Aggregate effects of Corruption

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1 Introduction

Corruption remains a widespread issue affecting economies worldwide, and its implications for businesses are profound. Understanding corruption is essential for firm development because it directly impacts operational efficiency, market competition, and long-term growth prospects. One in every four firms worldwide identify corruption as a major constraint to doing business according to the World Bank Enterprise Survey, and the number almost doubles in developing countries. Despite the importance of the problem, how pervasive corruption can be in an economy is still an open question.

In this paper, I exploit a large anti-corruption program that took place in Brazil between 2003 and 2014 to study the aggregate effects of corruption in the economy. My identification relies on the fact that municipalities were chosen at random to be audited, which provides with quasi-random variation in tackling corruption. Previous work has documented positive effects at the firm level (Colonnelli et al., 2022) and an increase in the performance of the local economy (Colonnelli and Prem, 2022). My paper builds on this work focusing on the externalities that were generated across industries and regions, by studying in more detail the spillovers and its consequences.

To the best of my knowledge, this is the first paper to explicitly study externalities in corruption across firms in different regions and industries. On the one hand, this is important as it enhances our understanding of anti-corruption policies and could change our measures of the effectiveness of such policies. On the other hand, as pointed out in Huber (2023), failing to account for possible sources of externalities could potentially induce bias in our results under fairly plausible assumptions. This could mean that not only we are missing a part of the effect of the policy, but also that previous estimates could be wrong.

I focus on spillover effects in two dimensions: regional and industry level. At the regional level for example, spillovers could arise if treatment affects local demand or local labor markets.

Colonnelli and Prem (2022) find that audited municipalities experienced firm growth and more entrants, which could be indicative of positive externalities within the municipality. However, Colonnelli et al. (2022) find that firms outside treated regions also were affected, which makes industries externalities also likely. Failing to account for one or both could induce bias in previous estimates, even if the treatment of other firms in the same region or industry are orthogonal to each firm's own treatment.

My estimates should do a better job at capturing spillovers across firms and industries, but it might still fail to capture effects at aggregate level or other GE effects (for example changes in composition of industries). At the same time, my estimates would be less informative about the potential effects of a different policy or one that takes place on a country with different levels of corruption. To try to account for these possibilities, in the second part of the paper I calibrate a model where government benefits corrupt firms and conduct a counterfactual exercise to match the effects found for Brazil.

In this (preliminary) version of the paper, I extend a Hopenhayn (1992) model, where I introduce frictions following the literature in capital misallocation (see for example Hsieh and Klenow (2009) and Hsieh and Klenow (2014)). This model is characterized by monopolistic competition with heterogeneous firms, where firms face a wedge that I interpret as corruption. Some firms will face a positive wedge in their revenues, which for the purpose of this paper can be interpreted either as a higher probability of receiving government contracts or the government being willing to pay a higher price for that variety of the good. In this model revenue productivity (the product of physical productivity and a firm's output price) should be equated across firms, so having corruption will lead to a subset of unproductive firms selling more than what they should in absence of corruption. My model shows that even a small corruption wedge can lead to large effects on output. Future versions of this work must extend this model to include different regions and sectors, so externalities -my main interest- can be present.

1.1 Related Literature

My paper contributes to three strands of the literature. On the first place, it contributes to a series of paper studying how political connections (or corruption) affect firm behaviour. It is well established that firms benefit from having relations with the government. In fact, evidence suggests that well-connected firms derive a significant portion of their value from political ties (Fisman, 2001). This phenomenon can be attributed to various factors. For example, firms that have better political connections have improved access to credit and reduced tax burdens (Faccio, 2006, 2007; Schoenherr, 2019). Similarly, Fisman and Wang (2015) show that politically connected firms in China can avoid compliance with costly regulations, which in this case ends up translating into more worker fatalities. It has been shown also that getting access to public funds by winning auctions increases long-term growth (Lee, 2021; Ferraz et al., 2015), so if the government could discretionally allocate this funds politically connected firms would benefit disproportionately. Interestingly, even though firms benefit from their connections to politicians, evidence shows that firms that pay higher bribes grow more slowly (Fisman et al., 2024) and that political connections relate to a higher rate of survival, as well as growth in employment and revenue, but not in productivity (Akcigit et al., 2023). Most of this studies see the direct effect on an "affected" firm, but ignores the effects of *other* firms being corrupt. My paper contributes to this literature by estimating how political connections/corruption affects not only one firm directly but also the other firms around it.

Another strand of literature attempts to study the effects of corrupt government at the regional or industry level. Akcigit et al. (2023) show that industries with a larger share of politically connected firms feature worse firm dynamics. Colonnelli and Prem (2022) show that reducing corruption in a region increases in the number of firms in the market. Reducing corruption also increases the efficiency of public spending. Fang et al. (2018) show that after an anti-corruption campaign subsidies became significantly positively associated with future innovation, and Choi et al. (2021) showed that spending on politically connected firms lowers the multiplier.

However, this micro evidence alone is insufficient to determine the overall effects of corruption, whether positive or negative. The enduring debate on the relationship between corruption and firms revolves around two conflicting perspectives. On one hand, some authors argue that corruption might be an efficient way to overcome other limitations present in the economy (Kaufmann and Wei, 1999). For example, firms could avoid inefficient regulations by engaging in (illegal) activities with government officials. Corruption in this case would be acting as "grease on the wheel". On the other hand, other theories highlight multiple ways in which corruption can harm firm activity, often characterizing it as a tax that hinders entry and stifles firm growth.

Finding a sound answer is difficult for two main reasons. First, given the nature of the problem obtaining data becomes a hard task. Second, it is complicated to establish a good causal link between corruption and aggregated outcomes as there might be infinite confounding variables. My paper tries to use spillovers to find a better estimate of the aggregate effects of corruption. My main caveat, however, is that I focus only on public spending, which is a very particular form in which firms and government officials can engage in corrupt activities but misses many others (for example bribes to be able to operate). Future research should aim to understanding these differences in corruption and measuring the relative importance of each, but it is out of the scope of my paper.

Finally, my paper contributes to the papers that analyze the consequences of capital misallocation in an Econpomy. Hsieh and Klenow (2014) and Hsieh and Klenow (2009) show that differences in output between countries can be attributed partly to a misallocation of resources across firms, but do not give a good answer as to what are the reasons for that inefficiency. My paper contributes to this literature by showing one possible channel that explains why misallocations happen in the first place.

2 CGU anti-corruption program

The Controladoria-Geral da União (CGU) is a pivotal governmental agency in Brazil tasked with enhancing transparency, promoting accountability, and combating corruption within the federal government. Between 2003 and 2014, the CGU implemented a pioneering program of random audits aimed at uncovering and combating corruption within municipal governments in Brazil. This initiative formed a critical component of Brazil's anti-corruption strategy, designed to enhance transparency, accountability, and efficient use of public funds. The core objective of the audits was to detect and deter corruption, improve governance, and ensure that federal resources were used appropriately and effectively.

The CGU employed a lottery system to randomly select municipalities for auditing. This process was conducted publicly and transparently, ensuring that all eligible municipalities had an equal chance of being audited. Some municipalities were excluded if they were larger than a certain threshold[1]. As of 2014, more than 99% of Brazil's 5,570 municipalities were eligible, and 1,881 had been selected at least once. I exclude from my analysis the large municipalities that could never be treated and focus on the rest. The randomness of the selection was critical in preventing any manipulation and ensuring fairness in the audit process, and it is what will guarantee the validity of the empirical approach.

Once selected, the municipalities underwent thorough audits involving several steps: a thoroughly document review, field inspections and interviews with local agents. Auditors examined financial records, contracts, and other relevant documents to identify discrepancies and irregularities. Auditors conducted on-site visits to verify the completion and quality of public projects funded by federal resources, such as schools, healthcare facilities, and infrastructure developments. Interviews and Surveys: Local officials, beneficiaries, and contractors were interviewed to gather insights and verify the information obtained from documents and field inspections.

The findings from these audits were compiled into detailed reports that highlighted any irregularities, mismanagement, or instances of corruption. These reports were made publicly available to ensure transparency. Additionally, the CGU followed up on the audit findings by recommending corrective actions and, when necessary, referring cases to law enforcement agencies for further investigation and prosecution. There are several potential consequences for firms that are exposed by the auditing program. In particular, if later found guilty, firms can be barred from participating in future tendering processes for federal and local contracts. Furthermore, exposed firms might have to pay penalties or return misused funds. In certain instances, firm owners might face judicial action. Even when not directly prosecuted, several anecdotes indicate that local governments steer away from doing business with firms involved in exposed irregularities, due to reputational and political considerations.

3 Data

The main dataset used in the analysis combines information from the new measures Colonnelli et al. (2022) create from the CGU anti-corruption reports and administrative matched employer-employee

[1]The population threshold was originally 100,000, but it was successively increased to 300,000 soon after the launch, and then rose to 500,000 for the remaining years of the program

data on the Brazilian formal sector.

For the corruption measure, I follow the same approach asColonnelli et al. (2022) . The final dataset includes all firms that were studied for an irregularity in all 39 audits round and 1881 municipalities randomly selected to be audited between 2003-2014. From this I retrieve information at the firm level of the amount of the contract, the date a contract was awarded and completed, and the extent of a firm's involvement with the aim of understanding whether it is the firm or the public official that is responsible for the irregularity.

The firm and worker level information we use as outcomes in the analysis comes mainly from the RAIS (Relação Anual de Informações Sociais) database, managed by the Brazilian Ministry of Labor. The RAIS has been used in a growing recent number of studies, and it is widely considered an extremely reliable census of formal sector activity in Brazil. Except for the informal sector and a subset of self-employed businesses, its coverage is almost universal. RAIS is a matched employer-employee dataset, which allows us to track individual employment careers over time across both firms and business establishments. Individuals are tracked using a unique administrative worker tax identifier, similar to the social security number in the US. In the data, I also observe the tax identifiers of both the firm and the establishment of the worker, as well as the five-digit industry they operate and the municipality they are located.

Table 1 shows that descriptive statistics at the municipality level. As we can observe in the table, audited and non-audited municipalities are very similar in all aspects, which provides evidence to support the randomness of the selection process.

However, as we can see on Table 2, firms that were audited differ in most aspects to those who were not (before being audited). As expected, they have a higher probability of be engaged in business with the government, and those contracts are larger by orders of magnitude. Also, audited firms are larger and pay higher wages.

Table 1: Municipalities descriptive statistics

	(1) Mean	(2) SD	(3) p10	(4) Median	(5) p90
Panel A: eligible municipalities					
N business establishments	251.11	710.67	6.00	53.00	555.00
N firms	239.38	672.00	6.00	51.00	532.00
Establishment size	11.21	74.63	1.00	3.00	17.00
Firm size	16.10	169.11	1.00	3.00	18.00
Private sector workers	2,815.60	9,688.85	18.00	324.00	5,837.00
Wage private sector	460.66	1,137.98	282.50	418.13	648.01
Public sector workers	685.18	1,447.31	122.00	335.00	1,382.00
Wage public sector	513.28	1,096.10	232.22	466.16	759.66
GDP per capita	4,686.43	5,492.51	1,411.96	3,401.38	8,798.00
Panel B: audited municipalities					
N business establishments	248.91	691.45	6.00	52.00	575.00
N firms	237.57	654.82	6.00	50.00	548.00
Establishment size	11.12	79.29	1.00	3.00	17.00
Firm size	15.78	135.36	1.00	3.00	19.00
Private sector workers	2,768.95	8,703.45	17.00	326.00	5,961.00
Wage private sector	457.22	239.78	282.70	416.53	647.28
Public sector workers	716.72	1,140.78	125.00	383.00	1,496.00
Wage public sector	497.98	727.49	224.44	459.45	747.95
GDP per capita	4,675.53	6,865.43	1,381.61	3,196.34	8,401.58

Source: Colonnelli and Prem (2022)

Table 2 : Firms descriptive statistics

	(1)	(2) RAIS Population	(3)	(4)	(5) Audited Firms	(6)
	Mean	Median	Standard Deviation	Mean	Median	Standard Deviation
Employees	15.66	3	351.15	46.52	12	112.62
Managers	0.71	0	20.04	2.47	0	6.67
Non-Manager	14.33	3	308.60	43.27	11	103.47
Wage	486.17	381	2569.26	524.97	438	310.39
Manager's Wage	1,150.38	752	4,279.22	1,282.43	907	1,159.86
Non-Manager's Wage	460.84	373	2415.63	496.80	425	260.80
Any Federal Contracts	0.00	0	0.05	0.05	0	0.21
Number of Federal Contracts	2.30	1	4.59	3.33	2	4.55
Amount of Federal Procurement	317.38	17	3,677.10	1,296.98	70	9,639.44

Source: Colonnelli et al. (2022)

4 Empirical Strategy

Unlike previous papers, my focus here is in understanding the aggregate effects of the program. To do so, I try to explicitly measure the spillovers across regions and industries, which allows me to infer how an audit affects parts of the economy that have been unaccounted for in previous research. The importance of understanding this spillovers is twofold. On one hand, it improves our understanding of the effects of anti-corruption policies. On the other, as pointed out by Huber (2023), not accounting for a direct estimation of spillover effects could bias the results of previous estimations. This could happen even when the spillovers are orthogonal to the individual treatment, for example in presence of measurement errors or misspecification of the model.

My main specification consists of estimating the direct effects of the audits rather than the effects of decreased corruption. The reason for this is that while the audits have a clear random component, corruption involves firms' decisions that are harder to see in the data. Assuming that audits reduced corruption in public procurement, as shown in previous work by Avis et al. (2018), and keeping in mind that the end-goal is to measure the effects of a decrease in corruption, my estimates can be interpreted as an intention to treat instead of a treatment effect.

I define treatment based on how exposed a firm was to the audits. In particular, I consider a firm i to be treated if at least one of its transactions was audited in a given year t and found to be engaged in corrupt businesses with the government. The program affected firms treatment because it is more likely for a firm to trade with its own municipality (although there are exceptions), and because some municipalities are more exposed to certain industries than others. Then, I calculate leave-out means to test for spillovers at the level of two groups: sector or industy s and regions r.

The share of other firms that are audited (leave-out mean) in the same sector is $x_{s(i),t}$ and the share in the region is $x_{r(i),t}$. Regions are defined as administrative municipalities where firms are located. Sectors are defined as industry cells (at the level of two-digit industries) for tradeable firms and industry-region cells for nontradable firms (since they sell locally). My main identification assumption is that firms audits in each year were determined at random, which implies that direct treatment status as well as sector and region leave-out means are uncorrelated with other shocks hitting firms. This relies directly on the random selection of municipalities to be audited.

The regression to estimate the direct effects of the spillovers is therefore[2]:

[2] another approach is to weight treatment and outcomes by size of the firms by weighting more larger firms. The extension is easy to implement in my context and for a more detailed description on implementation check Huber (2023)

$$y_{it} = \beta x_{it} + \gamma \bar{x}_{r(i),t} + \lambda \bar{x}_{s(i),t} + \Gamma + \varepsilon_{it}$$

Where the outcome y_{it}, given the data which I have access to, is employment measured either in workers or total wages. The first coefficient β is the direct effect of individual treatment x_{it} on the outcome. The direct effect represents by how much the outcome would change if firm i alone was treated. In addition, γ and λ capture the spillover effects of other firms in the same region or industry being treated respectively. Γ captures a set of firm, region, industry and year fixed effects.

As argued by Huber (2023), spillover estimates are misleading if a relevant spillover is not included in the specification. Unlike in the case of standard omitted variable bias, such bias can arise even if the different leave-out means are uncorrelated. This implies that researchers should include all potential spillover forces in their specification, even when they are orthogonal to the leave-out mean of interest.

A approach to assess the importance of my analysis is to explore whether the coefficients change without considering spillovers across industries, as has been done in the literature before (although not with the same methodology, other papers have focused on regional effects omitting the spillovers that this program might have across industries). If industries spillovers were important, not only there would be an extra effect to determine the impact of the policy, but the other coefficients could change even when spillovers are uncorrelated with individual treatment status.

5 Model

The empirical estimates provide a more accurate effect of the policy that took place in Brazil, given that particular implementation and context. In order to make a better assessment of how an anti-corruption program would work in a different economy, I calibrate a model that gives further insight into the mechanisms operating and the effect of the program in potentially different settings. I start with a simple model that tries to incorporate corruption in the public sector and I estimate a counterfactual exercise reducing corruption in the economy, which allows me to see how the economy responds.

The model I propose in this preliminary version is an adaptation of Hopenhayn (1992) with wedged that act as corruption, as is typical in the capital misallocation literature (Hsieh and Klenow (2009) or Hsieh and Klenow (2014)). While this simplistic version is good to show what the effects are of corruption in government spending, it misses two key points that are the goal of my paper. On the first place, it is a one-sector one-region model, therefore losing the spillovers that I am interested in estimating[3].

The second feature that my model is missing now is the fact that corruption is given as an exogenous parameter now, not accounting for the possibility of firms making an endogenous choice of being corrupt. It is unclear whether firms that benefit from the model choose to do so by paying extra taxes or are exogenously benefited by, for example, pre-existing relationships with government officials. While this question does not have a clear answer in the literature, it might have important implications in terms of the conclusions of my model.

Keeping these caveats in mind, I proceed to describe how my simple economy works.

5.1 Model Setup

The industry is composed by a continuum of firms which produce a homogeneous product. Firms behave competitively, taking prices in the output and input markets as given. Aggregate demand is given by the inverse demand function $D(Q)$ and the input price by $W(N)$, where N is total industry demand for the input.

Firms produce output according to the production function $y = f(\varphi, n)$, where q is the quantity of output, φ is the firm's productivity, and n is the labor input. I assume the production function is given by $y = \varphi n^{\alpha}$. The productivity process follows an AR(1) process:

$$\log \varphi = \overline{\varphi} + \rho \log \varphi + \sigma \varepsilon',$$

where $\varepsilon \sim N(0, 1)$. The demand function is assumed to be of the form: $D = \frac{\overline{D}}{p}\breve{}\,WC$. where $\overline{D}$ is a fixed demand and WC is the public funds that the government allocates to firms as an additional

[3] To account for this I plan to extend this model following Bonadio-Huo-Levchenko-Pandalai-Nayar (BHLP) Global Network Model, where the economy is comprised of N regions indexed by n, m, and l and J sectors indexed by j, i, and k.

markup.

New firms, referred to as entrants, draw their initial productivity from a distribution $G(\varphi)$. Firms face an entry cost c_e and a fixed per-period operating cost c_f. The discount factor for firms is $\beta \equiv \frac{1}{1+r}$, where r is the interest rate.

Households, who supply labor inelastically, are represented by the inverse demand function $p = D(Q)$, where $D'(p) < 0$. The timing of events within each period is as follows: incumbents decide whether to stay in the market or exit, and entrants decide whether to enter. Those that stay or enter pay their respective costs (c_f for incumbents and c_e for entrants) before observing their productivity for the period.

5.2 Firms

Firms are also subject to a distortion by the government. A fraction ν of firms are benefitted by a factor of $(1+\omega)$ that boosts their revenues, while the rest of the firms face the wedge $(1-\omega)$. This wedges represent the illegal activities that benefit some firms at the expense of the others, which would be a embezzlement of public funds. Once they enter the market, they draw a type $\{corrupt, non-corrput\}$ and remain in that group until they quit the market. Let $\tau \in \{\tau_c, \tau_{nc}\} = \{1+\omega, 1-\omega\}$ be the two possible scenarios for firms.

The static problem for a firm is to maximize its profits given the prices p, w and τ. The firm's problem is:

$$\pi(\varphi, \tau; p, w) = \max_n \{\tau p \varphi f(n) - wn - wc_f\}$$

The value function for an incumbent firm with productivity φ is given by the Bellman equation:

$$V_t(\varphi, \tau; p, w) = \pi(\varphi, \tau; p, w) + \beta \max \left\{0, \int V_{t+1}(\varphi', \tau; p, w)\, dF(\varphi'|\varphi)\right\}$$

where $F(\varphi'|\varphi)$ is the transition function for productivity.

Firms will decide to exit the market if their productivity falls below a reservation productivity threshold, $\varphi^*(\tau)$. The cutoff productivity $\varphi^*(\tau)$ solves the following condition (for interior solutions):

$$\int V_{t+1}(\varphi', \tau; p, w)\, dF(\varphi'|\varphi^*) = 0$$

Entrants, who do not know their productivity beforehand, pay the entry cost c_e to observe their productivity and begin production in the next period if they choose to stay. Denote the mass of entrants by M_t. The free entry condition is:

$$V^e = \beta \sum_t Pr(t = \tau) \int V_{t+1}(\varphi, \tau; p, w)\, dG(\varphi) - c_e \leq 0,$$

with equality whenever $M_t > 0$.

5.3 Incumbent Distribution

Let $\mu_{t,\tau}$ denote the measure of incumbent firms of type τ at time t. The law of motion for the distribution of incumbents is:.

$$\mu_{t+1,\tau}([0, \varphi^*)) = \int_{\varphi \geq \varphi^*} F(\varphi'|\varphi)\mu_{t,\tau}(d\varphi) + Pr_\tau(t = \tau)M_{t+1}G(\varphi).$$

If the distribution is discretized, this can be written as a linear system:

$$\mu_{t+1,\tau} = P_t \mu_{t,\tau} + Pr_\tau(t = \tau)M_{t+1}g,$$

where μ and g are $N \times 1$ vectors and P_t is an $N \times N$ matrix.

5.4 Equilibrium

We solve for the stationary competitive equilibrium, normalizing the wage to be the numeraire ($w = 1$). Define the policy decision to exit as $\chi(\varphi, p, \tau) \in \{0, 1\}$, where 1 denotes the decision to exit. A stationary recursive competitive equilibrium consists of firms' policy functions $(n(\varphi, p, \tau), \chi(\varphi, p, \tau))$, value functions V, V^e, price p, a measure of incumbent firms μ, and a measure of entrants M, such that:

- Given p, n and χ solve the firm problem and the associated value function V.
- Free entry implies $V^e = 0$ if $M > 0$ and $V^e < 0$ if $M = 0$.
- Goods market clear: $D(p) = Q^s(\mu, p) = \int q(\varphi, n; p)\mu(d\varphi)$.
- The measure of incumbent firms is invariant and solves:

$$\mu(d\varphi') = \int_{\varphi \geq \varphi^*} F(\varphi'|\varphi)[1 - \chi(\varphi, p)]\mu(d\varphi) + MG(\varphi). \tag{1}$$

5.5 Results

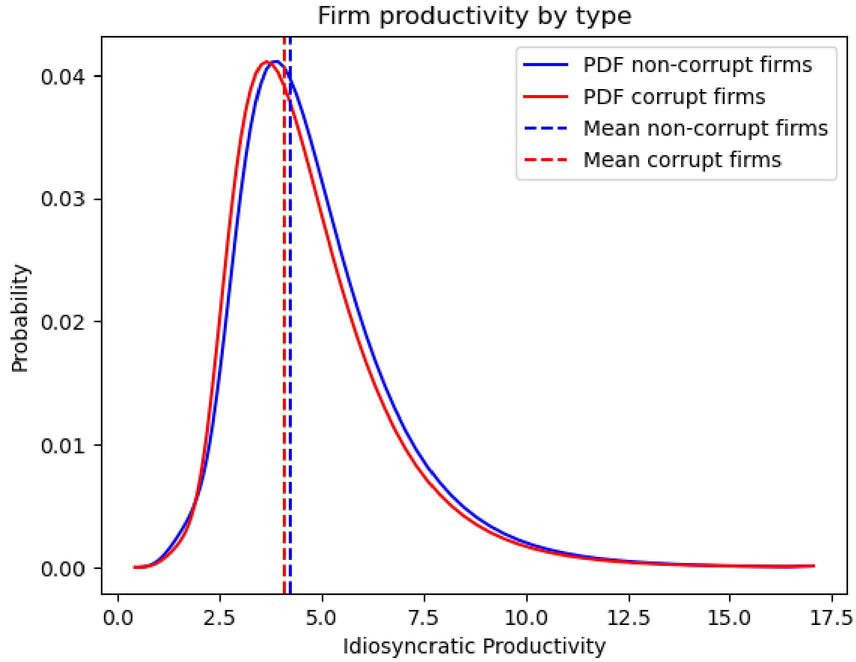
I compare three different economies: one with no corruption ($\omega = 0$), one with some distortion ($\omega = 0.025$) and 5% of corrupt firms, and a third one with the same distortion ($\omega = 0.025$) but only 2.5% of corrupt firms.

Introducing a small wedge of 2.5% has significant effects on this economy. The threshold for firms to remain in the market changes notably for both corrupt and non-corrupt firms: it decreases by 7% for corrupt firms and increases by 5% for non-corrupt firms. This shift introduces a market distortion, allowing corrupt firms to maintain lower productivity levels at the expense of non-corrupt firms. Interestingly, profits increase for all firms: corrupt firms benefit directly from the wedge, while non-corrupt firms experience higher profits due to the more severe selection process. Figure 1 illustrates the distribution of firms' productivities by type. As observed, in the corrupted economy, firms that benefit from the wedge gain a slight advantage over others.

On the aggregate level, the average firm size increases by approximately 5%, from 66 to 69 employees. This effect likely results from the pruning of smaller, less productive non-corrupt firms. While this might initially seem beneficial, the introduction of the small distortion leads to a nearly 30% decrease in output. This outcome is explained by the fact that firms are now able to obtain higher markups on their products, enabling less productive firms to enter the market and diverting resources from more productive to less productive firms.

Interestingly, when we reduce the number of corrupt firms by half, the response of the economy does not change as much. Productivity cutoffs do not change at all, firm size decreases slightly from

Figure 1 : Firms descriptive statistics



69.7 to 67.3 and aggregate output barely increases 2.5%. What is interesting on this scenario is that firms profits do fall by almost 10%, which is a large fall relative to the other changes in this economy.

Table 3: Comparison of Model Scenarios

	Scenario 1 $\omega = 0$	**Scenario 2** $\omega = 0.25$, 5% cor. firms	**Scenario 3** $\omega = 0.25$, 2.5% cor. firms
Price	1.2523	1.2811	1.2668
Avg. Firm Size	66.4673	69.6460	67.3515
Exit/entry Rate	0.1690	0.1857	0.1718
Productivity Cutoff for corrupt	2.8199	2.6203	2.6203
Productivity Cutoff for non-corrupt	2.8199	2.9253	2.9253
Aggregate Output	79.8549	56.5198	57.8721
Profits for non-corrupt	13.2337	14.0120	12.8915
Profits for corrupt	13.2337	15.8236	14.6434
Aggregate Profits	26.4673	29.8356	27.5349

This exercise is highly dependent on the calibration of the parameters, which at this point is not meant to match any relevant moment in the data. Future extensions of this work should try to discipline this economy so it can match key moments of the data and the empirical results (spillover effects) that arise from the previous section.

References

Akcigit, U., Baslandze, S., and Lotti, F. (2023). Connecting to power: political connections, innovation, and firm dynamics. *Econometrica*, 91(2):529–564.

Avis, E., Ferraz, C., and Finan, F. (2018). Do government audits reduce corruption? estimating the impacts of exposing corrupt politicians. *Journal of Political Economy*, 126(5):1912–1964.

Choi, J., Penciakova, V., and Saffie, F. (2021). Political connections, allocation of stimulus spending, and the jobs multiplier.

Colonnelli, E., Lagaras, S., Ponticelli, J., Prem, M., and Tsoutsoura, M. (2022). Revealing corruption: Firm and worker level evidence from brazil. *Journal of Financial Economics*, 143(3):1097–1119.

Colonnelli, E. and Prem, M. (2022). Corruption and firms. *The Review of Economic Studies*, 89(2):695–732.

Faccio, M. (2006). Politically connected firms. *American economic review*, 96(1):369–386.

Faccio, M. (2007). The characteristics of politically connected firms.

Fang, L., Lerner, J., Wu, C., and Zhang, Q. (2018). Corruption, government subsidies, and innovation: Evidence from china. Technical report, National Bureau of Economic Research.

Ferraz, C., Finan, F., and Szerman, D. (2015). Procuring firm growth: the effects of government purchases on firm dynamics. Technical report, National bureau of economic research.

Fisman, R. (2001). Estimating the value of political connections. *American economic review*, 91(4):1095–1102.

Fisman, R., Guriev, S., Ioramashvili, C., and Plekhanov, A. (2024). Corruption and firm growth: evidence from around the world. *The Economic Journal*, 134(660):1494–1516.

Fisman, R. and Wang, Y. (2015). The mortality cost of political connections. *The Review of Economic Studies*, 82(4):1346–1382.

Hopenhayn, H. A. (1992). Entry, exit, and firm dynamics in long run equilibrium. *Econometrica: Journal of the Econometric Society*, pages 1127–1150.

Hsieh, C.-T. and Klenow, P. J. (2009). Misallocation and manufacturing tfp in china and india. *The Quarterly journal of economics*, 124(4):1403–1448.

Hsieh, C.-T. and Klenow, P. J. (2014). The life cycle of plants in india and mexico. *The Quarterly Journal of Economics*, 129(3):1035–1084.

Huber, K. (2023). Estimating general equilibrium spillovers of large-scale shocks. *The Review of Financial Studies*, 36(4):1548–1584.

Kaufmann, D. and Wei, S.-J. (1999). Does" grease money" speed up the wheels of commerce?

Lee, M. (2021). Government purchases and firm growth. *Available at SSRN 3823255*.

Schoenherr, D. (2019). Political connections and allocative distortions. *The Journal of Finance*, 74(2):543–586.