Political Connections and Misallocation of Procurement Contracts: Evidence from Ecuador*

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Abstract

We use new administrative data from Ecuador to study the welfare effects of the misallocation of procurement contracts caused by political connections. We show that firms that form links with the bureaucracy experience an increased probability of being awarded a government contract. The reallocation of contracts generates opportunities for misallocation, as politically connected firms charge higher prices and are less efficient than unconnected firms. We develop a methodology to quantify the welfare losses of political connections through these margins—price inflation and excess cost of provision—and estimate welfare losses of up to 8% of the procurement budget.

Keywords: efficiency costs; procurement contracts; political connections

JEL codes: D61, D73, H57, P16.

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1 Introduction

Government procurement represents 12% of the global GDP (Bosio et al., 2020). Despite growing evidence on how procurement systems and practices affect the allocation of government contracts,[1] little is known about their welfare implications. This paper considers political connections as a contract reallocation mechanism and quantifies the welfare costs that connections levy on society through two complementary margins: *price inflation* and *excess costs of provision*.

We think about the two margins as follows. On the one hand, as documented by many news outlets, politically connected firms often charge the government high prices for the goods and services provided.[2] These price-related distortions affect welfare by reducing the amount of public goods procured by the government at a given budget. Depending on the shape of the government demand, the higher prices could also imply that the government will have to raise additional funds in order to meet its target demand. We refer to these effects as the *price inflation* margin of the misallocation of procurement contracts. On the other hand, politically connected firms could be allocated procurement contracts despite being more inefficient than their unconnected competitors, hence generating losses for society through a wasteful use of resources. We term this the *excess costs* margin.

In this paper, we develop a theoretical framework to conceptualize and measure the misallocation costs caused by political connections through the two margins just described. We overcome the past challenges of the empirical misallocation literature by building a novel database for Ecuador that allows us to precisely measure political connections, contract-level prices, and firm-level productivities. In particular, our data combines (i) firms' balance sheet information, (ii) firms' ownership information, (iii) the universe of public procurement contracts, and (iv) the identities of all bureaucrats. Key to our analysis, we observe politically connected firms by identifying instances when the owner of a firm is linked to the government. Our definition of political connection is broader than the one usually adopted in the literature along two concurring dimensions. First, while previous studies mainly focus on *elected* officials (e.g., Faccio, 2006), we can also identify political links occurring through *appointed* bureaucrats. Sec-

[1] See, for example, Bandiera et al. (2009), Krasnokutskaya and Seim (2011), Decarolis (2014), Best et al. (2017), and Liebman and Mahoney (2017).

[2] Overpricing practices during the COVID-19 pandemic are for instance documented in a recent New York Times article (`https://www.nytimes.com/2020/06/20/world/americas/coronavirus-latin-america-corruption.html`). Estimates by the Ecuadorian government on wasted resources due to overpricing in past administrations are instead reported by El Universo (`https://www.eluniverso.com/noticias/2019/01/04/nota/7122516/ecuador-habria-perdido-2500-millones-sobreprecios-5-proyectos`).

ond, we consider both cases in which the owner of a firm *directly* holds a bureaucratic position, and cases when the political connection is *indirectly* formed through one of the owner's siblings working as a public official.[3]

We begin our analysis by showing that political connections play a significant role in the allocation of government contracts. By exploiting our data's fine time dimension, we use an event-study design to estimate the effects of political connections on the probability of winning procurement contracts. We find that when firms establish a new political connection (i.e., when the owner of the firm or their siblings start working in the public sector for the first time), they benefit from a 2.8 percentage points increase in the probability of being awarded a contract in a given year (from a 20% basis). This supports recent empirical evidence from several countries.[4] We find the largest effects among contracts characterized by high discretion in the allocation process, while at the same time, we do not measure any sizeable effect on a set of contracts that are randomly allocated through a lottery system. We increase our confidence in these results implementing several robustness exercises.

With the aid of a simple stylized framework, we proceed to show how to estimate the welfare effects caused by the misallocation of contracts. Regarding price inflation, we show that the change in the provision of public goods and the additional budget required by the government are a function of the markup charged by politically connected firms and the government demand elasticity. We recover the markup levied by politically connected firms by analyzing data on contracts for standardized goods detailing prices and quantities at the product-transaction level. We estimate the government demand elasticity, instead, using information on quantities and prices of goods procured by the government at a 5-digit product level, together with a shift-share instrument based on changes to these products' exchange rates to capture exogenous variation in local prices.

We estimate that the additional markup charged by contractors after becoming politically connected ranges between 3.5% and 11.4%. We find a government demand elasticity of approximately -0.8, suggesting that the government will react to the higher prices induced by connected firms by increasing its total budget. The estimated markups and demand elasticity translate into a welfare cost due to the underprovision of goods of up to 0.5% of the procurement budget. Our estimates additionally imply that the government will increase its budget by up to 2.2%. We map the

[3]While family connections have been previously studied in the literature by Gagliarducci and Manacorda (2020), their definition is based on the first three consonants of an individual's last name together with an identifier for the municipality of birth, while ours uses each person's two complete last names.

[4]See, for example, the recent study by Goldman et al. (2013) in the context of the US, the paper by Schoenherr (2019) for Korea, and the one by Baltrunaite (2020) for Lithuania.

additional budget requirement to its welfare correspondent by adopting the marginal cost of public funds (MCPF) estimated by Ballard et al. (1985), and obtain a welfare loss of up to 3.0% of the public procurement budget. Altogether, the price inflation margin generates welfare losses that range between 1.0% and 3.5% of the government budget.

Regarding the excess costs of provision, we show that the average welfare loss to society of procuring an additional dollar from a politically connected firm (instead of an unconnected firm) depends on the gap in the marginal cost of revenue that exists between connected and unconnected contractors. Starting from the firm's cost minimization problem, we show that this cost gap is proportional to differences in firm productivity and capital intensity usage. Therefore, measuring the average welfare loss due to excess costs of provision requires information on productivity and production function parameters. We recover these estimates by modifying standard production function estimation techniques to account for the additional markup that politically connected firms charge when interacting with the government. Our results show that politically connected firms are, on average, less efficient than unconnected contractors. The efficiency gap implies excess costs of provision of up to 5.9%, which translate in welfare costs of up to 4.6% of the procurement budget.

This paper contributes to several strands of literature. First, it relates to the literature on the welfare consequences of political connections and corruption. Previous research suggests that connections could either positively or negatively affect total welfare. On the one hand, political connections might increase efficiency by reducing information asymmetries and moral hazard. This hypothesis is known in the literature as *greasing wheels* (Kaufmann and Wei, 1999). On the other hand, connected firms might engage in rent-seeking behaviors –the so-called *grabbing hand hypothesis*– which could lead to long-lasting negative consequences on welfare (Shleifer and Vishny, 2002). Our paper contributes to this literature by providing empirical estimates of the sign and magnitude of the welfare effects of political connection due to markups and excess production costs.

Next, it speaks to the literature that studies the relationship between public procurement and political connections. Recent empirical papers have shown that politically connected firms win more contracts than unconnected firms (Goldman et al., 2013; Tahoun, 2014; Do et al., 2015). However, connected firms execute these contracts with more delays and at a higher cost (Schoenherr, 2019), obtain more favorable renegotiation terms (Brogaard et al., Forthcoming), charge higher prices and are less efficient (Szucs, 2020), and experience declines in sales after anti-corruption crackdowns in public spending (Colonnelli and Prem, 2020). Our results confirm that politically connected firms are allocated more procurement contracts, charge the government inflated prices, and are less productive than unconnected firms. Moreover, we add to this literature by quantifying the welfare effects of political connections. To the best of our knowledge, only Schoenherr (2019) and Szucs (2020) study the allocative efficiency of procurement contracts. Schoenherr (2019) does it by quantifying the social costs of delay and estimating the additional government expenditures due to ex-post cost surges caused by political connections. On the other hand, Szucs (2020) studies the welfare effects of different entry thresholds into high-discretion procurement procedures on production and administrative costs. In our paper, instead, we develop a framework that considers the social losses deriving from the reduced supply of public goods and the increase in public expenditures due to price inflation, as well as from the excess costs of awarding contracts to inefficient firms.

More broadly, our paper relates to the literature that establishes the existence of a positive relationship between political connections and firm performance. This association has been recently documented for many developed and developing countries such as the US (Acemoglu et al., 2016), Italy (Cingano and Pinotti, 2013), Tunisia (Rijkers et al., 2017), Denmark (Amore and Bennedsen, 2013), China (Fan et al., 2007), Malaysia (Johnson and Mitton, 2003), Indonesia (Fisman, 2001), and Pakistan (Khwaja and Mian, 2005). Compared to previous papers, our work offers two innovations. First, while existing research tends to rely on indirect political connections,[5] we directly observe whether the owner of a firm is linked to the bureaucracy. Second, past works using information on firms' owners or top managers usually focus on publicly traded firms due to data availability. Instead, we leverage an Ecuadorian administrative ownership registry to study private firms, which are more pervasive than public companies in the developing world.

Finally, our paper is also related to the literature that studies misallocation, pioneered by Restuccia and Rogerson (2008) and Hsieh and Klenow (2009). Several papers have applied and extended their framework to quantify aggregate productivity losses stemming from misallocation (see, for instance, Blattner et al., 2019; Rotemberg, 2019; Baqaee and Farhi, 2020). Within this literature, the closest papers to ours are Asker et al. (2019) and Boehm and Oberfield (2020). Asker et al. (2019) studies misallocation in the oil production cartel by measuring the gap in cost functions from heterogeneous producers. Boehm and Oberfield (2020) contributes instead to the misallocation literature by studying suboptimal input usage due to weak legal enforcement

[5]For instance, Acemoglu et al. (2016) classifies a firm as politically connected if their executives met the president of the Federal Reserve Board personally through meetings or as being part of the same nonprofit boards. Cingano and Pinotti (2013) defines a connection by whether an *employee* of the firm also works at the local government.

and exploiting first moments rather than the dispersion in productivities to identify misallocation. We build on the intuition and methodologies developed in these papers and adapt them to the context of political connections in public procurement, a field which has been overlooked as a target of misallocation. Although we focus on political connections, our framework could be easily adapted to evaluate the misallocation generated by other government interventions, such as preferential rules in procurement contracts.

The remainder of the paper is organized as follows. Section 2 presents a stylized model of the welfare effects of price inflation and excess costs of provision. Section 3 details the data and main definitions of the paper. Section 4 shows reduced-form evidence of reallocation of procurement contracts in the presence of political connections. Section 5 describes the empirical framework we adopt to estimate the welfare losses from political connections. The main results of the welfare analysis are reported in Section 6. Section 7 concludes the paper.

2 Stylized Model of Welfare Effects of Political Connections

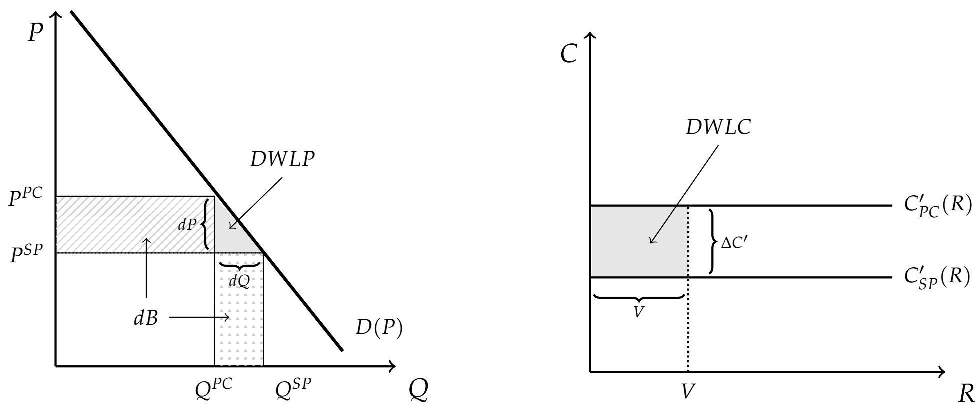
This section introduces a simple theoretical framework to conceptualize the welfare effects of political connections. We consider two independent mechanisms: price inflation and excess costs of provision.

2.1 Price Inflation

Figure 1a offers a stylized graphical representation of the relationship between price inflation and economic welfare. In the figure, $D(P)$ denotes the government aggregate demand over all procured goods, which we assume is characterized by a constant price elasticity, ϵ. In the absence of political connections, the Social Planner's equilibrium price is given by P^{SP}, and the corresponding quantity is Q^{SP}. If firms that are politically connected use their links to charge the government higher prices for otherwise identical goods, the contracts allocated to connected firms would have a price P^{PC} which is higher than the Social Planner's price. This generates a movement along the government demand curve and results in a lower demanded quantity, Q^{PC}.[6] The deadweight loss to society resulting from the under-provision of goods and services is represented in Figure 1a by the shaded area $DWLP$.

[6]The movement along the government demand curve when the average price level changes due to political connections is consistent with a world in which firms have political links to agencies at the local level, and the central government distributes funds to these entities based on reasons that are orthogonal to the degree of corruption of the agency itself. This representation appears to fit well the context of Ecuador.

When the elasticity of government demand is less than one, there exists an additional burden on society levied by the political connections markup. The higher average price due to connections is not completely offset by a corresponding decrease in quantity, so the government needs to raise a larger budget to provide the desired level of goods and services. The difference in government funds with and without connections can be observed in Figure 1a, where the dashed area $Q^{SP}dP$ is larger then the dotted area $P^{SP}dQ$, resulting in $dB > 0$. If the marginal cost of public funds (MCPF) is greater than one, a higher government budget generates, in turn, additional losses to society.[7]



(a) Price Inflation

(b) Excess Costs of Provision

Figure 1: Welfare Effects of Political Connection

2.2 Excess Costs

We next consider the welfare effects generated by excess costs of provision, as illustrated in Figure 1b. The cost of raising one extra dollar of revenue for unconnected contractors is represented by the curve $C'_{SP}(R)$, while the cost for a connected contractor is denoted by $C'_{PC}(R)$. For ease of illustration, we consider the case where both types of firms face constant marginal costs. We relax this assumption in Section 5.2. If politically connected firms are less efficient, such that $C'_{SP}(R) < C'_{PC}(R)$, allocating a contract of value V to a connected firm entails a wasteful use of resources. The resulting welfare cost per contract is given by the shaded area $DWLC$ and can be identified from the gap in the marginal cost curves.

[7]For a review of the literature on the MCPF see, for example, Dahlby (2008).

3 Data and Definitions

Estimating the welfare costs detailed in the previous section requires granular data to recover the government demand elasticity, the markup charged by politically connected firms, and the marginal costs of public contractors. In this section, we document the multiple administrative sources used to build our final dataset and provide additional definitions relevant to the analysis.

3.1 Data

3.1.1 Balance Sheets and Income Statements

We use balance sheets and income statements covering the universe of formal private firms in Ecuador for the period 2007-2017. The data is collected by the *Superintendencia de Compañias* (Business Bureau) and it contains information on firms' annual revenues, input expenditures (e.g., wages, physical capital, energy consumption), assets, and debt. We also observe each firm's main economic activity at the 6-digit ISIC sector level and a unique firm identifier. We leverage this data to estimate the marginal cost of government contractors.

3.1.2 Firms Ownership

We use a second database collected by the Business Bureau that tracks any change to the ownership composition of Ecuadorian private companies. The data starts in 2000, and we scraped it for each year up to 2017. Shares can be owned by natural persons or by legal entities, following a pyramidal structure. For shares directly owned by individuals, the records show each owner's national ID, full name, and their respective share in the firm. When another firm owns shares, we walk up the chain of control until we identify the ultimate beneficiaries at the top of the pyramid.[8]

3.1.3 Bureaucrats

In Ecuador, all elected or appointed public sector workers are required by law to submit a sworn statement of net worth each time they have a new appointment. This regulation became effective in 2003 for high-rank positions and was extended to all civil servants in 2008. For each public official, the webpage of the *Contraloría General*

[8]The dataset does not keep information on the individuals or companies investing in mutual funds. Therefore, we cannot establish a complete ownership structure for businesses owned by mutual funds. However, on the aggregate, total shares owned by national firms that cannot be traced to final local ownership amount to 1% of the firms in the data.

del Estado del Ecuador (Comptroller General) makes publicly available information regarding national ID, full name, the agency where the bureaucrat works, starting year, and position held. We scraped this data for all years up to 2018.[9] For our analysis, we exclude individuals with non-administrative jobs in schools, hospitals, and military institutions.

Although the data allows us to identify any subsequent inter- or intra-agency moves, it does not keep track of whether an individual stops working for the government. Therefore, it cannot be used to study the effects of *exit* from bureaucracy.

3.1.4 Government Purchases

Starting in 2008, the Ecuadorian government issued new regulations to centralize and modernize the public procurement system. Among these changes, the government created a new web portal with the intent of facilitating the interaction between local agencies and contractors.[10] Agencies use the platform to post calls for tenders, while registered suppliers use it to submit their bids.[11]

We scraped all webpages available on the public procurement portal during the summer of 2018 and constructed a dataset containing virtually every contract issued by the government agencies between 2009 and 2018. For each contract, the data contains information that includes a description of the contract, starting date, initial budget, agreed value, length of the contract, type of contract, and the number of firms presenting bids. A large fraction of the contracts in the data are of very small value. In order to keep a relevant and comparable sample, we drop contracts of value below the 1^{st} and above the 99^{th} percentile of the contract value distribution. We further exclude contracts that were either deserted, unilaterally terminated, or terminated by mutual agreement.

The exact procedure used to award a contract depends on the type and value of the goods or services provided. Normalized goods and services are procured through reverse auctions, in which the winner is selected based on the lowest price offered. Instead, non-normalized products are procured through scoring auctions. The exact scoring function depends on the value of the contract and takes into account the price offered as well as other more subjective elements. For relatively small purchases, there

[9] Even if there are records reporting a start date as early as 1970, the coverage of the data becomes representative of the public labor force in the early 2000s.

[10] The portal is administered by the *Superintendencia de Compras Públicas* (Public Procurement Bureau) and can be accessed at https://www.compraspublicas.gob.ec/ProcesoContratacion/compras/PC/buscarProceso.cpe?sg=1#.

[11] Registration requires only some basic information, which includes the type of company, economic sector, and products it can provide down to 10 digits of detail.

exists the option to contract directly without an auction or any other contest. Finally, public works of relatively small value are organized through a process denoted *menor cuantia* (lower value), where the winner is randomly selected through a lottery among pre-qualified contenders. For the analysis, we classify the contracts in three categories –auctions, discretionary, and random– depending on the degree of discretion of the allocation process.

We also obtain information for a set of standardized goods and services procured through an electronic catalog similar to the one studied in Bandiera et al. (2009). The electronic catalog allows an institution to purchase goods and services from a pre-specified list of providers, where each provider is free to choose the price at which they want to sell. For this data, we observe quantities and prices at a ten-digit product-level, so that we can infer unit-prices very granularly. The products' classification allows us to distinguish, for example, between pencils with erasers and without erasers, or between different computer specifications. The data from the electronic catalog covers the period 2014-2018.

3.1.5 Linking Sources Together

We match the balance sheet and business ownership information using unique firm identifiers, which are assigned for tax purposes when a company is established. Similarly, to link the balance sheet data to the public procurement data, we use the firm IDs and their legal names.[12]

We use the individuals' IDs to match the bureaucrats and ownership datasets. The resulting matches identify owners who also work for the government. We additionally consider links between individuals and their siblings. These matches are obtained as follows. First, we construct "families" using the two last names of each individual recorded in our data.[13] People sharing both last names are then assumed to be siblings. Our procedure generates small family groups, so the rate of unrelated individuals misclassified as siblings is unlikely to be high. As shown in Appendix Figure A.1, the family size distribution we obtain is similar to the family size distribution observed in census data.

[12]The use of the companies' legal names in our matching algorithm has the objective to limit the number of wrong matches that could arise in case of reporting mistakes in the firm IDs between different data sources.

[13]In Ecuador, individual identities are recorded with two last names. The first is the paternal last name and the second is the maternal last name.

3.2 Key Definitions

3.2.1 Government Contractors

Although we have balance sheet and ownership information for the universe of private firms in Ecuador, we focus our analysis on government contractors. We classify a firm as a contractor if we observe it at least once in the procurement dataset, so our final sample also includes firms that participated in a tender without winning it. As we need balance sheet information to quantify excess costs, we exclude from the analysis (except where explicitly indicated) government contractors that operate as individuals and not as firms.

3.2.2 Political Connections

For our analysis, we consider two types of political connections: direct and indirect. We say that a firm has a *direct* connection if any of its owners work as a public official. Instead, we classify a connection as *indirect* when one of the siblings of a shareholder holds a bureaucratic position. To define an indirect connection, we only consider families of size less than or equal to 4 (corresponding to the 75$^{\text{th}}$ percentile of the family size distribution). We impose this restriction to reduce the risk of false-positive indirect connections, which arise when unrelated individuals are erroneously classified as siblings.[14] For both direct and indirect connections, we consider only owners controlling at least 20% of the firm's shares at some point in time. We choose this threshold as it is commonly used by government authorities as a rule of thumb to assess whether an owner exerts significant control over a firm.[15]

Since owners may sell their shares of a company to hide their political links, our definition of political connection considers both current and past owners. However, we exclude two groups of connected firms from our analysis. The first group consists of businesses whose shares are bought by individuals already working as public officials (we refer to these connections as a "strategic" connections). We drop these firms, as the decision to buy shares of a firm may be influenced by unobservables, such as growth opportunities, that could bias our analysis. Second, we exclude firms created by bureaucrats (or their siblings), since they mechanically lack a baseline period before the connection occurs. We additionally exclude observations for the years in which we do not have balance sheet information for a firm. This restriction is intended to create a uniform sample across all parts of the analysis.[16]

[14]We perform robustness checks using a family size threshold of 7 (approximately the 90$^{\text{th}}$ percentile of the family size distribution) and obtain comparable results.

[15]See, for example, European Commission (2015), section 4.4.

[16]In particular, the analysis of the excess costs of provision relies on production function estimation

3.3 Descriptive Statistics

In this section, we present summary statistics for the data used in our analysis. Table 1 gives information on the average number of connections observed in the data. For our main analysis, we use data from 29,027 firms that are government contractors, of which, 6,030 firms are politically connected at some point in our data.[17] Of the politically connected firms, 46% of connections are exclusively direct, 23% are indirect connections, and the remaining firms are connected through the two margins. On average, each firm has about 1.6 connections.

In Figure 2, we present the top 20 bureaucratic positions in our data in terms of the aggregate value of contracts won by the firms connected to each position. The most valuable position is *Director*, which is a high-rank position. However, the data also includes links through low-rank positions as, for example, the second and third most valuable positions are *Analyst* and *Public servant 1-4*, which are among the lowest-ranked bureaucrats.[18]

Table 2 provides summary statistics for 2015 for the firms included in the data. Panel A allows a comparison between all private firms (Column (1)) and the sample of contractors (Column (2)). Firms classified as contractors are, on average, larger in terms of revenue, capital, wages, inputs, and debt. In Panel B, we decompose the set of contractors between connected and unconnected firms. Politically connected firms, which account for about 31% of the government contractors, are considerably smaller than unconnected ones. This is also true for the set of connected firms used in our main analysis, shown in Column (5), which excludes firms acquired or created by a bureaucrat and firms with connections established before 2000. The remainder of the table (Panel C) shows that connected firms that establish direct, indirect, or both types of political connections are similar with each other. Note that cross-sectional differences between connected and unconnected firms need not pose a challenge to our identifying assumptions. In fact, our analysis of the effect of political connections exploits variations in the timing of connections, while the welfare analysis explicitly accounts for differences between the two types of firms.

Table 3 shows statistics for all government contracts issued between 2009 and 2017. Most of the contracts are allocated using auctions, which account for over 45% of the

and thus on the availability of balance sheet data.

[17] The 6,030 connected firms exclude 1,384 firms that are strategically connected and 509 firms that are created by bureaucrats.

[18] We keep *Professors* as part of the bureaucratic force as anecdotal evidence suggests that they can affect the allocation of public funds. Moreover, public universities have large expenses of about US $ 1 billion per year. See, for example, the report by the expenditure watchdog *Observatorio de Gasto Público* (https://www.gastopublico.org/informes-del-observatorio/el-presupuesto-de-las-universidades-dinero-bien-gastado).

contracts. A typical auction has a value of about US $49,000. These contracts are relatively competitive, as they have, on average, 2.2 firms bidding for the same contract. Publications are the second most common contract type, with almost 65,000 contracts. These contracts are about one-third the size of auctions and are used for "special" circumstances, so that the issuing agency has complete discretion in selecting the winning firm. The table also presents statistics for other contracts that are allocated in a discretionary way. Quotations and other discretionary contracts are awarded using a scoring auction. Instead, contracts issued through direct contracting are allocated without a contest, as well as the vast majority of lower value contracts for goods and services. The remaining category –lower value contracts entailing public works– are randomly allocated to firms through a lottery.

Descriptive statistics for contracts in the electronic catalog are reported in Table 4. Our data contains 958,823 transactions, with an average transaction value of US $1,621, and an average unit price of US $161. We also note that there is considerable competition for the goods and services provided through the electronic catalog, as the yearly average number of suppliers for a given product is 50.1.

4 Effect of Political Connections on Procurement Contracting

In this section, we provide evidence that firms can use their political connections to influence the allocation of government procurement contracts. This finding motivates our following analysis of the costs incurred by society when politically connected firms win contracts.

4.1 Methodology

To identify the role played by political connections in the allocation of government contracts, we exploit the yearly variation in the number of contracts awarded to firms and their political connection status in an event-study design. For simplicity, despite firms can establish links with multiple bureaucrats, we focus our analysis on the first connection, i.e., the event is defined as the first appointment of one of the owners of a firm (or one of their siblings) as a public worker.

Let e_i denote the first time firm i establishes a link with the public sector. We study the allocation of public procurement contracts to firm i around the event e_i and investigate whether it experiences a sharp change in its probability of winning a contract after gaining a political connection. Let $Contract_{it}$ be an indicator variable equal to one if i is awarded contracts in year t. We run the following event-study regression

$$Contract_{it} = \sum_{\tau=-T}^{T} \mathbb{1}(t - e_i = \tau)\beta_\tau + \alpha_t + \gamma_i + \varepsilon_{it}, \tag{1}$$

where β_τ denotes the coefficients of interest, α_t are year fixed-effects, γ_i are individual fixed-effects, and ε_{it} are time-varying unobservables. Under the assumption that the timing of the bureaucrats' appointment is exogenous with respect to other variables correlated with the probability of winning a contract, any significant mean shift at the time of the event can be interpreted as the causal effect of political connection on public contracts allocation. We indirectly test the assumption of exogenous timing by looking at pre-trends in the event-study plot, which should be flat around the event. Given our definition of $Contract_{it}$, the β_τ coefficients in equation 1 are interpreted as the change in the probability of being awarded a contract around the time of the first political connection. We present in the appendix an alternative specification that uses as dependent variable the value of the contracts won.

After applying the restrictions listed in Section 3.2.2, the sample we use in the main event-study regression includes 6,030 politically connected contractors. We further include 22,997 firms that never establish a link with the public sector (never treated). This control group allows to separate the year fixed effects from the dynamic treatment effects of interest (Borusyak and Jaravel, 2017).

4.2 Political Connections and Allocation of Procurement Contracts

Figure 3 shows the evolution in the yearly probability of being awarded a government contract for politically connected firms before and after the first connection is established. The plot reports coefficients from the event-study regression described in equation 1. The probability of winning a contract in a given year increases by 2 to 3 percentage points after establishing a connection, from a baseline average probability of about 20%. The overall path is very similar if we replace the dependent variable with the yearly value of procurement contracts won (Appendix Figure A.2).

We observe that part of the mean shift happens already one year before the event (between period -2 and -1). This is likely to be explained by measurement error in the time of the first political connection. Our measure of entry into bureaucracy is based on the sworn declaration of net worth that Ecuadorian officials are mandated to present when appointed. While it is unlikely that a bureaucrat will present the affidavit before the actual entry date, some bureaucrats submit theirs with some delay.[19]

[19] Indeed, Appendix Figure A.3 shows that a disproportionate number of appointments is recorded

Therefore, the reference year (-1) might be partially treated. While we acknowledge that the mean shift observed one year before the event could also be explained by the presence of confounding factors, it is important to note that the preceding periods do not show any significant pre-trend.

In Table 5, we present a decomposition of the effects plotted in Figure 3 by type of political connection (direct and indirect) and contract category. For this specification, we replace the dynamic treatment effect in equation 1, with a pre- and post-event indicator variables. Column (1) indicates that political connections increase the probability of winning a contract on average by 2.8 percentage points in the post-treatment period (from a 19.5% basis). Columns (2) through (4) present the results separately for the three alternative types of connections (direct, indirect, and both). We measure similar effects across all types of connections.

In Columns (5)-(7), we group contracts into three categories depending on the degree of discretionality of the allocation process. The dependent variable is replaced with the probability of being awarded a contract from one of these categories. Columns (5) and (6) show that the effects of establishing a political connection are milder for auctions (18.4% increase from a baseline probability of 6.3%) than for discretionary contracts (24.1% increase from a 13.8% basis). We interpret this finding as evidence that auctions are awarded through a more competitive process. On the other hand, the effect on the set of contracts allocated randomly is precisely estimated at zero (Column (7)).

4.2.1 Robustness

Appendix Table A.1 reports a first set of robustness checks. First, our estimates rely on the assumption that the timing of connection is exogenous. To relieve concerns on the validity of this assumption, Column (1) looks at contractors that form bureaucratic links with agencies undergoing large reshuffles in their workforce.[20] Usually, large reshuffles result from changes in the leadership of an agency, so their timing is more likely to be unanticipated. Second, Column (2) checks if considering only the first political connection of a firm (and not accounting for whether it establishes other connections at later periods) affects the results. We test this by restricting the sample to firms that we observe forming only one political link. Finally, our results may be

in January. If part of them actually occurred in December of the previous year but were only registered in January due to measurement error, the jump observed between period -2 and -1 would substantially decrease.

[20] We say an agency is undergoing a large reshuffle if we observe at least ten bureaucrats working for the agency in a given year, and at least 50% of the agency's employees did not work there the previous year.

biased by the fact that some bureaucrats sell their shares after they start working in the public sector. We drop this set of potentially "strategic" exits in Column (3). We find overall consistent effects of political connections in all these robustness samples.[21]

The remainder of this section presents additional falsification and robustness event-studies. The sample used in each test excludes contractors that establish an actual political connection. The event-studies differ in terms of the firms considered in the "placebo" treatment group, those included in the control group, and how the event is defined. The results of the tests are reported in Figure 4.

Panel (a) presents a falsification test where we assign random treatment years to 20% of the unconnected contractors, leaving 80% of the sample as a control group. We further impose that the distribution of fake entry years matches the true distribution. The plot shows no evidence of a discontinuity in the yearly probability of being awarded a contract around the time of the event.

In the second test, we consider only connections through families having more than 15 siblings,[22] which likely generate a high share of false-positive links. For such a sample, one should expect weaker or no effects on the probability of winning a contract after a false-positive connection is established. Panel (b) presents the results for this test.[23] We observe an increase in the probability of winning contracts the year of the event and the following period, reflecting the idea that some of the connections we measure are true. However, these estimates are noisy and decay quite rapidly over time.

Finally, in Panel (c), we consider the subsample of low-ranked bureaucrats and select firms in which they own less than 10% of the shares.[24] The intuition underlying this robustness test is that low-ranked bureaucrats should have fewer opportunities to allocate contracts to their firms. Furthermore, if firm shares are a proxy of how profits are redistributed across owners, bureaucrats with small shares should have less incentive to engage in contract reallocation activities. Consistent with our hypothesis, we do not find any evidence of an increase in the probability of winning contracts around the time of the event.

Overall, none of the robustness tests presented in Figure 4 shows an effect on the probability of being awarded a contract comparable to that observed in Figure 3.[25]

[21] In Column (4) of Appendix Table A.1, we present the results for connections generated through bureaucrats acquiring shares of a firm (i.e., strategic entrants). We find an increase in the probability of winning contracts of about 9 percentage points, from a baseline probability of 16.3%. The larger effect is consistent with bureaucrats strategically investing in firms with higher growth potential.

[22] This corresponds to approximately the 95th percentile of the family size distribution.

[23] The sample includes 2,642 treated firms and 12,905 control firms.

[24] The sample includes 1,148 contractors in the treatment group and 20,710 in the control group.

[25] We conduct equivalent robustness exercises using the value of contracts as dependent variable and

Therefore, we interpret our results as evidence that political connections affect the allocation of government contracts, leading to the question of whether these contracts are misallocated and hence generate a welfare loss.

5 Welfare Analysis: Methods

Section 2 briefly outlined how the misallocation of contracts due to political connections can affect welfare through two channels: price inflation and excess costs of provision. In this section, we provide sufficient statistics to quantify each of these costs.

For price inflation, we first derive simple expressions to calculate the size of the deadweight loss in Figure 1a, as well as the cost due to the additional public funds required to meet the new expenditure target. Next, we show how to measure markups from a subset of contracts for homogeneous goods detailing quantity-price information. We then use an instrumental variable approach to estimate the government demand elasticity.

For the excess costs of provision, we show how to leverage firm balance sheet data to compute gaps in the marginal cost of revenue between connected and unconnected contractors. In particular, this exercise requires measures of firms' productivity and input elasticities, which we obtain building on standard production function estimation techniques. The conditions we derive can be used to calculate the size of the welfare loss area of Figure 1b under different assumptions regarding how firms can adjust capital at the time of production.

5.1 Quantifying the Welfare Effects of Price Inflation

5.1.1 *Sufficient Statistics for the Effects of Price Inflation*

Our goal is to quantify the size of the areas $DWLP$ and dB. First, consider the triangle $DWLP$, which is given by

$$DWLP = \left|\frac{dPdQ}{2}\right|, \tag{2}$$

where dP is the difference in the average unit price with and without political connections, and dQ is the corresponding change in the quantity of goods and services procured. Let μ^{PC} denote the additional markup charged to the government by politically connected firms over the social planner price P^{SP}, and let $(1-\theta)$ be the share of contracts allocated to politically connected firms. The average price faced by the government in the presence of political connections can be written as

obtain similar results (see Appendix Figure A.4).

$P^{PC} = \theta P^{SP} + (1-\theta)(1+\mu^{PC})P^{SP}$, so that the change in price with respect to the Social Planner's target is

$$dP = (1-\theta)\mu^{PC}P^{SP}. \tag{3}$$

Under the assumption that the price elasticity of demand is constant and equal to ϵ, we have the following relationship between the change in quantities and the change in prices

$$dQ = dP\frac{\epsilon B^{SP}}{(P^{SP})^2}, \tag{4}$$

with B^{SP} denoting the government budget in the absence of political connections. Putting the last two equations together, we obtain a simple expression for the deadweight loss of price inflation

$$DWLP = \frac{1}{2}\epsilon B^{SP}\left(\mu^{PC}(1-\theta)\right)^2. \tag{5}$$

Next, we compute an expression for the change in government funds, dB. Using the elasticity formula, we can write $dB = Q^{SP}(1+\epsilon)dP$. Multiplying and dividing by P^{SP} and taking the expression for the change in price from equation 3, we derive

$$dB = B^{SP}(1+\epsilon)(1-\theta)\mu^{PC}. \tag{6}$$

When the government demand is unit-elastic ($\epsilon = -1$), the total budget in the presence of political connections is equal to the Social Planner's budget, or $dB = 0$. However, an inelastic demand implies that the government will have to raise more funds and, consequently, generate an additional welfare loss through taxation.

Note that equations 5 and 6 depend on the unobserved Social Planner budget, B^{SP}. To rewrite these expressions as a function of the observed budget with connections, B^{PC}, we use the following relationship $dB + B^{SP} = B^{PC}$ and obtain

$$B^{SP} = \frac{B^{PC}}{1+(1+\epsilon)(1-\theta)\mu^{PC}}. \tag{7}$$

Using equation 7 we can rewrite the expressions for the deadweight loss of price inflation and the change in government budget as

$$DWLP = \frac{1}{2}\epsilon B^{PC}\frac{\left(\mu^{PC}(1-\theta)\right)^2}{1+(1+\epsilon)(1-\theta)\mu^{PC}}, \tag{8}$$

and

$$dB = B^{PC} \frac{(1+\epsilon)(1-\theta)\mu^{PC}}{1+(1+\epsilon)(1-\theta)\mu^{PC}}. \tag{9}$$

All parameters in equations 8 and 9 are directly observable or can be estimated from the data.

5.1.2 *Government Demand Elasticity*

The framework developed in the previous section shows that the welfare loss from price inflation is proportional to the elasticity of government demand. For example, a government with perfectly inelastic demand ($\epsilon \rightarrow 0$ and vertical $D(P)$ curve in Figure 1a) will keep procuring the same quantity independently of the level of prices. In this case, there will be no deadweight loss from under-provision of goods ($DWLP = 0$), but the government will have to raise a larger budget to meet demand at the inflated prices ($dB > 0$).

We estimate the government demand elasticity by regressing changes in (log) quantity procured on changes in the average (log) unit price at the CPC-5 product level. We use an instrument that captures unexpected shocks to supply from international trade to address the endogeneity in the observed prices. More precisely, we instrument the change in the price for good j at time t with

$$\sum_c \Delta ExchangeRate_{ct} \frac{Imports_{jct-1}}{\sum_c Imports_{jct-1}}, \tag{10}$$

where $\Delta ExchangeRate_{ct}$ is the percentage yearly change in the exchange rate between country c and Ecuador, and $Imports_{jct-1}$ denotes Ecuadorian imports of good j from country c in the previous year.[26]

To fix ideas on the intuition underlying this instrument, suppose Ecuador imports a large quantity of good j from country c. A positive shock to the exchange rate with this country will make the import of j cheaper, therefore lowering its average price while keeping demand fixed. Our instrumental variable approach exploits the exogenous variation in prices induced by unanticipated exchange rate shocks to trace the slope of government demand.

[26]Similar shift-share instruments have been previously used in the literature, for example, by Park et al. (2010) and Brambilla et al. (2012).

5.1.3 Estimating Price Inflation

Equations 8 and 9 of Section 5.1.1 show that both channels through which price inflation affects welfare depend on the markup charged by politically connected firms on government sales. This section presents the empirical framework we adopt to test whether connected contractors systematically charge inflated prices. To reduce the concern that the observed price differences could be explained by product heterogeneity, we focus our analysis on electronic catalog purchases and contracts allocated through auctions. As discussed in Section 3.1.4, the government uses these types of contracts to procure highly standardized goods.

We proceed to estimate the markup of political connections using the following approach. Let P_{ijat} denote the price charged by firm i for one unit of good j to a government agency a at time t. This is computed as the ratio between the total value of the contract and the quantity of goods procured. We then define the standardized log price $p_{ijat} = log(P_{ijat}) - \bar{p}_{jt}$, with $\bar{p}_{jt}$ denoting the average log price of product j across all firms in a given year t. Similarly, let $q_{ijat} = log(Q_{ijat}) - \bar{q}_{jt}$ be the demeaned log quantity of good j.[27] To make the standardization meaningful, we drop observations of goods that are sold by a single contractor over the course of a year.[28] This allows us to compare the price that a firm charges for a given standardized good relative to other contractors supplying the same good in the same year. We can then use the demeaned price to measure the markup charged by politically connected firms for the goods they provide. In practice, we estimate the following regression

$$\begin{aligned} p_{ijat} = & (\beta_1 BeforePC_{it} + \beta_2 AfterPC_{it}) \times FirmContractor_{it} \\ & + (\beta_3 BeforePC_{it} + \beta_4 AfterPC_{it}) \times PersonContractor_{it} \\ & + \gamma q_{ijat} + \nu_a + \nu_t + \varepsilon_{ijat}, \end{aligned} \tag{11}$$

where $BeforePC_{it}$ is an indicator for politically connected contractors that have not yet established their first link with bureaucracy, while $AfterPC_{it}$ is an indicator for the years following the connection.[29] These two variables capture the average over- or under-pricing behavior relative to unconnected contractors. For this part of the analysis, we include contractors registered as individuals (as opposed to firms only), as they

[27] Similar normalizations are used, for example, by DellaVigna and Gentzkow (2019).

[28] We also exclude medicine purchases, as the process for defining the set of providers differs from the other products procured through the electronic catalog.

[29] Notice that the coefficients of interest capture averages at the contractor-year level, while the unit of observation in the regressions is the transaction level. This introduces differential weighting across contractors if transactions are unevenly distributed among them. With this in mind, we run a second set of regressions where we average all variables at the contractor-year level.

provide valuable information to calculate the mean prices $\bar{p}_{jt}$. The indicator variable $PersonContractor_{it}$ is equal to one when the contractor is registered as an individual, whereas $FirmContractor_{it}$ is equal to one when the contractor is registered as a firm. The coefficient on the interaction $AfterPC_{it} \times FirmContractor_{it}$ is our estimate of the average government markup from political connections. On the other hand, the coefficient on the interaction $BeforePC_{it} \times FirmContractor_{it}$ serves as a falsification test, as the political connection link is not yet active.

Each regression controls for agency and year fixed effects, represented by ν_a and ν_t respectively. Agency fixed effects are introduced to account for the possibility that some agencies systematically pay more than others for the same good (Bandiera et al., 2009). We include deviations from the average quantity, q_{ijat}, to entertain the possibility that bulk discounts are applied to contracts involving large quantities of goods or services. Lastly, ε_{ijat} denotes the error-term.

5.2 Quantifying the Welfare Effects of Excess Costs of Provision

The stylized model discussed in Section 2 helps visualize the misallocation cost incurred by society when politically connected firms are allocated government contracts despite being less efficient than unconnected contractors. Let $V = (1-\theta)B$ represent the total value of contracts allocated to connected firms for a government budget B. The social loss represented in Figure 1b by the shaded area is then given by

$$DWLC = (1-\theta)B\Delta C' = (1-\theta)B(EC^{PC} - 1)C'_{SP}(R), \tag{12}$$

where EC^{PC} denotes the excess costs due to political connections and is defined as the gap in marginal costs of revenue between connected and unconnected firms, i.e. $C'_{PC}(R)/C'_{SP}(R)$ for a level of revenue R.

In the next sections, we develop an empirical framework to estimate the excess costs of provision under constant returns to scale and either flexible or fixed capital. Since the excess cost equations we derive depend on firms' productivity and capital elasticity, we additionally show how to use production function estimation techniques to retrieve the estimates required to quantify the excess costs.

5.2.1 A Production Function Framework

Assume firm i produces output Q_{it}, at time t, according to a Cobb-Douglas production function

$$Q_{it} = L_{it}^{\beta_l} M_{it}^{\beta_m} K_{it}^{\beta_k} exp(\omega_{it} + u_{it}), \tag{13}$$

where L_{it} denotes labor, M_{it} intermediate inputs, and K_{it} capital. Production also depends on a firm-specific Hicks-neutral productivity shock, ω_{it}, and on u_{it}, which captures measurement error and idiosyncratic production shocks. We assume that the u_{it} term is independent and identically distributed (i.i.d.) across producers and time.

As we do not observe firms' physical output or inputs, but rather revenues, $R_{it} = P_{it}Q_{it}$, and input expenditures, $\widetilde{L}_{it} = w_{st}L_{it}$, $\widetilde{M}_{it} = \rho_{st}M_{it}$, and $\widetilde{K}_{it} = r_{st}K_{it}$, we rewrite equation 13 as

$$R_{it} = \widetilde{L}_{it}^{\beta_l}\widetilde{M}_{it}^{\beta_m}\widetilde{K}_{it}^{\beta_k}P_{it}\Psi_{st}^{-1}exp(\omega_{it} + u_{it}), \tag{14}$$

where $\Psi_{st} = w_{st}^{\beta_l}\rho_{st}^{\beta_m}r_{st}^{\beta_k}$ collects the input prices, each one scaled by the elasticity of the corresponding input. Our formulation implicitly assumes that all firms in a given sector s face the same input prices at a given point in time t.

Taking logs of equation 14 and dropping tildes from input expenditures for ease of notation, we obtain

$$r_{it} = \beta_l l_{it} + \beta_m m_{it} + \beta_k k_{it} + \omega_{it} + p_{it} - \psi_{st} + u_{it}, \tag{15}$$

with lowercase letters denoting the log transformation of the corresponding variable.

As shown in equation 15, without information on firm-level prices we cannot identify quantity-based total factor productivity (TFPQ). Rather, we will retrieve estimates of revenue-based total factor productivity (TFPR), represented by $\omega_{it}^{*} = \omega_{it} + p_{it}$. TPFR captures both TFPQ, as well, as markups, product quality, and the product mix (De Loecker and Goldberg, 2014). Although the empirical industrial organization literature is usually concerned with producing unbiased TFPQ estimates, TFPR is the relevant measure of productivity for the notion of excess costs we consider.

5.2.2 Quantifying Excess Costs

Our analysis of the welfare effects from excess costs of provision focuses on revenue-based excess costs. These are defined as the costs of providing an additional dollar of revenue (at private market prices) to the government. We refer to Section 5.2.3 for a detailed discussion on why we think this is the relevant notion of social cost.

In order to derive an expression for revenue excess costs, we assume firms are cost minimizing and face the following Lagrangian function

$$\begin{aligned}\mathcal{L}(L_{it}, M_{it}, K_{it}, \lambda_{it}) = {} & L_{it} + M_{it} + K_{it} \\ & + \lambda_{it}\left(R_{it} - L_{it}^{\beta_l}M_{it}^{\beta_m}K_{it}^{\beta_k}\Psi_{st}^{-1}exp(\omega_{it}^{*})\right).\end{aligned} \tag{16}$$

Recall that our formulation implies that all firms in a given sector face the same input prices and production technology. Additionally, we make the following assumption:

Assumption 1 ***Constant Returns to Scale:*** *In each sector s, the production function satisfies constant returns to scale (CRTS), or $\beta_l + \beta_m + \beta_k = 1$.*

As we will show in Section 6.2, we fail to reject this assumption in our data.

We now derive two expressions that compare the marginal cost of raising one extra dollar of revenue between connected and unconnected firms. The first one assumes that capital can be freely adjusted to respond to realized demand shocks. The second builds on the idea that capital is a dynamic input, in the sense that it is pre-determined by the firm's investment decisions in period $t-1$.

Flexible Capital

Consider a scenario in which capital is fully flexible, so that firms choose all inputs contemporaneously. Let $C_{it}(R_{it}, \omega_{it}^*, \Gamma)$ denote the cost function to raise a target revenue R_{it} given firm TFPR, ω_{it}^*, and structural parameters common to all firms in the sector, Γ. From the minimization of equation 16 we derive the following proposition.[30]

Proposition 1 *With CRTS and flexible capital, the excess cost (EC) of procuring an additional dollar from a politically connected contractor rather than an unconnected contractor is given by*

$$EC_{flex} = \frac{\partial C_{it}(R_{it}^{con}, \omega_{it}^{*con}, \Gamma)/\partial R_{it}}{\partial C_{it}(R_{it}^{unc}, \omega_{it}^{*unc}, \Gamma)/\partial R_{it}} = exp\{\omega_{it}^{*unc} - \omega_{it}^{*con}\}. \tag{17}$$

Proposition 1 implies that, if the assumption of CRTS and flexible capital is satisfied, we can identify the average gap in marginal cost of revenue between connected and unconnected firms simply by looking at differences in TFPR. Allocating contracts to politically connected firms entails higher costs, and thus a welfare loss, if connected contractors are, on average, less productive than their unconnected competitors.

Fixed Capital

Proposition 1 offers a relatively straightforward way of computing excess costs. However, it strictly relies on the assumption that capital can be flexibly adjusted, and therefore abstracts from any issue that arises when firms are close to their capital-utilization capacity. A more realistic approach assumes that capital at time t is pre-determined by investments at time $t-1$, allowing for non-linearities in the cost function. Minimization of the Lagrangian for a fixed level of capital $\bar{K}_{it}$ leads to the following proposition.

[30] A complete derivation is shown in Appendix C.

Proposition 2 *With CRTS and fixed capital, the excess cost (EC) of procuring an additional dollar from a politically connected contractor rather than an unconnected contractor is given by*

$$\begin{aligned} EC_{fixed} &= \frac{\partial C_{it}(S_{it}^{k,con}, \omega_{it}^{*con}, \Lambda)/\partial R_{it}}{\partial C_{it}(S_{it}^{k,unc}, \omega_{it}^{*unc}, \Lambda)/\partial R_{it}} \\ &= exp\Big\{ \frac{\beta_k}{1-\beta_k} \Big(ln(S_{it}^{k,unc}) - ln(S_{it}^{k,con}) \Big) + \frac{1}{1-\beta_k} (\omega_{it}^{*unc} - \omega_{it}^{*con}) \Big\}, \end{aligned} \tag{18}$$

where $S_{it}^{k} = \bar{K}_{it}/R_{it}$ *is the capital-revenue share.*

Intuitively, the excess cost function depends on productivity differences between connected and unconnected contractors, as well as gaps in their capital utilization. The convexity in the cost function introduced by fixed capital implies that firms with low levels of capital-revenue share will require a larger input usage to raise an additional dollar of revenue at the margin. Setting aside productivity differences, allocating contracts to connected firms will generate a cost for society if unconnected firms are further away from their capacity constraint. As we show below, we can identify all estimates required to quantify the excess costs of political connections using standard production function estimation techniques.

Note that, contrary to the extensive literature on misallocation initiated by the seminal contribution of Hsieh and Klenow (2009), our measure of inefficiency does not come from the dispersion of TFPR in the economy but rather by comparisons of average productivities across groups of firms. We take this approach as recent studies have shown that dispersion-based measures of misallocation are sensitive to measurement error and outliers (Bils et al., 2017; Rotemberg and White, 2017).

5.2.3 Discussion on Revenue-Based Excess Costs

The methodology outlined above defines social cost in terms of procuring one extra dollars of revenue (rather than one extra unit of quantity) from either a connected or an unconnected firm. To see why we think this is the relevant experiment, consider replacing Propositions 1 and 2 with their equivalent in terms of the *quantity-based marginal cost*. As quantity does not capture quality differences between producers, the gap in marginal costs will be informative of social excess costs only under the assumption of no quality heterogeneity across sellers. This would be a very restrictive assumption. Moreover, relying on quantity-based measures would disregard quality misallocation.

By focusing on revenue-based marginal cost instead, we are able to capture the social costs stemming from differences in quality provided. The reason for this is that revenue is an aggregate measure of the quantity produced, the product quality, and market power. Indeed, Atkin et al. (2019) show that measures of revenue productivity (TFPR) correlate well with lab-based measures of quality productivity, and are in fact, better proxies for it than quantity productivity (TFPQ).

However, to map the revenue-based excess costs of Propositions 1 and 2 to social costs, we need to assume that private sector's markups are equal across firms within an industry. Under this assumption, the price variation in private markets is only driven by differences in product quality, so that the TFPR estimates reflect solely differences in quality productivity. This assumption is arguably weaker than requiring no quality differences across firms. At the same time, it allows us to speak not only about the private costs of supplying a good (i.e., waste of resources) but also about the public costs of supplying a worse good (i.e., the lower social benefits from consuming the good). It is important to note that this assumption only applies to private markets. Differences in markups on government sales between connected and unconnected contractors are explicitly accounted for in our production function framework.

5.2.4 *Estimating Production Function and Excess Costs*

Measuring excess costs as shown in equations 17 and 18 requires knowledge of firms' productivity and the production function input elasticities. This section explains how to estimate these variables relying on techniques from the production function estimation literature.

The framework presented in Section 5.2.1 follows closely the one used in standard production function estimation (see, for example, De Loecker and Goldberg, 2014). We now introduce a simple variation to account for the previously documented finding that politically connected contractors charge the government higher prices than unconnected firms. In particular, assume that firms can raise revenue both from private sales, R_{it}^{priv}, and from contracts with the government, R_{it}^{gov}. We can decompose total revenue as

$$\begin{aligned} R_{it}^{o} &= R_{it}^{priv} + R_{it}^{gov} \\ &= (1-\sigma_{it})R_{it} + \sigma_{it}R_{it}(1+\mu^{PC}AfterPC_{it}), \end{aligned} \tag{19}$$

where R_{it}^{o} is the revenue reported in the balance sheet data, $(1-\sigma_{it})$ indicates the fraction of revenue deriving from private sales, and μ^{PC} is the additional markup charged to the government when the political connection link is active (i.e., when the indicator

$AfterPC_{it}$ is equal to one).

Taking logs of equation 19 and using the approximation $ln(1+x) \approx x$, we obtain an estimating equation for the production function that incorporates the political connection markup

$$r^{o}_{it} = \beta_l l_{it} + \beta_m m_{it} + \beta_k k_{it} - \psi_{st} + \omega^{*}_{it} + \sigma_{it}(\mu^{PC} AfterPC_{it}) + u_{it}, \tag{20}$$

where lowercase letters denote as before the log transformation of the variable. The presence of the term $\sigma_{it}(\mu^{PC} AfterPC_{it})$ in equation 20 suggests that any procedure that fails to correct for the political connection markup will retrieve biased estimates of firm productivity.

To estimate equation 20, we follow the standard production function estimation literature to deal with the simultaneity and selection biases that arise from the correlation between productivity and inputs (Olley and Pakes, 1996; Levinsohn and Petrin, 2003; Wooldridge, 2009).[31] We control for ψ_{st} by estimating separate production functions in each 2-digit sector and by including year fixed effects in the regressions. Finally, in our main specification, we control for the connection markup by including the interaction between an indicator for periods after the first political connection, $AfterPC_{it}$, and the share of revenue deriving from contracts with the government, σ_{it}.[32, 33] This derives from the implicit assumption that firms can only use their political connections to charge the government higher markups.

In practice, we proxy the share σ_{it} with an indicator for whether the firm had positive sales to the government at time t. We do this because our data does not detail precise information on the timing of the payments from multi-year contracts, and consequently σ_{it} might lie above one.[34] This heuristic is equivalent to assuming that the

[31] Specifically, we adopt the Wooldridge (2009) one-step GMM version of Levinsohn and Petrin (2003), which we refer to as LP-Wooldridge. The known assumption of dynamic capital required for identification might seem at odds with the flexible capital scenario described in Proposition 1. However, these two assumptions can be reconciled if the time horizon relevant for the provision of a contract is longer than that of period-to-period production (e.g., for contracts lasting multiple years or when the winner's identity is known with sufficient time in advance).

[32] As we present our results in Section 6.2, we will discuss alternative approaches we use to deal with the connection markup.

[33] Equation 20 allows to estimate the connection markup in a way that complements the framework presented in Section 5.1.3. Note that, for politically connected firms we do not observe directly σ_{it} but a markup-inflated government sales share, i.e. $\widetilde{\sigma}_{it} = \sigma_{it}(1+\mu^{PC})$. The estimate of the coefficient on the interaction term $\sigma_{it} AfterPC_{it}$, which we denote $\hat{\gamma}$, represents hence the relationship $\hat{\gamma} = \mu^{PC}/(1+\mu^{PC})$. From this, we obtain an estimate of the government markup as

$$\mu^{PC} = \frac{\hat{\gamma}}{1-\hat{\gamma}}. \tag{21}$$

[34] We also run a similar specification allowing for a continuous government share σ_{it} (capping it at 1)

share of revenue coming from government contracts is the same for all firms that have positive sales to the government.

Given the augmented revenue equation 20, estimates of firm-level TFPR can be obtained by the residuals

$$\hat{\omega}^{*}_{it} = r^{o}_{it} - \hat{\lambda}_s - \hat{\beta}_l l_{it} - \hat{\beta}_m m_{it} - \hat{\beta}_k k_{it} - \hat{\tau}_t - \hat{\gamma}\sigma_{it} \times AfterPC_{it}, \tag{22}$$

where $\hat{\lambda}_s$ is the sector-specific constant and $\hat{\tau}_t$ are years fixed effects. With elasticities and productivities in hand, we use the empirical analogs of Proposition 1 and 2 to compute the average gap in marginal costs of revenue between politically connected firms and unconnected ones. In particular, assuming capital is fully flexible, we run the within-sector regression

$$\hat{\omega}^{*}_{it} = \alpha^{1}_{s} + \gamma_{\omega} PC_{it} + \tau^{1}_{t} + \nu^{1}_{it}, \tag{23}$$

where PC_{it} is an indicator for contractors that establish a link with bureaucracy at some point in our data. The coefficient γ_{ω} identifies average differences in TFPR between connected and unconnected firms. We can then measure excess costs as

$$\hat{EC}_{flex} = exp(-\hat{\gamma}_{\omega}). \tag{24}$$

On the other hand, under the assumption of fixed capital, we estimate the following two equations at the sector level

$$\begin{aligned} \hat{\omega}^{*}_{it} &= \alpha^{1}_{s} + \gamma_{\omega} PC_{it} + \tau^{1}_{t} + \nu^{1}_{it} \\ s_{it} &= \alpha^{2}_{s} + \gamma_{S} PC_{it} + \tau^{2}_{t} + \nu^{2}_{it}, \end{aligned} \tag{25}$$

with $s_{it} = \bar{k}_{it} - r_{it}$. We then plug these estimates in the excess cost equation

$$\hat{EC}_{fixed} = exp\Big(- \frac{\hat{\beta}_k}{1-\hat{\beta}_k}\hat{\gamma}_S - \frac{1}{1-\hat{\beta}_k}\hat{\gamma}_{\omega} \Big), \tag{26}$$

where β_k is the elasticity of capital identified from equation 20.

6 Welfare Analysis: Results

This section summarizes the main results of the welfare analysis. We first report a set of estimates for the government elasticity of demand and government markup. We

and obtained similar results for the production function estimation and excess costs.

then apply these estimates to characterize the deadweight loss from price inflation. Next, we discuss estimates of the production function elasticities and excess costs and use them to quantify the welfare cost caused by the misallocation of procurement contracts.

6.1 Government Markups and Welfare Loss from Price Inflation

In Section 5.1.1, we showed how to recover the welfare effects of price inflation as a function of the government markup and demand elasticity. In this section, we present the corresponding estimates.

We begin by looking at the estimates of the government demand elasticity, reported in Table 6. Columns (1) and (2) present the elasticities obtained by running OLS regressions of quantities on prices. The results show that the government responds to price changes with less than proportional changes in the quantity demanded ($\hat{\epsilon} \approx -0.40$). However, these coefficients are likely to be biased as prices and quantities are determined in equilibrium. Therefore, we create exogenous variation in the observed prices using an instrumental variable approach based on unanticipated exchange rate shocks. Columns (3) and (4) show that we retrieve an estimate of the government elasticity of about -0.8. These results indicate that price inflation due to political connections causes the government to increase its budget target, as it responds to the price increase with a less than proportional adjustment in quantity.

Table 7 reports the estimates of the political connection markup. Across all samples and specifications, we find positive and statistically significant markups in the years after a firm has established its first link with bureaucracy. On the other hand, the average markups in the years before connection are smaller in size and non-statistically different from zero. In particular, for transactions in the electronic catalog, politically connected firms charge, on average, 3.5% higher prices than unconnected contractors (Column (1)). For the sample of auctions, we estimate instead a government markup of about 11.4% (Column (3)). It is important to note that different contractors can provide multiple products and fulfill more than one order of the same good.[35] This could introduce uneven weighting across contractors since treatment status is defined at the firm-year level while the unit of observation in the regressions is the transaction. Columns (2) and (4) deal with this issue by using as dependent variable the average demeaned price charged by a contractor in a given year. Adopting this specification, we estimate a government markup of 6.4% with the electronic catalog sample, and

[35] In the electronic catalog sample, firms fulfill, on average, 6.7 orders of the same good per year. Moreover, the average contractor provides 5.6 different products per year. These numbers are respectively 1.3 and 2.5 for the sample of auctions.

10.0% using auctions.[36]

Table 7 additionally presents the welfare cost caused by price inflation as a percentage of the government budget. We report the results focusing on the set of contracts allocated to connected firms –or, in other words, we set $\theta = 0$. The results reveal a relatively small social cost in terms of underprovision of public goods, ranging between 0.1% (when the markup from political connections is 3.5%) to 0.5% (when we consider the 11.4% markup).

However, the inelastic government demand implies that the higher prices induced by political connections will impact welfare also through an increase in the size of the government budget. Given our preferred demand elasticity estimate of -0.8, we find that the government requires additional funds (dB) ranging between 0.7% and 2.2% (not reported in the table). Translating this figure into its welfare equivalent requires measuring the social loss generated by each additional dollar of tax revenue. We adopt the preferred estimate from Ballard et al. (1985), who report a MCPF of 1.3, and find that the budget adjustment implies a welfare cost of 0.9% to 2.7% of the government procurement budget. Considering the two mechanisms together, we find that the total welfare cost from price inflation lies between 1.0% and 3.5% of the procurement budget.

6.2 Welfare Loss from Excess Costs of Provision

This section presents our estimates of the production function elasticities, excess costs, and implied welfare losses. All parameters are estimated at the 2-digit sector level, and the tables report weighted averages across industries. We compute standard errors via 30 bootstrap repetitions.

Economy-wide average labor, intermediate inputs, and capital elasticities are reported in Table 8, together with the corresponding returns to scale.[37] For each specification, we present the results obtained via an OLS regression, as well as the one-step GMM version of Levinsohn and Petrin (2003) proposed by Wooldridge (2009) (denoted LP-Wooldridge henceforth), which accounts for the correlation between inputs and unobserved productivity. The first two columns are based on the model adjusted for the government markup from political connections described in equation 20. The remaining columns estimate instead the more standard production function specification reported in equation 15, and differ in the approach we adopt to correct for the con-

[36] We also compute the government markup relying on the methodology described in footnote 33 of Section 5.2.4. Estimating the augmented production function via LP-Wooldridge, we obtain a comparable markup of 3.5% (standard error of 1.2%, computed via 30 bootstrap repetitions).

[37] Our definition of intermediate inputs includes both material inputs and services used in production.

nection markup. Columns (3) and (4) rely on the sample of unconnected contractors and connected ones in the years before their first link is established. This specification attempts to eliminate the bias that would emerge in the elasticities estimates if politically connected firms systematically differ from unconnected ones after becoming connected. Columns (5)–(6) adjust the revenue from government sales of connected contractors by a 6% markup. In Columns (7) through (10) we make no markup corrections. Columns (7)–(8) estimate equation 15 on the sample of contractors, while column (9)–(10) use all Ecuadorian firms. We find consistent estimates across all specifications. Importantly, we fail to reject the assumption of constant returns to scale in all models considered.

The estimates of the excess costs from political connections are reported in Table 9. Panel A presents our main results, where productivity is computed as residual from the augmented revenue equation 20. The first two columns assume that capital can be flexibly adjusted. We retrieve an average excess cost of about 1% using the OLS TFP estimates, and of 3.5% with the LP-Wooldridge estimates. Columns (3)–(4) consider capital as a fixed input. As stated in Proposition 2, under this assumption, the excess cost of provision also depends on differences in the capital-revenue ratio between connected and unconnected contractors. We find excess costs of about 0.7% when productivity is estimated via OLS, and 3.8% using the LP-Wooldridge correction. The higher point estimates relative to the flexible capital case suggest that connected firms are, on average, closer to their capital capacity. A reallocation of contracts to unconnected firms would thus entail lower costs both due to their higher productivity and, in the presence of increasing marginal costs, because of their lower capital utilization. The remaining panels of the table present results for the alternative specifications used to estimate the production function parameters. Focusing on the excess costs obtained using LP-Wooldridge productivities and assuming fixed capital (Column (4)), we find overall consistent estimates ranging between 2.9% to 5.9%.

We present a decomposition of the excess cost estimates by industry in Figure 5 (for the 20 largest sectors in terms of public procurement expenditure) and in Appendix Table A.2 (for all the sectors). We report the coefficients obtained assuming fixed capital and with production functions estimated by the LP-Wooldridge method on the augmented revenue equation 20.[38] Sectors related to construction, consultancy, real estate activities, and telecommunications show large excess costs of provision from political connections, in line with anecdotal evidence. However, for some sectors such as wholesale trade, we estimate negative excess costs. The existing heterogeneity is sug-

[38]Appendix Table A.3 shows a positive and high correlation with the industry level excess cost obtained using the other specifications and assumptions.

gestive that, although political connections induce welfare losses in the majority of the industries, we cannot rule out that they play a beneficial role in some specific sectors.[39]

With a measure of excess costs at hand, we can then apply equation 12 to compute the size of the implied welfare loss. As for the social costs from price inflation, we focus on the set of contracts allocated to connected firms ($\theta = 0$). We approximate the marginal cost of unconnected contractors, $C'_{SP}(R)$, with their variable costs-revenue ratio. Results are presented in Table 9 as a share of the government budget. The estimates obtained using LP-Wooldridge productivities and flexible capital (Column (2)) range between 2.0% and 3.5%. On the other hand, assuming fixed capital, we measure a welfare loss of 2.2% to 4.6% (Column (4)). The social cost implied by our main specification is approximately 2.9%.

Combining our estimates of the welfare cost from price inflation with those of the loss due to excess costs of provision, we find a total welfare cost of 1.2% to 8.0% of the procurement budget. While the estimated misallocation effects are non-negligible, it is important to notice that they are likely to be a lower bound, as we are focusing on a limited definition of political connections. Moreover, our estimates do not include general distortions in public procurement that may exist even in the absence of political connections.

7 Conclusion

In this paper, we study the welfare costs of the misallocation of procurement contracts caused by political connections. Using a novel dataset that joins several administrative sources for Ecuador, we provide evidence that firms that form links with the bureaucracy experience a significant increase in the probability of being awarded a contract. This effect is robust across a variety of samples and specifications.

We develop a methodology to quantify the welfare losses induced by political connections through two margins: price inflation and excess costs of provision. Exploiting contract-level information for contracts on standardized goods and services, we find that politically connected firms charge the government an additional markup lying between 3.5% and 11.4%. This markup causes a reduction in the provision of public goods and, at the same time, an increase in the level of required public funds. Between the under-provision of goods and the costs of collecting a larger government budget, we estimate a welfare loss due to price inflation that ranges between 1.0% and 3.5% of the procurement budget.

Next, using production function estimation, we find that politically connected

[39] Of the 42 sectors for which we estimate excess costs, 33 have positive point estimates.

firms are less efficient than unconnected contractors. The efficiency gap translates into welfare losses that range between 0.2% and 4.6% of the procurement budget.

Although our definition of political connections is relatively narrow, this paper finds significant welfare losses when political connections are used to influence the allocation of procurement contracts. Alternative implicit allocation practices (such as favoring individuals in the same social network) and explicit allocation rules (e.g., preferential selection of small firms) may also have important welfare consequences. Given that public procurement represents a large share of GDP across most countries, we believe that further evidence on these margins would be a valuable avenue for future research.

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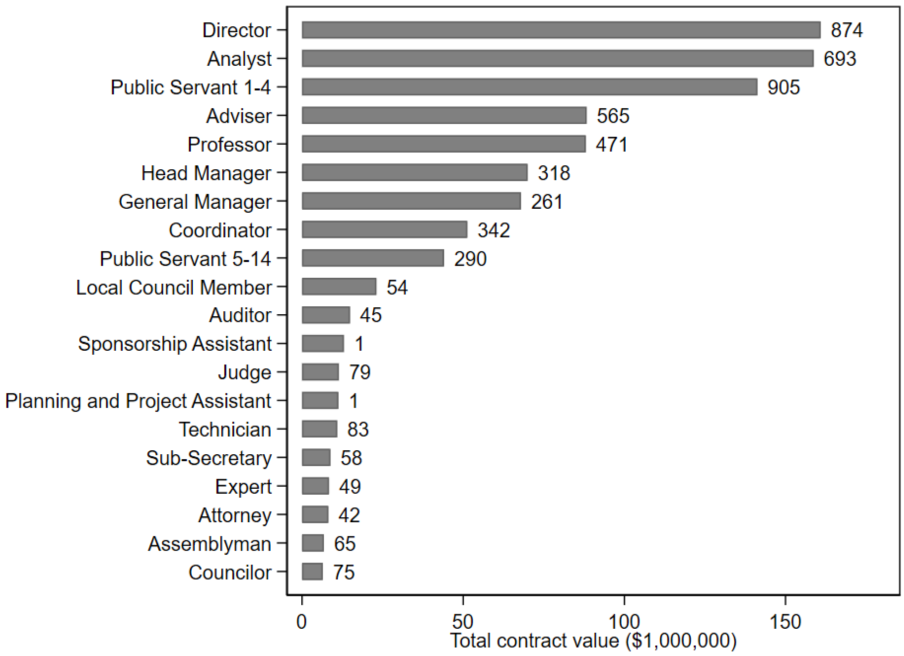
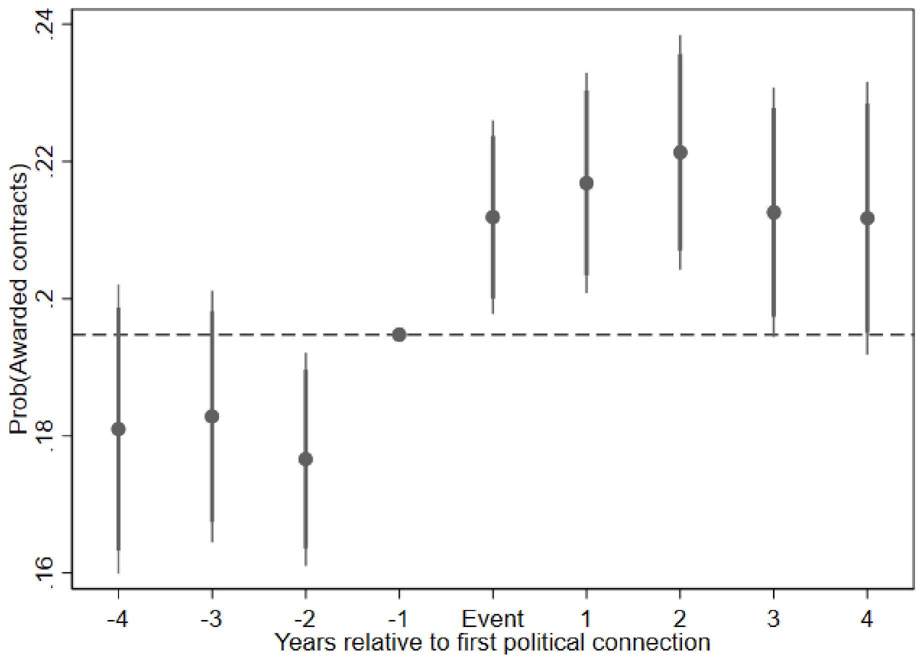
Figures and tables

Figure 2: Bureaucratic Positions



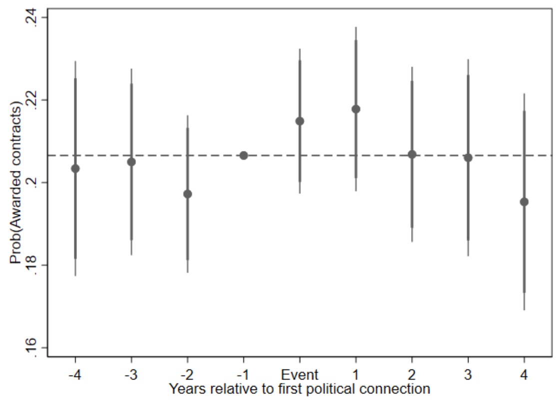
Notes: The figure shows the top 20 bureaucrat positions ranked by the aggregate value of the contracts won by firms connected to bureaucrats in each position. The value of contracts won is constructed as follows. First, we consider the set of firms owners who are appointed as bureaucrats and exclude firms created or acquired by bureaucrats in office and those that establish their first political connection before 2000. For every bureaucrat, we take the last position they hold in the data, and each bureaucrat is assigned the value of the contracts won by the firms they own. The value of contracts awarded to firms connected to more than one bureaucrat is equally split among them. We compute the aggregate value of contracts won at the bureaucrat position level and report it in million USD on the x-axis. The numbers shown next to each bar indicates the number of distinct bureaucrats observed in a given position.

Figure 3: Probability of Being Awarded a Contract Before and After Political Connection

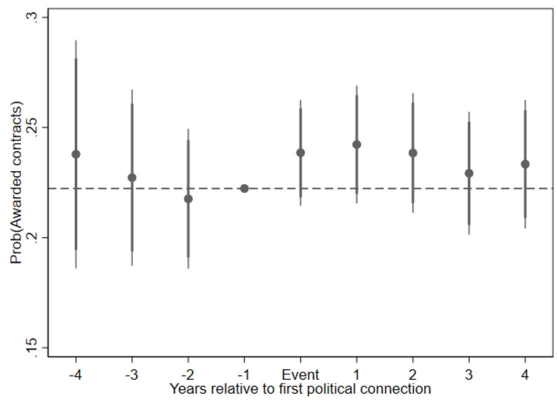


Notes: This figure presents the coefficients from a regression of an indicator for years in which a firm is awarded government procurement contracts on a vector of lead and lagged indicators for years relative to the firm's first political connection. The dependent variable is equal to one when the value of contracts won in a given year is larger than US $3,000, which roughly corresponds to the 10^{th} percentile of the yearly contract value distribution for firms winning a non-zero number of contracts. We set the year prior to the first connection (-1) as the omitted category. We include unconnected contractors as a control group by fixing their relative year indicator to -1. The sample is the set of firms classified as government contractors (see Section 3.2.1). The unit of observation is contractor-year. We include only years in which a contractor files balance sheet information. We exclude firms created or acquired by bureaucrats, and firms that established the first political connection before 2000. The regression includes year and contractor fixed effects, and two indicators for observations before and after 4 years of the first firms' political connection. Error bars indicate 90 and 95% confidence intervals with standard errors clustered at the contractor level. The dotted line shows the sample mean in the years before the event, and each coefficient is shifted by this constant.

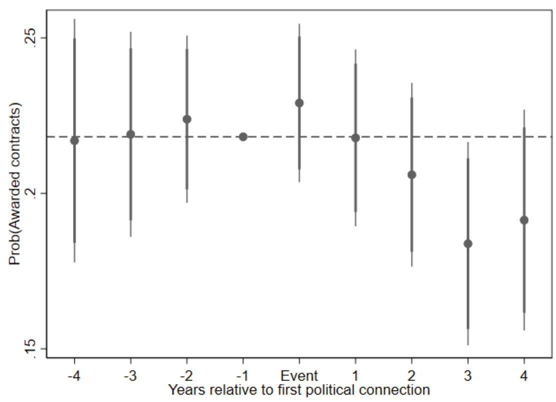
Figure 4: Robustness Event-Studies: Probability of Winning a Contract



(a) Random treatment years



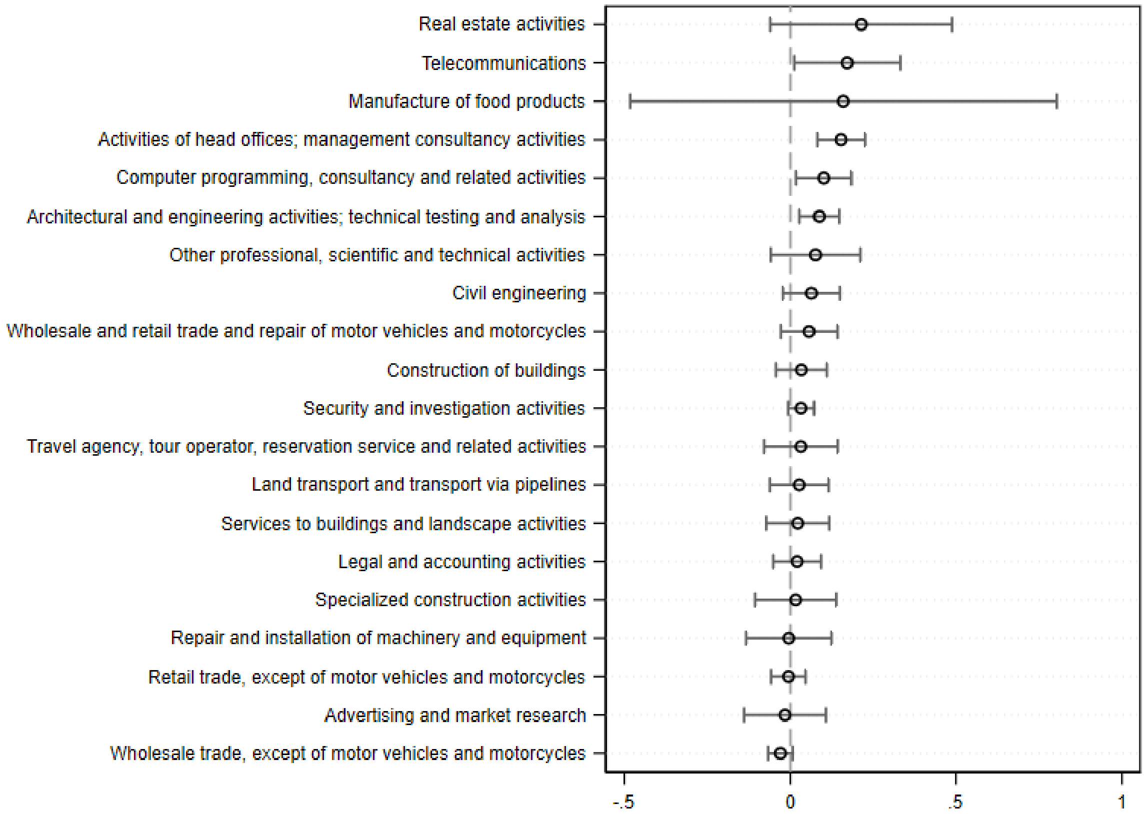
(b) Large families



(c) Bureaucrats owning small shares

Notes: Each panel plots coefficients from a regression of an indicator for years in which a firm is awarded procurement contract on lead and lagged indicators for years relative to the "placebo" event. The dependent variable is equal to one when the value of contracts won in a given year is larger than US $3,000. In Panel (a), we assign a random treatment year to each contractor, imposing that the entry year distribution is equal to the true one. In Panel (b), we consider connections through families having more than 15 siblings. In Panel (c), we consider connections to bureaucrats who own less than 10% of the firm's shares and have a low-rank positions. In all specifications, we assign placebo events to unconnected contractors dropping all firms with real links from the data. We keep unconnected contractors that are not assigned a placebo event as control group, by fixing their relative year indicator to -1. All regressions set the year prior to the event (-1) as the omitted category. The unit of observation is a contractor-year. The regression controls for year and contractor fixed effects, and two indicators for observations before and after 4 years of the first firms' placebo event. Error bars indicate 90 and 95% confidence intervals with standard errors clustered at the contractor level. The dotted line shows the sample mean in the years before the event, and each coefficient is shifted by this constant.

Figure 5: Excess Costs Estimates, Largest Sectors



Notes: The figure reports averages and 95% confidence intervals of the excess costs of political connection at the 2-digit sector level. We report estimates only for the 20 largest sectors in the data in terms of public procurement expenditure. Excess costs are estimated from equation 25 assuming fixed capital. The production function elasticities and firm TFPR used as inputs to the excess costs regressions are obtained using the LP-Wooldridge methodology with the specification detailed in equation 20. The sample for each industry is the set of firms classified as government contractors. Each regression includes year and 3-digit sector fixed effects. Standard errors are obtained via 30 bootstrap simulations.

Table 1: Sample Size for Different Categories of Connected Contractors

	All connections	Only direct connections	Only indirect connections	Both direct and indirect connections
	(1)	(2)	(3)	(4)
Panel A: Politically connected (not strategic)				
Number of firms	6,030	2,789	1,370	1,871
Avg. nbr. distinct connection years	1.232	1.144	1.031	1.517
Avg. nbr. connections	1.631	1.177	1.102	2.719
Panel B: Politically connected (strategic)				
Number of firms	1,384	507	223	654
Avg. nbr. distinct connection years	1.686	1.387	1.108	2.114
Avg. nbr. connections	2.280	1.435	1.171	3.303
Panel C: Created by bureaucrat				
Number of firms	509	236	97	176
Avg. nbr. distinct connection years	1.298	1.156	1.065	1.639
Avg. nbr. connections	1.724	1.178	1.092	2.879

Notes: The table reports sample size and statistics on the number of links to bureaucracy for different categories of politically connected firms. In Panel A, we include the sample of contractors used for the analysis. Panel B, considers firms with shares bought by a bureaucrat in office. Panel C, considers the set of firms created by a bureaucrat. In all columns, we drop firms that establish their first political connection before 2000 and firms that do not file balance sheet information. Our data additionally comprises 22,997 unconnected contractors.

Table 2: Descriptive Statistics of Ecuadorian Firms in 2015

	Panel A Full Sample		*Panel B* Contractors Sample			*Panel C* Connected Contractors Sample		
	All firms	All contractors	Not politically connected	Politically connected	Connected with restrictions	Only direct connections	Only indirect connections	Both direct and indirect connections
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Revenue	810,647	1,340,678	1,677,244	602,489	815,973	749,802	999,055	771,809
	(3,317,781)	(4,447,662)	(5,068,397)	(2,456,432)	(2,972,394)	(2,830,820)	(3,199,652)	(2,994,810)
Capital	325,902	380,484	476,583	169,711	225,226	218,479	235,544	227,478
	(1,373,586)	(1,553,196)	(1,772,079)	(866,911)	(1,011,721)	(1,033,252)	(968,168)	(1,012,668)
Wage bills	128,916	221,214	263,260	128,994	168,925	152,581	202,778	167,213
	(460,268)	(627,813)	(698,629)	(419,254)	(499,233)	(473,394)	(531,463)	(510,762)
Intermediate inputs	542,330	893,766	1,132,297	370,597	503,149	469,293	623,025	459,354
	(2,361,077)	(3,135,226)	(3,576,742)	(1,712,347)	(2,058,365)	(1,967,839)	(2,191,545)	(2,083,934)
Debt	441,808	646,554	810,890	286,117	377,571	342,120	460,428	366,234
	(1,714,406)	(2,186,380)	(2,486,208)	(1,232,358)	(1,444,691)	(1,341,569)	(1,629,782)	(1,440,076)
Revenue-asset ratio	1.689	1.900	1.896	1.908	1.867	1.859	1.865	1.881
	(3.577)	(3.329)	(3.242)	(3.514)	(3.374)	(3.423)	(3.011)	(3.572)
Age	9.528	9.902	10.593	8.387	11.100	10.610	11.406	11.623
	(10.112)	(9.922)	(10.653)	(7.881)	(8.373)	(8.034)	(8.466)	(8.774)
Sample size	73,133	27,058	18,585	8,473	4,532	2,106	1,085	1,341

Notes: The table reports means and standard deviations (in parenthesis) of balance sheet information in 2015. In Column (1), the sample is all Ecuadorian private firms, while Column (2) only includes government contractors (see Section 3.2.1). Columns (3) and (4) present statistics for unconnected and connected contractors, respectively. Column (5) excludes firms created or acquired by bureaucrats in office and those that establish their first political connection before 2000. Columns (6)–(8) present a decomposition of Column (5) by type of political connection. For each variable, we winsor non-zero observations at the 1st and 99th percentile of the respective distribution. Dollar values are deflated by the consumer price index series computed by the World Bank (`https://data.worldbank.org/indicator/FP.CPI.TOTL?locations=EC`).

Table 3: Descriptive Statistics of Government Procurement Contracts

	Contract value ($)	Contract budget ($)	Contract length (days)	Number of contracts	Number of competitors
	(1)	(2)	(3)	(4)	(5)
Overall	41,286	103,418	70	199,727	1.671
	(80,086)	(252,887)	(151)		(1.484)
Auctions	48,859	127,285	90	90,272	2.240
	(81,845)	(216,014)	(179)		(1.832)
Publication	15,316	32,537	26	65,093	1.000
	(51,074)	(110,066)	(85)		(0.008)
Direct contracting	21,914	50,081	97	8,607	1.000
	(15,238)	(35,391)	(122)		(0.000)
Quotations	198,800	481,793	156	6,440	1.392
	(126,892)	(330,293)	(230)		(0.916)
Other discretionary	214,282	631,661	210	2,954	1.437
	(154,315)	(1,266,095)	(287)		(1.267)
Lower value (goods and services)	16,198	35,831	63	16,462	1.130
	(13,450)	(30,221)	(110)		(0.604)
Lower value (public works)	47,474	106,844	63	9,899	1.333
	(40,602)	(93,029)	(35)		(1.482)

Notes: The table reports means and standard deviations (in parenthesis) for the sample of Ecuadorian government procurement contracts won by firm contractors between January 2009 and December 2017. We exclude contracts of total value below the 1st percentile and above the 99th percentile of the contract value distribution. Other discretionary contracts include public contests, trade fairs, tenders, and short lists. Statistics on the number of competitors are computed using the subset of contracts detailing this information and refer to the number of firms competing for each tender. Dollar values are deflated by the consumer price index series computed by the World Bank (https://data.worldbank.org/indicator/FP.CPI.TOTL?locations=EC).

Table 4: Descriptive Statistics of Electronic-Catalog Transactions

Contract value ($) (1)	Unit price ($) (2)	Quantity (units) (3)	Number of transactions (4)	Number of competitors (5)
1,621	161	1,224	958,823	50.11
(50,882)	(8,496)	(186,759)		(257.95)

Notes: The table reports means and standard deviations (in parenthesis) for the universe of transactions recorded in the electronic catalog in the period 2014-2018. We exclude all medicine purchases. Dollar values are deflated by the consumer price index series computed by the World Bank (`https://data.worldbank.org/indicator/FP.CPI.TOTL?locations=EC`). The number of competitors corresponds to the number of sellers for a specific product in a given year.

Table 5: Probability of Being Awarded a Contract

	Panel A By Type of Connection				*Panel B* By Type of Contract		
	All connections	Only direct connections	Only indirect connections	Direct and indirect connections	Auctions	Discretionary	Random
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
After first political connection	0.0280***	0.0253***	0.0270**	0.0300***	0.0116***	0.0332***	-0.0017
	(0.0058)	(0.0084)	(0.0118)	(0.0101)	(0.0037)	(0.0053)	(0.0024)
Sample size	190,789	168,593	159,344	162,274	190,788	190,788	190,788
Number contractors	29,027	25,786	24,367	24,868	29,027	29,027	29,027
Connected contractors	6,030	2,789	1,370	1,871	6,030	6,030	6,030
R-squared	0.4829	0.4848	0.4879	0.4849	0.5355	0.3912	0.4760
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean before connection	0.195	0.196	0.204	0.184	0.063	0.138	0.032

Notes: The sample is the set of firms classified as government contractors according to the definition in Section 3.2.1. The unit of observation is the contractor-year. We exclude firms created or acquired by bureaucrats in office, and those that establish their first political connection before 2000. All specifications include unconnected contractors as the control group. The dependent variable is equal to one when the value of contracts won in a given year is larger than US $3,000. In Column (1) the treatment sample includes all firms that establish a direct or indirect link (or both) with a bureaucrat. Columns (2)–(4) present a decomposition of Column (1) by separately looking at firms that form direct connections, indirect connections, or both types of connections, respectively. In Columns (1)–(4), the dependent variable is the probability of being awarded procurement contracts of any category in a given year. Columns (5)–(6) repeat the specification in Column (1) but replace the dependent variable with the probability of winning at least US $ 3,000 in government contracts of the category indicated in the column header. Each regression controls for year and contractor fixed effects. Standard errors are clustered at the contractor level.

Table 6: Elasticity of Government Demand

	OLS (1)	OLS (2)	IV (3)	IV (4)
Δp	-0.4036***	-0.4029***	-0.8246***	-0.8056***
	(0.0463)	(0.0467)	(0.1641)	(0.1651)
Sample size	2,428	2,428	2,428	2,428
CPC-2 FE	No	Yes	No	Yes

Notes: The table reports estimates of the government elasticity obtained regressing changes in log quantity procured on changes in average log unit prices. The unit of observation is the CPC-5 product level-year. Standard errors are clustered at the CPC-5 product level. In columns (3) and (4) prices are instrumented with unexpected shocks to supply from international trade, computed as $\sum_c \Delta ExchangeRate_{ct} \frac{Imports_{jct-1}}{\sum_c Imports_{jct-1}}$. Bilateral trade data comes from the Observatory of Economic Complexity (https://oec.world/en/resources/data/) and is available for products at the HS6 revision 2007 (6 digit depth). HS6 products are mapped to CPC-5 products using the WITS concordance table (https://wits.worldbank.org/product_concordance.html). Yearly exchange rates between countries are obtained from the OECD (https://data.oecd.org/conversion/exchange-rates.htm).

Table 7: Price Inflation Estimates and Welfare Costs

	Electronic-catalog		Auctions	
	Standardized price (1)	Average price (2)	Standardized price (3)	Average price (4)
Panel A: Inflation estimates				
Before political connection	-0.0085	0.0245	-0.0186	0.0599
	(0.0066)	(0.0993)	(0.0535)	(0.0402)
After political connection	0.0348***	0.0642***	0.1138***	0.1000***
	(0.0024)	(0.0207)	(0.0291)	(0.0266)
P-value difference	0.000	0.693	0.018	0.399
Sample size	881,709	23,378	49,136	15,825
R-squared	0.1120	0.0049	0.6951	0.5168
Year FE	Yes	Yes	Yes	Yes
Agency FE	Yes	No	Yes	No
Panel B: Welfare cost as % of procurement budget ($\epsilon = -0.80$, $\theta = 0$, $MCPF = 1.33$)				
$DWLP$	0.048***	0.163	0.507**	0.392*
	(0.007)	(0.104)	(0.256)	(0.207)
$dB \times MCPF$	0.919***	1.687***	2.960***	2.607***
	(0.063)	(0.536)	(0.741)	(0.680)
Total	0.967***	1.850***	3.467***	2.999***
	(0.070)	(0.640)	(0.997)	(0.887)

Notes: Panel A presents the estimates for the price inflation regressions discussed in Section 5.1.3. Columns (1)–(2) use electronic catalog transactions (excluding medicine), while Columns (3)–(4) look at auctions. We drop observations for products provided by a single contractor in a given year, and compute product-level demeaned log prices (winsored at the 1^{st} and 99^{th} percentile of the respective distribution). In Columns (1) and (3) the unit of observation is the transaction level. Columns (2) and (4) take averages at the contractor-year level. In all specifications, we report coefficients of an indicator for firm contractors in the years before their first political connection, and an indicator for the years after connection. The omitted category is an indicator for transactions executed by unconnected firm or person contractors. The estimates for the years after connection correspond to our price inflation estimates. All regressions control for indicators for politically connected person contractors before and after connection (not reported). Columns (1) and (3) additionally control for standardized log quantities at the transaction level, while Columns (2) and (4) control for average log quantities at the contractor level. We control for year and agency fixed effects as indicated in each column. We cluster standard errors at the agency level in Columns (1) and (3) and use robust standard errors in specifications (2) and (4). Panel B presents the welfare costs implied by the inflation estimates. $DWLP$ corresponds to the dead weight loss caused by the reduced provision of public goods as defined in equation 8, dB corresponds to the change in the required public funds as defined by equation 9, and $MCPF$ is the marginal cost of public funds estimated by Ballard et al. (1985). Standard errors are computed with the delta method.

Table 8: Production Function Elasticities

	Main specification		Exclude political connection years		Markup-adjusted revenue		No markup adjustment		All firms	
	OLS (1)	LP-Wooldridge (2)	OLS (3)	LP-Wooldridge (4)	OLS (5)	LP-Wooldridge (6)	OLS (7)	LP-Wooldridge (8)	OLS (9)	LP-Wooldridge (10)
Labor	0.3808	0.3875	0.3549	0.3612	0.3808	0.3873	0.3624	0.3688	0.3461	0.3536
	(0.1034)	(0.1262)	(0.0991)	(0.1210)	(0.1029)	(0.1252)	(0.1014)	(0.1237)	(0.0882)	(0.1060)
Intermediate Inputs	0.5327	0.5121	0.5599	0.5347	0.5326	0.5130	0.5509	0.5304	0.5253	0.4971
	(0.1076)	(0.1257)	(0.1069)	(0.1290)	(0.1062)	(0.1260)	(0.1061)	(0.1262)	(0.1028)	(0.1119)
Capital	0.0497	0.0309	0.0488	0.0304	0.0498	0.0308	0.0492	0.0304	0.0689	0.0400
	(0.0241)	(0.0193)	(0.0229)	(0.0199)	(0.0239)	(0.0197)	(0.0220)	(0.0187)	(0.0369)	(0.0274)
Returns to scale	0.9632	0.9304	0.9635	0.9263	0.9632	0.9311	0.9625	0.9296	0.9403	0.8907
	(0.0228)	(0.0432)	(0.0219)	(0.0457)	(0.0226)	(0.0446)	(0.0211)	(0.0411)	(0.0367)	(0.0683)
Number firms	20,866	16,398	20,155	15,484	20,866	16,398	21,396	17,164	54,482	38,295
Sample size	118,057	75,791	120,173	79,636	118,057	75,791	137,556	93,408	290,919	183,927
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table reports economy-wide average elasticities. These are obtained by estimating production functions at the 2-digit industry level, and then computing across-sector means weighted by the number of firms in each sector. We drop industries having less than 750 observations. We report in parenthesis the standard deviation of the distribution of sector-level elasticities obtained via 30 bootstrap simulations. In each bootstrap replicate, we sample firms with replacement to match the original number of firms in each sector. In columns (1)–(8) the sample correspond to firms classified as government contractors. For columns (9)–(10) the sample is all Ecuadorian private firms. Columns (1) and (2) report estimates from the specification in equation 20. The remaining columns estimate production functions following equation 15. Columns (3)–(4) exclude observations from connected contractors in the years after they establish a link with the bureaucracy. In Columns (5)–(6), we deflate the revenue from government sales of politically connected contractors in the years following connection by a 6% government markup. Columns (7) through (10) do not make any adjustment for the government markup. We exclude from all specifications firms acquired or created by a bureaucrat in office and those that establish their first political connection before 2000. The unit of observation is the contractor-year. We winsor non-zero observations of each variable at the 1^{st} and 99^{th} percentile of the respective distribution. Dollar values are deflated by the consumer price index series computed by the World Bank (`https://data.worldbank.org/indicator/FP.CPI.TOTL?locations=EC`). All regressions control for year fixed effects.

Table 9: Excess Cost Estimates

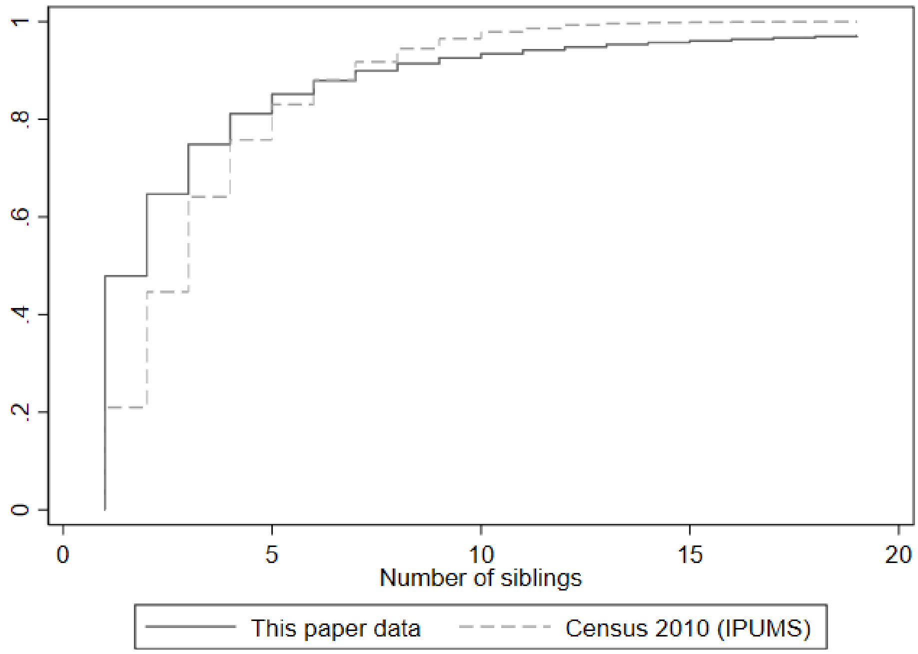
	Flexible capital		Fixed capital	
	OLS (1)	LP-Wooldridge (2)	OLS (3)	LP-Wooldridge (4)
Panel A: Main specification				
Excess Costs - 1	0.010	0.035***	0.007	0.038***
	(0.007)	(0.008)	(0.008)	(0.010)
Welfare cost (% of proc. budget)	0.725	2.772***	0.490	2.944***
	(0.547)	(0.676)	(0.658)	(0.830)
Sample size	118,057	75,791	118,057	75,791
Panel B: Exclude political connection years				
Excess Costs - 1	0.011**	0.036***	0.010	0.049***
	(0.005)	(0.009)	(0.007)	(0.016)
Welfare cost (% of proc. budget)	0.860*	2.902***	0.747	3.914***
	(0.442)	(0.747)	(0.583)	(1.238)
Sample size	130,651	87,917	134,579	89,837
Panel C: Markup-adjusted revenue				
Excess Costs - 1	0.017***	0.041***	0.016***	0.044***
	(0.005)	(0.007)	(0.006)	(0.009)
Welfare cost (% of proc. budget)	1.366***	3.238***	1.190***	3.431***
	(0.445)	(0.534)	(0.487)	(0.722)
Sample size	118,057	75,791	118,057	75,791
Panel D: No markup adjustment				
Excess Costs - 1	0.005	0.025***	0.004	0.029***
	(0.005)	(0.007)	(0.007)	(0.011)
Welfare cost (% of proc. budget)	0.402	1.948***	0.194	2.184***
	(0.458)	(0.597)	(0.556)	(0.865)
Sample size	137,556	93,408	137,556	93,408
Panel E: All firms				
Excess Costs - 1	0.017**	0.044***	0.019*	0.059***
	(0.008)	(0.012)	(0.010)	(0.021)
Welfare cost (% of proc. budget)	1.367**	3.540***	1.465*	4.606***
	(0.661)	(0.976)	(0.794)	(1.574)
Sample size	137,556	93,408	137,555	93,408

Notes: The table reports excess cost estimates and corresponding welfare costs as percentage of the procurement budget. We estimate excess costs at the 2-digit industry level, and compute economy-wide averages using as weights the number of firms in each sector. Standard errors (in parenthesis) are obtained from the same 30 bootstrap simulations used to compute production function elasticities. Welfare costs are estimated via equation 12, assuming that $\theta = 0$. Outcomes in Columns (1)–(2) assume flexible capital and are estimated as in equation 23. Specifications (3)–(4) assume fixed capital and are estimated via equation 25. All excess cost regressions control for year and 3-digit sector fixed effects. Panels differ on the estimation source for elasticities and TFPR. Panel A uses the sample of government contractors and the specification presented in equation 20. In Panel B, we exclude observations after the connection for politically connected contractors for estimating the production function, but include the connected years in the counterfactual exercise. In Panel C, we deflate the revenue from government sales of politically connected contractors in the years following connection by a 6% government markup. Panel D makes no adjustment for the government markup. Panel E uses production function estimates obtained using the sample of all Ecuadorian private firms. Panels B through E estimate production functions using equation 15. From all specifications, we exclude firms acquired or created by a bureaucrat already working in the public sector, and those that establish their first political connection before 2000. All panels compute then TFPR residuals for firms classified as government contractors and estimate excess costs and welfare costs on this sample. In the regressions with fixed capital, Panel A and C additionally deflate the share of revenue from government sales of politically connected firms by a 6% government markup, while the other panels make no further adjustment. Differences in sample sizes between OLS and LP-Wooldridge come from the fact that LP-Wooldridge uses two years of lags as instruments. Panel B, D, and E use all years of data, while Panel A and C use only information from 2009 onward, as they require information on government contracts.

Online Appendix

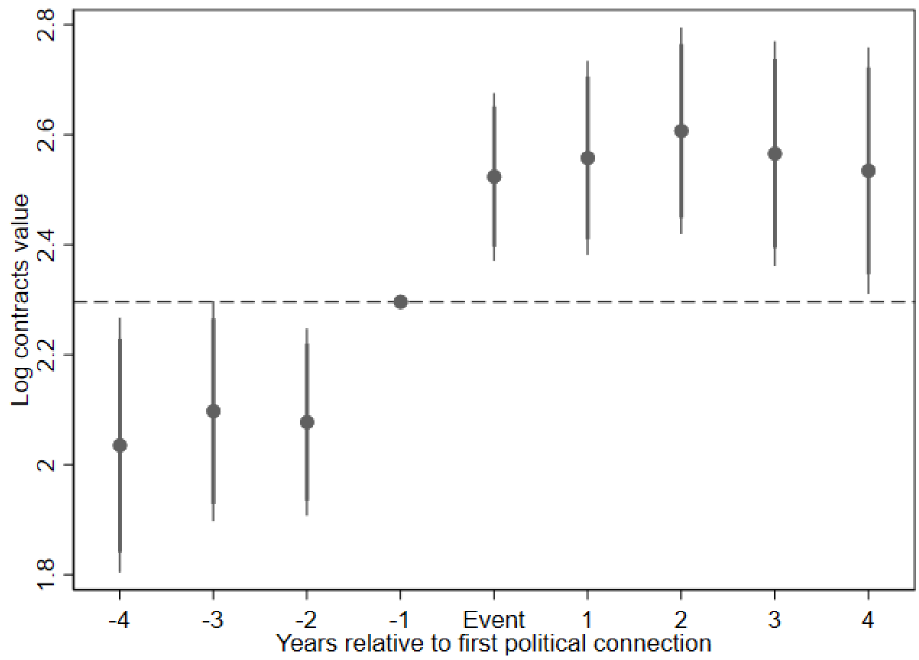
A Appendix figures and tables

Figure A.1: Family Size CDF



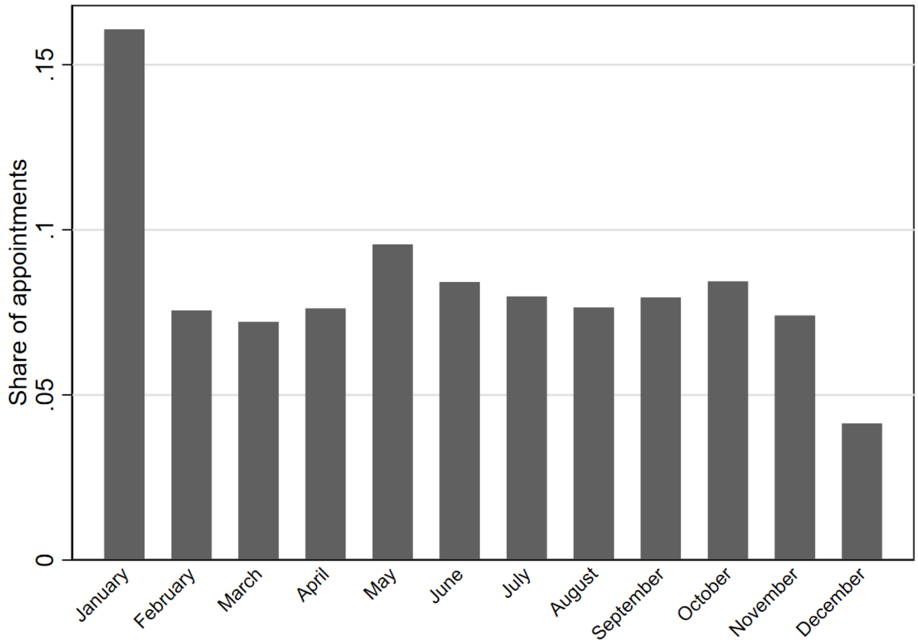
Notes: The figure shows the cumulative distribution of family size computed using the two last names of the individuals in our data, as well as the distribution of number of children obtained from the 2010 Census data available from IPUMS (https://international.ipums.org/international/index.shtml). For the distribution based on the individuals in our data, families are constructed combining the sample of individuals in the IRS data, firms' owners registry, and bureaucrat registry. The distributions are truncated at the 99$^{\text{th}}$ percentile.

Figure A.2: Value of Contracts Won Before and After Political Connection



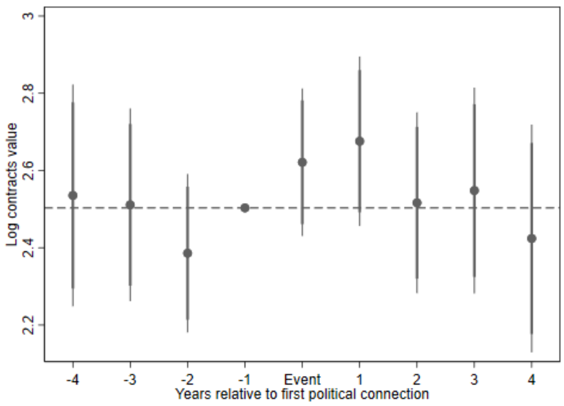
Notes: This figure presents the coefficients from a regression of log of one plus the value of government procurement contracts won in a year on a vector of lead and lagged indicators for years relative to the firms' first political connection. We set the year prior to the first connection (-1) as the omitted category. We include unconnected contractors as a control group by fixing their relative year indicator to -1. The sample is the set of firms classified as government contractors (see Section 3.2.1). The unit of observation is contractor-year. We exclude firms created or acquired by bureaucrats, and firms that established the first political connection before 2000. The regression includes year and contractor fixed effects, and two indicators for observations before and after 4 years of the first firms' political connection. Error bars indicate 90 and 95% confidence intervals with standard errors clustered at the contractor level. The dotted line shows the sample mean in the years before the event, and each coefficient is shifted by this constant.

Figure A.3: Distribution of Appointment Months

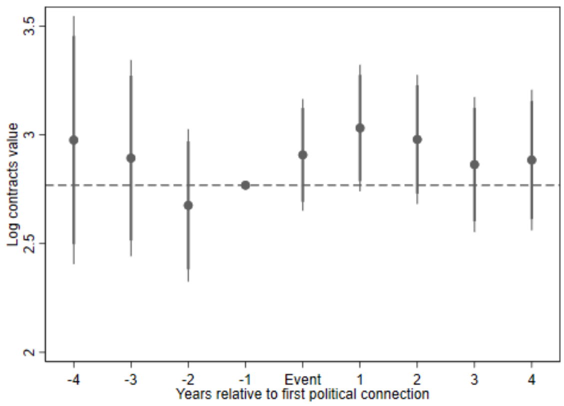


Notes: The figure shows the distribution of the bureaucrats' month of entry into the public sector. The figure only considers the fist entry month for bureaucrats that appear more than once in the data.

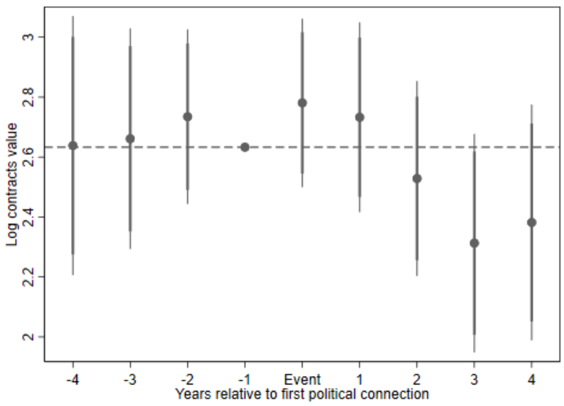
Figure A.4: Robustness Event-Studies: Value of Contracts



(a) Random treatment years



(b) Large families



(c) Bureaucrats owning small shares

Notes: Each panel plots coefficients from a regression of log of one plus the value of government procurement contracts won in a year on lead and lagged indicators for years relative to the "placebo" event. In Panel (a), we assign a random treatment year to each contractor, imposing that the entry year distribution is equal to the true one. In Panel (b), we consider connections through families having more than 15 siblings. In Panel (c), we consider connections to bureaucrats who own less than 10% of the firm's shares and have low-rank positions. In all specifications, we assign placebo events to unconnected contractors dropping all firms with real links from the data. We keep unconnected contractors not assigned a placebo event as control group, by fixing their relative year indicator to -1. All regressions set the year prior to the event (-1) as the omitted category. The unit of observation is a contractor-year. The regression controls for year and contractor fixed effects, and two indicators for observations before and after 4 years of the first firms' placebo event. Error bars indicate 90 and 95% confidence intervals with standard errors clustered at the contractor level. The dotted line shows the sample mean in the years before the event, and each coefficient is shifted by this constant.

Table A.1: Probability of Being Awarded a Contract, Robustness

	Panel A Restricted Sample			*Panel B* Strategic Sample
	Large reshuffles (1)	Single entry year (2)	No strategic exits (3)	Strategic entries (4)
After first political connection	0.0377***	0.0271***	0.0329***	0.0915***
	(0.0096)	(0.0073)	(0.0068)	(0.0117)
Sample size	164,947	174,507	176,329	159,226
Number contractors	25,206	26,632	26,953	24,381
Connected contractors	2,209	3,635	3,956	1,384
R-squared	0.4858	0.4861	0.4832	0.4857
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Mean before connection	0.193	0.196	0.184	0.163

Notes: Each column is based on a different subsample of the set of firms classified as government contractors. All specifications include unconnected contractors as control group and drop firms that establish their first political connection before 2000. Columns vary in the set of firms considered in the treatment group. The dependent variable is equal to one when the value of contracts won in a given year is larger than US $3,000. In Column (1) we consider connections through large reshuffles of government agencies. Column (2) limits the treatment group to the set of contractors that establish their political connections in a single year. Column (3) drops firms for which owners sell their shares after being appointed as bureaucrats. Finally, in Column (4) the treatment group comprises firms politically connected through a strategic entrant (i.e., when a bureaucrat acquires shares of a firm). The unit of observation is the contractor-year. Each regression controls for year and contractor fixed effects. Standard errors are clustered at the contractor level.

Table A.2: Excess Costs Estimates, All Sectors

Rank	ISIC2	Description	Excess costs	CI (95%)	Avg. number firms	Avg. share connected	Avg. sectoral revenue (million $)	Avg. public expend. (million $)
1	J59	Motion picture, video and television programme production, sound recording and music publishing activities	26.3%**	[4%, 49%]	173.5	18.8%	129.0	1.6
2	I55	Accommodation	23.8%	[-6%, 53%]	454.6	8.6%	282.3	1.3
3	L68	Real estate activities	21.4%	[-6%, 49%]	7920.0	3.4%	1180.6	11.2
4	J58	Publishing activities	19.9%***	[4%, 36%]	276.6	24.7%	143.8	3.4
5	N77	Rental and leasing activities	19.8%	[-22%, 61%]	355.2	10.3%	227.5	3.5
6	J61	Telecommunications	17.2%**	[1%, 33%]	557.2	20.1%	684.8	6.8
7	C10	Manufacture of food products	16.0%	[-48%, 80%]	845.6	4.3%	3334.2	6.6
8	K65	Insurance, reinsurance and pension funding, except compulsory social security	15.8%**	[2%, 30%]	302.8	15.3%	303.3	0.5
9	M70	Activities of head offices; management consultancy activities	15.3%***	[8%, 23%]	2004.7	20.3%	480.1	16.7
10	P85	Education	11.0%	[-6%, 28%]	687.5	10.9%	255.2	1.7
11	I56	Food and beverage service activities	10.7%	[-9%, 30%]	752.0	4.9%	535.7	2.4
12	J62	Computer programming, consultancy and related activities	10.1%***	[2%, 18%]	688.3	27.3%	278.0	13.9
13	M71	Architectural and engineering activities; technical testing and analysis	8.8%***	[3%, 15%]	1141.9	27.7%	578.0	29.7
14	Q86	Human health activities	8.0%	[-4%, 20%]	659.4	11.0%	531.7	1.7
15	M74	Other professional, scientific and technical activities	7.6%	[-6%, 21%]	665.5	29.9%	123.2	9.9
16	F42	Civil engineering	6.4%	[-2%, 15%]	1940.4	31.5%	1232.2	64.9
17	C18	Printing and reproduction of recorded media	6.2%	[-13%, 25%]	345.1	15.2%	364.2	4.0
18	G45	Wholesale and retail trade and repair of motor vehicles and motorcycles	5.7%	[-3%, 14%]	1567.2	6.9%	3187.4	26.4
19	K66	Activities auxiliary to financial service and insurance activities	5.7%	[-16%, 28%]	371.4	11.0%	195.3	0.6
20	C20	Manufacture of chemicals and chemical products	5.3%	[-4%, 14%]	436.5	9.8%	823.9	4.3
21	S95	Repair of computers and personal and household goods	5.3%	[-20%, 31%]	169.7	15.6%	95.8	2.1
22	C23	Manufacture of other non-metallic mineral products	5.1%	[-14%, 24%]	225.8	12.7%	616.1	5.6
23	C25	Manufacture of fabricated metal products, except machinery and equipment	4.7%	[-9%, 18%]	282.7	12.5%	372.4	4.8

Continued on next page

Table A.2: Excess Costs Estimates, All Sectors (Continued)

Rank	ISIC2	Description	Excess costs	CI (95%)	Avg. number firms	Avg. share connected	Avg. sectoral revenue (million $)	Avg. public expend. (million $)
24	B09	Mining support service activities	3.9%	[-14%, 22%]	234.3	17.8%	700.6	2.6
25	C22	Manufacture of rubber and plastics products	3.7%	[-7%, 14%]	297.9	5.8%	877.2	2.1
26	F41	Construction of buildings	3.4%	[-4%, 11%]	2733.9	24.1%	1034.8	51.0
27	N80	Security and investigation activities	3.3%	[-1%, 7%]	892.5	32.2%	593.9	33.3
28	N79	Travel agency, tour operator, reservation service and related activities	3.2%	[-8%, 14%]	1595.0	9.7%	338.2	7.4
29	H49	Land transport and transport via pipelines	2.7%	[-6%, 12%]	5027.7	3.8%	1152.3	20.0
30	J60	Programming and broadcasting activities	2.6%	[-11%, 16%]	297.8	27.4%	206.2	2.0
31	N81	Services to buildings and landscape activities	2.3%	[-7%, 12%]	447.9	22.4%	179.3	12.6
32	M69	Legal and accounting activities	2.1%	[-5%, 9%]	1524.7	19.1%	275.2	6.4
33	F43	Specialized construction activities	1.6%	[-11%, 14%]	731.4	20.0%	473.9	16.9
34	C33	Repair and installation of machinery and equipment	-0.5%	[-13%, 12%]	487.0	17.7%	263.2	11.3
35	G47	Retail trade, except of motor vehicles and motorcycles	-0.6%	[-6%, 5%]	3092.5	8.7%	4037.3	41.2
36	H52	Warehousing and support activities for transportation	-0.6%	[-11%, 9%]	895.1	8.5%	765.9	5.0
37	M73	Advertising and market research	-1.6%	[-14%, 11%]	967.8	20.0%	547.7	15.3
38	G46	Wholesale trade, except of motor vehicles and motorcycles	-3.0%	[-7%, 1%]	10908.2	9.6%	14509.9	232.2
39	H51	Air transport	-4.0%	[-30%, 22%]	361.3	8.1%	650.3	1.1
40	A01	Crop and animal production, hunting and related service activities	-4.1%	[-22%, 14%]	3039.1	2.8%	2885.8	2.4
41	N82	Office administrative, office support and other business support activities	-9.5%	[-28%, 9%]	463.7	12.9%	251.3	4.4
42	D35	Electricity, gas, steam and air conditioning supply	-16.6%	[-48%, 14%]	286.5	9.8%	555.3	4.6

Notes: The table reports coefficients and confidence intervals of the excess costs of political connection at the 2-digit sector level. Excess costs are estimated from equation 25 assuming each firm's capital level is fixed. The production function elasticities and firm TFPR used as inputs to the excess costs regressions are obtained using the LP-Wooldridge methodology with the specification detailed in equation 20. The sample is the set of firms classified as government contractors in sectors with at least 750 observations. The regressions to estimate the productivity and capital utilization (reported in equation 25) include year and 3-digit sector fixed effects. Confidence intervals (CI) are obtained from the same 30 bootstrap simulations used to compute production function elasticities. The table additionally reports the yearly average number of contractors operating in the sector, the yearly average share of politically connected firms, the average total revenue of the sector per year, and the average total public expenditure in the year.

Table A.3: Correlation Between Sectoral Misallocation Estimates

Capital	Model	Sample for production function est.	Correlation
Flexible	LP-Wooldrige	Main specification	0.912
Fixed	OLS	Main specification	0.827
Flexible	OLS	Main specification	0.654
Fixed	LP-Wooldrige	Before connection	0.746
Flexible	LP-Wooldrige	Before connection	0.624
Fixed	OLS	Before connection	0.744
Flexible	OLS	Before connection	0.527
Fixed	LP-Wooldrige	Markup-adjusted revenue	0.984
Flexible	LP-Wooldrige	Markup-adjusted revenue	0.877
Fixed	OLS	Markup-adjusted revenue	0.850
Flexible	OLS	Markup-adjusted revenue	0.674
Fixed	LP-Wooldrige	No markup adjustment	0.956
Flexible	LP-Wooldrige	No markup adjustment	0.840
Fixed	OLS	No markup adjustment	0.796
Flexible	OLS	No markup adjustment	0.583
Fixed	LP-Wooldrige	All firms	0.875
Flexible	LP-Wooldrige	All firms	0.746
Fixed	OLS	All firms	0.752
Flexible	OLS	All firms	0.451

Notes: The table shows pairwise correlation coefficients between sector level estimates of excess costs computed with different samples and model specifications. The reference estimates are obtained with LP-Wooldridge production functions estimated on the sample of government contractors using our main specification (see equation 20) and assuming fixed capital. The unit of observation is the 2-digit sector level.

B Data Construction

B.1 Identifying Families

We identify families using the universe of people in the individual tax-income data for the years 2007-2015, and the bureaucratic and shareholder databases, which covers years 2000-2017. We observe over 5.3 million different individuals and classify them into 1.3 million different families. To have a sense of proportionality, in 2017, 12.4 million people were eligible to vote (i.e., people over 16 years of age). Given the large informal economy (around 45 percent according to surveys conducted by the Ecuadorian Statistical Institute), we actually cover a substantial share of the formal population. To determine family links, we considered that two persons are part of the same family if they share their first and second last names (ordered). Note that using the first two words in a name string as the last names could misclassify families. Given last name conventions in Hispanic countries, compounded last-names as ”De la Torre” are actually just one last name rather than three. For this purpose, we have to identify which words in a name belonged to each of the individual's last names. We separate the names into different words and consider as one last name all the combination of words that started with ”De la”, ”Del”, ”De los”, ”Di”, ”San”, ”Von” and ”Van der”, etc. As there are other combinations of compound last names, we manually imputed together words that are consistently repeated in the same order for more than three people. This allows us to identify the first and second last names of each person with higher accuracy.

C Proofs

This section presents proofs of Proposition 1 and 2. For both, we assume firms are cost minimizing and face the following Lagrangian function

$$\begin{aligned}\mathcal{L}(L_{it}, M_{it}, K_{it}, \lambda_{it}) = {} & L_{it} + M_{it} + K_{it} \\ & + \lambda_{it}\left(R_{it} - L_{it}^{\beta_l} M_{it}^{\beta_m} K_{it}^{\beta_k} \Psi_{st}^{-1} exp(\omega_{it}^*)\right),\end{aligned} \tag{27}$$

with L_{it}, M_{it}, and K_{it} denoting input expenditures where we suppressed the tilde for ease of notation, and $exp(\omega_{it}^*) = exp(\omega_{it})P_{it}$.

Proof of Proposition 1 Assuming flexible capital, the revenue-conditional demand for intermediate inputs can be written as

$$\begin{aligned} M_{it}(R_{it}, \omega^*_{it}, \boldsymbol{\beta}) &= \left(\frac{R_{it}\Psi_{st}}{exp(\omega^*_{it})} \beta_m^{(\beta_l+\beta_k)} \beta_l^{-\beta_l} \beta_k^{-\beta_k} \right)^{\frac{1}{\beta_l+\beta_m+\beta_k}} \\ &= \left(\frac{R_{it}}{exp(\omega^*_{it})} \right)^{\frac{1}{\beta_l+\beta_m+\beta_k}} \Gamma_m, \end{aligned} \tag{28}$$

where Γ_m is a constant that collects factor elasticities and the sector-level multiplier. We can derive corresponding revenue-conditional demand functions for labor and capital. Given these expressions, each firm's total cost function can be written as

$$\begin{aligned} C_{it}(R_{it}, \omega^*_{it}, \Gamma) &= L_{it} + M_{it} + K_{it} \\ &= \left(\frac{R_{it}}{exp(\omega^*_{it})} \right)^{\frac{1}{\beta_l+\beta_m+\beta_k}} (\Gamma_l + \Gamma_m + \Gamma_k). \end{aligned} \tag{29}$$

Assuming CRTS and taking derivatives with respect to revenue, we obtain

$$\frac{\partial C_{it}(R_{it}, \omega^*_{it}, \Gamma)}{\partial R_{it}} = exp(\omega^*_{it})^{-1}(\Gamma_l + \Gamma_m + \Gamma_k). \tag{30}$$

Thus, a firm's cost function is linear in revenue, with a different slope depending on the productivity level. To get a measure of excess costs of political connection it is sufficient to compare this expression between connected and unconnected firms in the same sector

$$EC_{flex} = \frac{\partial C_{it}(R^{con}_{it}, \omega^{*con}_{it}, \Gamma)/\partial R_{it}}{\partial C_{it}(R^{unc}_{it}, \omega^{*unc}_{it}, \Gamma)/\partial R_{it}} = exp\{\omega^{*unc}_{it} - \omega^{*con}_{it}\}, \tag{31}$$

so that average excess costs can be estimated by within-sector differences in TFPR, as stated in Proposition 1.

Proof of Proposition 2 Assume now that firm's capital cannot be freely adjusted, so that the revenue-conditional demand for intermediate inputs becomes

$$\begin{aligned} M_{it}(R_{it}, \bar{K}_{it}, \omega^*_{it}, \boldsymbol{\beta}) &= \left(\frac{R_{it}\Psi_{st}}{\bar{K}_{it}^{\beta_k} exp(\omega^*_{it})} \left(\frac{\beta_m}{\beta_l} \right)^{\beta_l} \right)^{\frac{1}{\beta_l+\beta_m}} \\ &= \left(\frac{R_{it}}{\bar{K}_{it}^{\beta_k} exp(\omega^*_{it})} \right)^{\frac{1}{\beta_l+\beta_m}} \Lambda_m, \end{aligned} \tag{32}$$

with $\bar{K}_{it}$ denoting the fixed level of capital, and Λ_m a constant that collects the remaining sector-specific parameters of the model. Using a similar expression for labor, we can write the following cost function for variable inputs

$$\begin{aligned} C_{it}(R_{it}, \bar{K}_{it}, \omega^*_{it}, \Lambda) &= L_{it} + M_{it} \\ &= \left(\frac{R_{it}}{\bar{K}_{it}^{\beta_k} exp(\omega^*_{it})} \right)^{\frac{1}{\beta_l + \beta_m}} (\Lambda_l + \Lambda_m). \end{aligned} \tag{33}$$

Assuming CRTS, the derivative of the cost function with respect to revenue is

$$\frac{\partial C_{it}(R_{it}, \bar{K}_{it}, \omega^*_{it}, \Lambda)}{\partial R_{it}} = \frac{1}{1-\beta_k} R_{it}^{\frac{\beta_k}{1-\beta_k}} \bar{K}_{it}^{-\frac{\beta_k}{1-\beta_k}} exp(\omega^*_{it})^{-\frac{1}{1-\beta_k}} (\Lambda_l + \Lambda_m). \tag{34}$$

Defining the capital-revenue share as $S^k_{it} = \bar{K}_{it}/R_{it}$, and taking ratios between the same expression for connected and unconnected firms, we obtain the expression for excess costs stated in Proposition 2

$$\begin{aligned} EC_{fixed} &= \frac{\partial C_{it}(S^{k,con}_{it}, \omega^{*con}_{it}, \Lambda)/\partial R_{it}}{\partial C_{it}(S^{k,unc}_{it}, \omega^{*unc}_{it}, \Lambda)/\partial R_{it}} \\ &= exp\left\{ \frac{\beta_k}{1-\beta_k} \left(ln(S^{k,unc}_{it}) - ln(S^{k,con}_{it}) \right) + \frac{1}{1-\beta_k} (\omega^{*unc}_{it} - \omega^{*con}_{it}) \right\}. \end{aligned} \tag{35}$$