcement, Malfeasance and Compensation of Enforcers. *Journal of Legal Studies*, 3: 1-18.

Bertrand, M., Djankov, S., Hanna, R. & Mullainathan, S. (2007). Obtaining a Driving License in India: An Experimental Approach to Studying Corruption. *The Quarterly Journal of Economics*, 122(4), 1639-1676.

Besley, T. & J. McLaren. (1993). Taxes and Bribery: The Role of Wage Incentives. *Economic Journal*, 103: 119-141.

Bhagwati, J. (1982). Directly unproductive, profit seeking (DUP) activities. *Journal of Political Economy.* 90, 998-1002.

Borzadaran, G. R. M. & Borzadaran, H. A. M. (2011). Log-concavity Property for some Well-known Distributions. *Surveys in Mathematics and its Applications,* 6, 203-219.

Buchanan, J. M. (1980). Rent-seeking and profit-seeking. In *Towards a Theory of the Rent-Seeking Society,* eds. J.M. Buchanan, R.D. Tollison & G. Tullock, 3-15. College Station: Texas A&M University Press.

Chong, E., Klien, M., & Saussier, S. (2013). *The quality of governance and the use of negociated procurement procedures: some (un)surprising evidencefrom the European Union.* mimeo.

Davis, J. (2004). Corruption in Public Service Delivery: Experience from South Asia's Water and Sanitation Sector. *World Development*, 32(1), 53–71.

Deiniger, K. & Mpuga, P. (2004). Does Greater Accountability Improve the Quality of Public Service Delivery? Evidence from Uganda. *World Development*, 33(1), 171–191.

Della Porta, D. & Rose-Ackerman, S. (2002). Corrupt exchanges: Empirical themes in the politics and political economy of corruption. Ed *Nomos*. Verlagsgesellschaft

Di Tella, R. & Schargrodsky, E. (2003). The Role of Wages and Auditing during a Crackdown on Corruption in the City of Buenos Aires. *Journal of Law and Economics*, 46(1), 269-92.

Djankov, S., La Porta, R., Lopez-de-Silanes, F. & Shleifer, A. (2002). The Regulation of Entry. *Quartely Journal of Economics*, 117(1), 1-37.

Elbahnasawy, N. G. (2014) E-Government, Internet adoption, and Corruption: An Empirical investigation. *World Development*, 57, 114-126.

European Commission. (2011). Public procurement in Europe. Cost and effectiveness. Study prepared for the European Commission by PwC, London Economics and Ecorys.

Fafchamps, M. & La Ferrara, E. (2012). Self-Help Groups and Mutual Assistance: Evidence from Kenyan Slums. *Economic Development and Cultural Change,* 60(4), 707-34, .

Ferraz, C. & Finan, F. (2008). Exposing Corrupt Politicians: The Effect of Brazil's Publicly Released Audits on Electoral Outcomes. *Quarterly*

Journal of Economics. 123(2), 703–745.

Fisman, R. (2001). Estimating the Value of Political Connections. *American Economic Review*, 91(4), 1095-1102.

Fisman, R. & Sarria-Allende, V. (2004). Regulation of Entry and the Distortion of Industrial Organization. *Journal of Applied Economics*, 13(1), 91-111.

Fries, S., Lysenko, T., & Polanec, S. (2003). *The 2002 Business Environment and Enterprise Performance Survey: Results from a Survey of 6,100 Firms*. Working Paper No. 84, European Bank for Reconstructions and Development, London.

Goldman, E., Rocholl J. & So, J. (2013). Politically Connected Boards of Directors and the Allocation of Procurement Contracts. *Review of Finance*, 17 (5), 1617-1648.

Hellman, J. S., Jones, G. & Kaufmann, D. (2003). 'Seize the State, Seize the Day': State Capture, Corruption, and Influence in Transition. *Journal of Comparative Economics*, 31, 751-773.

Hsieh, C.-T., Miguel, E., Ortega, D. & Rodriguez, F. (2011). The Price of Political Opposition: Evidence from Venezuela's Maisanta. *American Economic Journal: Applied Economics*, 3(2), 196-214.

Hyytinen, A., Lundberg, S. & Toivanen, O. (2007). *Politics and Procurement: Evidence from Cleaning Contracts*. HECER Discussion Paper No. 196.

Khwaja, A. I. & Mian, A. (2005). Do lenders favor politically connected

firms? Rent provision in an emerging financial market. *Quarterly Journal of Economics*, 120 (4), 1371-1411.

Krueger, A. (1974). The political economy of the rent seeking society. *American Economic Review*, 64, 291-303.

Li, H., Meng, L., Wang, Q. & Zhou, L.-A. (2008). Political connections, financing and firm performance: Evidence from Chinese private firms. *Journal of Development Economics*, 87(2), 283-299.

Mauro, P. (1995). Corruption and Growth. *The Quarterly Journal of Economics*, 110(3), 681-712.

Mironov, M. & Zhuravskaya, E. (2012). *Corruption in Procurement and Shadow Campaign Financing: Evidence from Russia*. mimeo.

Moohkerjee, D. & Png, I. P.L. (1995). Corruptible Law Enforcers: How Should They Be Compensated? *Economic Journal*, 105, 145-159.

Murphy, K. M., Shleifer, A. & Vishny, R. W. (1991). The Allocation of Talent: Implication for Growth. *Quarterly Journal of Economics*, 106(2), 503–530.

Nanda, A. K. & Shaked, M. (2001). The Hazard Rate and the Reversed Hazard Rate Orders, with Applications to Order Statistics. *Annals of the Institute of Statistical Mathematics*, 53(4), 853-864.

Olken, B. (2007). Monitoring Corruption: Evidence from a Field Experiment in Indonesia. *Journal of Political Economy* 115(2), 200-249.

Olken, B. & Pande, R. (2012). Corruption in Developing Countries. *Annual Review of Economics,* 4, 479-505.

Pande, R. (2008). Understanding Political Corruption in Low Income Countries. in *Handbook of Development Economics, Vol. 4, eds.* T. Schultz and J. Strauss. North-Holland: Elsevier.

Rama, M. (1993). *Rent-Seeking Trade Policy. A Time-Series Approach.* Policy Research Working Paper 1142, Washington D.C.: The World Bank.

Reinikka, R. & Svensson, J. (2004). Local Capture: Evidence from a Central Government Transfer Program in Uganda. *Quarterly Journal of Economics*, 119(2), 679-706.

Rose-Ackerman, S. (1999). *Corruption and Government: Causes, Consequences, and Reform.* Cambridge: Cambridge University Press.

Slinko, I., Zhuravskaya, E. & Yakovlev, E. (2005). Laws for Sale: Evidence from Russia. *American Law and Economics Review*, 7(1), 284-318.

Sequeira, S. (2014). *Tariffs and Corruption: Evidence from a Tariff Liberalization Program.* mimeo.

Svensson, J. (2005). Eight questions about Corruption. *Journal of Economic Perspectives*, 19 (5), 19-42.

Straub, S. (1998). Evolución Macroeconómica del Paraguay 1989-1997: Burbuja de Consumo y Crisis Financiera. *Revista de la CEPAL*, 65: 119-132.

Straub, S. (2005). Informal Sector: The Credit Market Channel. *Journal of Development Economics*, 78, 299-321.

Straub, S. (2014). Political Firms, Public Procurement, and the Democratization Process. TSE Working Paper, n°14-461

Tran, A. (2011). *Which Regulations Reduce Corruption? Evidence from*

the Internal Records of a Bribe-paying Firm. Working Paper.

Transparencia Paraguay. (2006). *Indice de desempeño e integridad en contrataciones públicas 2004-2005.* Asuncion.

Tullock, G. (1967). The Welfare Costs of Tariffs, Monopolies, and Theft. *Western Economic Journal*, 5, 224-232.

Tybout, J. R. (2000). Manufacturing Firms in Developing Countries: How Well do They do and Why? *Journal of Economic Literature*, 38(1), 11-44.

Ufere, N., Perelli, S., Boland, R. & Carlsson, B. (2012). Merchants of Corruption: How Entrepreneurs Manufacture and Supply Bribes. *World Development*, 40(12), 2440–2453.

Wade, R. (1985). The Market for Public Office: Why the Indian State Is not Better at Development. *World Development*, 13(4), 467-497.

Wooldridge, J. (2002). *Econometric Analysis of Cross Section and Panel Data.* MIT Press.

Online Appendix (not for publication)

1 Paraguay: Country Overview

Paraguay is a small landlocked country of 6.2 million inhabitants (2008) located in the heart of South America. With a per capita GDP of US$ 1,670 in 2008, it is a low-middle income country. Its main sources of growth are agrarian activities and local services. 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. 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. In exchange, 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 corporate income, by order of magnitude).

Politically, after enduring the dictatorship of Alfredo Stroessner between 1954 and 1989, Paraguay returned to democracy through a military coup in 1989. Yet, the Asociación Nacional Republicana, traditionally known as *Colorado Party*, managed to retain power for 61 years, including the 19 years elapsed since the 1989 coup and covering the whole period of our study (See Pérez-Liñán et al., 2006, for a description of the political environment of Paraguay).

Given this political context, the dams' propitious source of income shaped the growth of the Paraguayan "rent-seeking economy". First, the dams' construction fostered a culture of intense rent-seeking and corruption and allowed a few entrepreneurs that were on good terms with the dictator to become immensely rich. Second, the free flow of resources to the government's budget meant that bureaucrats were in a position to favor friends through public expenses. During the whole period, the party effectively "privatized" public resources, using public employment and procurement to favor party members (Nickson and Lambert, 2002).

2 Data

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.

The largest contracts (above 10,000 mdw; see Table A1 below) 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 (between 2,000 and 10,000 mdw) 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 firm, which 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. For contracts worth less than 20 mdw a 'fixed funds' mechanism was created to allow institutions to purchase directly from a single supplier without justification. This

mechanism has no specific requirement on the number of offers or publication of the call for offers. We include it as a direct purchase.

Finally, in order to bypass costly administrative procedures in cases of "force majeure", 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$.

(Table A1 here)

Institution corruption data

The institutions for which this data is available 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 belongs to the Ministry of Interior).

There are three tentative measures of corruption: the news index, which

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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. We rescale all indices on a 0-10 scale, with 10 representing more corruption. The appeal of these indices, contrary to those based on perceptions of corruption, is the objectivity of the criteria used to construct them. More importantly, our theory calls for a measure of the probability of detection at the institution level, which is well captured by these indices as they are widely advertised.

3   Empirical Evidence. Complements

Difference-in-Differences

We contruct the control and the treatment groups in the following ways. Consider for example our first criteria, the total value of each pair's transactions. We define the treatment group, identified by a dummy variable $D_T = 1$, as being composed of the pairs with a value exceeding the median value in the 2004-2005 sample, while those below this threshold are in the control group ($D_T = 0$). We then complete the sample by keeping all the 2006-2007 observations corresponding to institution-firm pairs that were al-

ready active in 2004-2005 and therefore were assigned to either the treatment or the control. In practice, this implies dropping pairs that were not active in the first period because the firms had not won any contract from that specific institution. Our final sample contains 37,453 observations, covering 79% of the initial ones. More specifically, 60% of the contracts made over 2006-2007 involved pairs that were already active before.

For the second criteria, we assign to treatment pairs with a share of institutions' budget above the sample median.

The third criteria experiments with yet another definition of the treatment group, based on the use of exception in the base period. Inclusion into treatment is now based on the total value of a pair's contract by exception being above the average in the base sample (the median is 0, as a majority a firms, mostly the ones having only one or few contracts, make no use of the exception).

The fourth criteria defines inclusion into the treatment group on the basis of the share of exception in a pair's transaction being above the average. Finally, criteria five is similar, but restricting the sample to pairs having made at least one contract by exception in this period, and defining the treatment group with respect to the share of exception in a pair's transaction in this subsample (the threshold is the average, equal to 0.7, as the median is now 1). This is meant to address the possibility that left censoring at 0 is somewhat biasing our results in the sense that it prevents pairs in the control group to further reduce their use of exception. This reduces the sample of

eligible pairs to 13,709.

In our estimating equation, D_{0607} is a dummy variable taking value 1 for the period 2006-2007, and D_T is our treatment group as defined in one of the ways mentioned above. β_3 is the differences-in-differences estimator. Note that the coefficient of D_{0607}, β_1, captures the control group-specific trend between the two periods, while the coefficient of D_T, β_2, gives us the difference in the use of exception between the treatment and the control group in the base period (2004-2005). Finally, all estimations include the full set of institutions, goods, and firms fixed effects.

Finally, note that to be valid our diff-in-diff strategy requires that the treatment and the control groups have similar trends before the release of the Transparency Paraguay report. This can be tested using the data for 2004 and 2005. The bottom lines of Table 3, show the coefficient and standard errors of β_3 from a similar estimation as (7) on the sample restricted to 2004 and 2005, where the D_{0607} dummy has been replaced by a dummy taking value one for 2005 and 0 for 2004. All the coefficient are positive and not significant (with the exception of the one in column 4, at the 10% level), showing that there is no differential trend over these two years, whatever the way our treatment and control group are defined.

Self-selection dummies

First, there is a large number of contracts in office and machinery categories sold by commercial intermediaries; locally, these are often nicknamed "suitcase firms", because they specialize in importing and selling any item

upon request. For example, one of the firm in our sample, run by a member of the close circuit of the former president (also member of the Masonic loge and honorary consul of an Eastern European country), won 301 contracts between 2004 and 2007, for close to $1.45m worth of office supplies, electric material, cooking utensils, textile, chemical products, cleaning products, computing equipment, Paraguayan flags, etc.

Next, many contracts are in the construction and maintenance categories. Finally, we also focus on services provided by consulting firms (Mironov and Zhuravskaya, 2012, show for Russia that phantom consulting firms are often used to channel corrupt deals involving procurement funds).

For each of these three groups, we define sets of related words and create three dummy variables, equal to one if at least one of the specific words appears in the firms' official denomination. The keywords are chosen so as to match standard names used by firms in the relevant sectors of activities (allowing for variations such as abbreviations):

- "Import-export" dummy: ferretería, comercial, distribuidora, casa, representación, servicio, supply, venta, supermercado, material, pieza, trade, import, export.

- "Construction and maintenance" dummy: ingeniero, arquitecto, mecanico, taller, repuesto.

- "Consulting" dummy: abogado, auditor, consultor, asociados, asesor, comunicación.

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Table A2 shows how these categories of firms are represented among state providers and non state providers respectively.

(Table A2 here)

Concerning excludability, as stated in the text, there is no reason why firms names would influence their profitability directly, other than through the nature of their branch of activity (the "construction" and "consultancy" dummies are actually negatively correlated with firm-level gains). The "import-export" dummy can be discussed on the ground that it may affect profitability through a distinct channel, namely the fact that firms in these activities could also be benefiting from the widespread smuggling rents available in the Paraguayan economy. To address this concern, we rerun the estimations excluding this variable from the set of instruments. Results, not shown here to save space, are almost identical to those in Table 5. Table A3 presents the first stage estimations, including respectively the three instruments or only the last two.

(Table A3 here)

Table A1: Minimum daily wage, exchange rate and procurement thresholds

	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 A2: Distribution of self-selection dummies

State providers		0	1	Total
Import-export				
	0	7,035 (97.1%)	4,170 (75.7%)	11,745
	1	213 (2.9%)	801 (24.3%)	1,014
Construction and maintenance				
	0	7,224 (99.7%)	4,983 (90.4%)	12,207
	1	24 (0.3%)	528 (9.6%)	552
Consulting				
	0	7,246 (99.97%)	5,277 (95.8%)	12,523
	1	2 (0.03%)	234 (4.2%)	236
Total		7,248	5,511	12,759

Note: In each cell, the number in parenthesis indicates the share of firms with or without the name attribute, as a percentage of the total of firms in the category (state provider or not). For example, firms in the "impexp" category represent 2.9% (213/7248) of non state providers, and 24.3% (801/5511) of state providers.

Table A3 : Probit model of firms' intervention in procurement

	(1) State provider dummy	(2) State provider dummy
Import-export	1.051	
	(0.080)***	
Construction and maintenance	1.540	1.781
	(0.164)***	(0.163)***
Consulting	2.244	2.170
	(0.547)***	(0.542)***
Importer	-2.414	-2.415
	(0.036)***	(0.034)***
Exporter	-1.235	-1.241
	(0.074)***	(0.076)***
Constant	1.303	1.379
	(0.026)***	(0.025)***
Pseudo R2	0.53	0.51
Observations	12759	12759

Robust standard errors in parentheses. *** significant at 1%.

4 References

Nickson, A. & Lambert, P. (2002). State Reform and the Privatized State in Paraguay. *Public Administration and Development*, 22(2), 163-174.

Mironov, M. & Zhuravskaya, E. (2012). *Corruption in Procurement and Shadow Campaign Financing: Evidence from Russia.* mimeo.

Pérez-Liñán, A., Molinas, J., Montero, M., & Saiegh, S. (2006). *Political Institutions, Policymaking Processes and Policy Outcomes in Paraguay, 1954-2003.* Inter-American Development Bank, Research Network Working Papers R-502.