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Abstract

Exploiting China's anti-corruption campaign, we show that following a decrease in the effectiveness of corruption, the performance of firms operating in ex ante more corrupt environments improves. Small firms benefit more. We identify the channels through which corruption hampers firm performance. Following the anti-corruption campaign, the allocation of capital and labor becomes more efficient. Firms operating in ex ante more corrupt environments experience larger productivity gains, easier access to debt financing, and higher growth of sales than other firms. Taken together, our results suggest that corruption creates negative externalities.

Keywords: Corruption, corporate governance, capital and labor allocation, China

JEL Classifications: D22, D62, G30, L20, O12, P26

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The Externalities of Corruption: Evidence from Entrepreneurial Firms in China*

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Abstract

Exploiting China's anti-corruption campaign, we show that following a decrease in the effectiveness of corruption, the performance of firms operating in ex ante more corrupt environments improves. Small firms benefit more. We identify the channels through which corruption hampers firm performance. Following the anti-corruption campaign, the allocation of capital and labor becomes more efficient. Firms operating in ex ante more corrupt environments experience larger productivity gains, easier access to debt financing, and higher growth of sales than other firms. Taken together, our results suggest that corruption creates negative externalities.

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Firms around the world attempt to obtain political favors, such as lenient taxation, relaxed regulatory oversight, or generous financing, by hiring politicians to their boards and other posts, by providing financial support to different political factions, or by paying bribes. The costs and benefits of these behaviors, which can be largely assimilated to corruption, have been subject to intense debate. On the one hand, corruption may represent a second-best efficient solution because it allows firms to avoid bureaucratic delays (Leff, 1964; Huntington, 1968). Put differently, corruption would be oil in the wheels in highly regulated economies. Empirically, a number of papers show that corruption benefits firm shareholders in a variety of countries (see, for instance, Fisman, 2001; Faccio, 2006).

On the other hand, corruption may hamper an efficient allocation of resources (Shleifer and Vishny, 1993). This may explain why, at the macroeconomic level, a country's growth rate is negatively correlated with the level of corruption (Mauro, 1995). Hence, it seems plausible that corruption may be sand in the wheels for an economy because it causes negative externalities and inefficiencies. Evidence on the externalities of corruption, however, is scarce.

In this paper, we ask whether corruption causes negative externalities and inefficiencies that go above and beyond the benefits that it might yield to corrupting firms. Specifically, using China's recent anti-corruption campaign as a negative shock to the effectiveness of corruption, we investigate whether corruption stifles firm performance and whether it affects disproportionally small firms. We also explore whether corruption impairs an efficient allocation of resources between firms with different productivities and how corruption affects entrepreneurial entry and industrial structure.

China provides a unique setting to investigate the effects of corruption on entrepreneurial activity for several reasons. First, China experienced an exogenous shock to the extent and

effectiveness of corruption. The Xi Jinping administration launched a major anti-corruption campaign in 2012. This anti-corruption drive has been considered the most far-reaching and lasting than any previous attempts. Approximately 200,000 officials incurred sanctions for corruption or abuse of power in 2013 alone, dramatically affecting officials' risk of providing favors to corrupting firms and their willingness to bend the rules. By increasing the probability that government officials are investigated and convicted for corruption, the campaign made firms' corruption efforts less effective. The drop in corruption was large and rapid (Chen and Kin, 2019). Largely unanticipated by market participants, the launch of the anti-corruption campaign was exogenous to firm performance and corporate policies. Thus, to gauge whether corruption is sand or oil in the wheels, we explore how the performance of firms, which operate in an ex ante more corrupt environment, varies after the start of the campaign.

Second, we are able to access a large-scale proprietary dataset providing comprehensive information on a sample of public and private firms, which is representative of the distribution of firms in the Chinese economy across 31 provinces, 47 industries, and a variety of size classes. This allows us to test whether corruption results in a less efficient allocation of resources between firms and whether it affects disproportionately small firms. Small firms are particularly important in China, where they employ the overwhelming majority of non-agricultural workers and generate the largest increments in employment (Allen, Qian and Qian, 2005). In addition, the creation of new firms is crucial for spurring creative destruction and sustained economic growth (Akcigit and Kerr, 2016), especially in economies, such as China, which may otherwise fall into middle-income traps (Zilibotti, 2017). Since corruption is widespread, exploring its effects and economic consequences is particularly relevant to understand the process of development in emerging economies.

Third, while corruption is notoriously hard to measure (Olken and Pande, 2012), in China, it is possible to observe firms' efforts to obtain political favors. An item on all Chinese firms' profit and loss accounts, the entertainment expenses, is highly correlated with the grease money firms spend to secure better government services and lower tax payments (Cai, Fang and Xu, 2011).[1] By increasing the risks of providing favors to firms for government officials, the anti-corruption campaign decreased officials' willingness to bend the rules and, ultimately, the effectiveness of entertainment expenses.

We use entertainment expenses in an industry or in a province, measured well before the start of the anti-corruption campaign, to capture the extent of corruption in the environment in which a firm operates before the campaign. We ask how the performance of firms that operate in an ex ante more corrupt environment changes after the crackdown. Besides using entertainment expenses to capture a corrupt business environment, we show the robustness of our results to the use of more conventional proxies based on political connections.

Ultimately, we expect that a decrease in government officials' willingness to bend the rules would be associated with weaker firm performance in ex ante more corrupt industries (or provinces) if corruption facilitated economic activity. Firm performance should instead improve in these industries (provinces) if corruption caused negative externalities.

We find that the negative shock to the effectiveness of corruption is associated with an improvement in the performance of firms operating in ex ante more corrupt environments. The changes in performance following the anti-corruption campaign appear to be brought about by an increase in sales growth, easier access to debt financing, and a decrease in the cost of debt. There

[1] Entertainment expenses are also often discussed by news media as associated with favors firms are able to obtain from government officials and have been widely used in existing literature to measure corruption (e.g., Griffin, Liu and Shu, 2016; Lin, Morck, Yeung and Zhao, 2016; Fang, Lerner, Wu and Zhang, 2018). We show that industry entertainment expenses are unlikely to capture other industry characteristics, such as size or leverage, which may in turn be correlated with firm performance.

are significant distributional effects as the profitability and total factor productivity of smaller firms increase to a larger extent.

Importantly, the anti-corruption campaign improves the allocation of resources between firms. Estimating a model based on Wurgler (2000) and Bai, Carvalho and Phillips (2018), we find that following the campaign, the speed of labor (capital) reallocation to firms with high marginal productivity of labor (capital) increases if these firms operate in ex ante more corrupt business environments, which are therefore more affected by the launch of the campaign.

Corruption also appears to have an effect on industry structure and the geographical distribution of entrepreneurial activity. Following the start of the anti-corruption campaign, concentration decreases to a larger extent in the most corrupt industries. In addition, the proportion of young firms increases particularly in the provinces and industries with high ex ante entertainment expenses. This is especially the case for young firms with high productivity. Taken together, our results suggest that a corrupt business environment hinders an efficient allocation of resources, firm performance, and firm entry.

In most of our empirical analysis, we exploit the anti-corruption campaign as an exogenous shock to corruption, which should have affected disproportionately firms in ex ante more corrupt industries. Therefore, our empirical strategy relies on the assumption that firms in such industries did not experience improvements in performance already before the start of the campaign. Put differently, as in any difference-in-difference setting, there should be no pre-existing differential trends in performance for firms that are subject to different extents of treatment. We show that this identifying assumption is satisfied.

In addition, the ability to saturate the empirical models with high-dimensional fixed effects allows us to control non-parametrically for shocks and omitted factors. For instance, we

include interactions of province and time fixed effects and of size and time fixed effects; in the specifications in which we test for the differential effects on small firms, we even include interactions of industry and year fixed effects. To further address the concern that industry shocks may drive our findings, we consider that firms compete for services and resources with neighboring firms and measure a firm's ex ante exposure to a corrupt environment at the province level, instead of the industry level. This allows us to control for interactions of industry and year fixed effects. Results are robust in the within-industry and within-province specifications.

These patterns of heterogeneity in the effects of the reform allay concerns that other shocks or policies, contemporaneous to the anti-corruption campaign, could explain our findings. Nevertheless, we explicitly rule out some key alternatives based on government policies towards SOEs, changes in lending policies, or a decrease in the underground economy.

Taken together, our results indicate that a negative shock to the effectiveness of corruption benefits entrepreneurial activity. By increasing the rents of a few incumbent firms, corruption may stifle the ability of small firms to grow and compete. Such a mechanism may have potentially large adverse consequences on an economy's performance.

This paper belongs to a growing literature studying the effects of corruption and political connections. A strand of the literature documents a positive effect of political connections and firms' spending to obtain political favors, such as campaign contributions, lobbying expenses and bribes, on firm value and operating performance (Faccio, 2006; Amore and Bennedsen, 2013; Borisov, Goldman and Gupta, 2016; Zeume, 2017; Schoenherr, 2018).

A few papers explore the effect of corruption and political connections among Chinese listed companies. Calomiris, Fisman and Wang (2010) show that political connections

established through government ownership stakes benefit Chinese listed companies, confirming that political connections add value also in China. However, Fan, Wong and Zhang (2007) find that IPO firms with politically connected CEOs underperform both in terms of returns and operating performance.

Other studies document that corrupt economic environments are associated with weaker firm performance (Fisman and Svensson, 2007; Dass, Nanda and Xiao, 2016) and firms' attempts to shield their assets (Smith, 2016). These studies do not consider shocks to the effectiveness of corruption as we do, and are therefore unable to evaluate whether a corrupt environment worsens firm performance.

In contemporaneous work, Avis, Ferras and Finan (2018), Lagaras, Ponticelli and Tsoutsoura (2017), and Colonnelli and Prem (2017) study the local consequences of anti-corruption audits in Brazil. To the best of our knowledge, we are the first to be able to study the effects of a generalized increase in the cost of corruption on firm performance. Going beyond audits and considering a generalized crackdown on corruption is important to evaluate the effects of anti-corruption campaigns, as not all firms can be audited. Even more importantly, firms are likely to benefit if their competitors are fined or put out of business after an audit, whereas an increase in the perceived cost of corruption may in principle stifle firm performance and economic activity if corruption is oil in the wheels.

A number of recent papers explore the effects of the 2012 anti-corruption campaign. For instance, Chen and Kung (2019) show that the discounts at which politically connected firms are able to obtain land decreased immediately after 2012, indicating that the anti-corruption campaign was effective from its onset. Griffin, Liu and Shu (2016) show that the most corrupt firms are indeed targeted in the anti-corruption campaign. Lin, Morck, Yeung and Zhao (2016)

and Ding, Fang, Lin and Shin (2017) perform event studies and show that the valuations of politically connected firms dropped in anticipation of future enforcement. While these studies highlight cross-sectional differences in announcement returns across listed companies, they do not distinguish whether differences in announcement returns are due to differences in the expected probability of detection of corporate malfeasance or to changes in allocational efficiency. Instead, we directly explore the spillover effects of corruption. We also document for the first time the effects of the anti-corruption reform on unlisted companies, which are the vast majority of firms in any economy.

The rest of the paper is organized as follows. Section 1 discusses the institutional background. Section 2 introduces the methodology and Section 3 describes the data. Section 4 presents the empirical results. Section 5 explores the effects of corruption on the allocation of resources and industrial structure. Section 6 concludes. Variable definitions are in the Appendix.

1. Institutional Background

1.1 Economic Growth and Corruption in China

China is the largest emerging market and has experienced spectacular economic growth following an overhaul of its economic system in the late 1970s. However, economic growth in China has been accompanied by widespread corruption. Thanks to extensive decentralization of administrative power, local party chiefs can allocate capital, award large contracts, and determine land use. Local party chiefs also have strong incentives to pick a few large firms that become local champions to further their political careers.

This way of allocating resources and contracts has given incentives to private businesses and state-owned enterprises (SOEs) to deploy large amounts of resources in securing favorable

treatment and establishing close relationships with government officials. Firms appoint CEOs and directors who are former government officials to obtain direct connections to political power. Firms also spend in lavish banqueting, private club memberships, and expensive gifts, consisting of European luxury brands, jewelry, and artwork, to attract the favors of government officials.

These costs are recorded as entertainment expenses in Chinese firms' profits and loss accounts. Entertainment expenses are likely to include expenses for outright illegal activities, such as bribes, as well as borderline activities. The latter would encompass in advanced democracies (more or less corrupt) lobbying and campaign contributions. In the Chinese context, donations and other investments favoring the careers of local politicians play a similar role. There exists ample evidence that entertainment expenses, and the political connections they help establishing, are associated with benefits for firms, including lower taxes, government subsidies, and preferential access to contracts and financing (Li, Meng, Wang and Zhou, 2008; Cai, Fang and Xu, 2011).

1.2 The Anti-Corruption Campaign

President Xi Jinping's administration viewed corruption as a threat to the Communist Party's survival. For this reason, on November 8th, 2012, only 19 days into the new administration, President Xi Jinping launched an anti-corruption campaign at the 18th National Congress of the Communist Party of China (CPC). Following the launch of the campaign, on December 4th, the Political Bureau of the Central Committee of the CPC formulated an eight-point policy document to cut corruption. Even more detailed rules were then specified by central and provincial governments. The CPC also launched a website in which whistleblowers could report violations of the rules.

Xi's anti-corruption drive has been considered the most far-reaching and lasting than any previous attempts. As a result of the campaign, approximately 200,000 officials incurred sanctions for corruption or abuse of power in 2013 alone. About 2,000,000 people have been investigated to date.[2] All government officials have to turn in their passports to authorities to prevent them from running away in case of investigations.

There is ample evidence that these measures affected companies and government officials' behavior from the onset. For instance, the discount at which provincial party leaders sold land to connected firms dramatically shrank right after 2012 (Chen and Kung, 2019). Moreover, firms with high entertainment and travel expenses, a common proxy for corruption efforts, experienced negative abnormal returns on November 8th, 2012, the day of the announcement of the campaign (Lin, Morck, Yeung and Zhao, 2016). Politically connected firms also experienced negative returns in May 2013, when the actual inspections of provincial governments were announced (Ding, Fang, Lin and Shi, 2017), indicating that market participants continued to consider the anti-corruption drive credible. The effectiveness of the campaign is also demonstrated by the fact that firms have decreased their entertainment and travel expenses (Griffin, Liu and Shu, 2016) and that Chinese imports of luxury goods, typically used as gifts for government officials, have dropped (Qian and Wen, 2015).

Given its sudden and swift announcement, the anti-corruption campaign came as a surprise event, largely exogenous to firms' policies and performance. Previous administrations had typically announced policy changes roughly one year after their installation. The new administration of President Xi Jinping in turn had been formed at the end of a fierce power struggle within the CPC, which had left uncertainty on whether an anti-corruption faction of the

[2] "China Focus: China's anti-graft drive wins people's trust", October 7, 2017, Xinhuanet.

party would have prevailed. The swift policy change was not driven by the demands of small firms, but was rather an attempt of preserving the legitimacy of the CPC.

Overall, the anti-corruption campaign has increased the expected punishment associated with corruption, thus decreasing officials' willingness to concede political favors and the effectiveness of firms' entertainment expenses. In our empirical analysis, we exploit the anti-corruption campaign as an exogenous shock increasing in the cost of corruption and decreasing in the effectiveness of firms' efforts to obtain political favors. We expect firms in ex ante more corrupt industries to be affected by the shock to a larger extent. This allows us to evaluate the effects of a corrupt environment on firm performance and resource allocation.

Importantly, as effectively summarized in a New York Times' (2017) review of Xi Jinping's track record, there were no other major policy reforms that may have affected firms differentially.[3] In particular, Xi's administration continues to favor large companies and SOEs and has been ineffective in tackling their inefficiencies.[4] Thus, there were no changes in industrial policy that may affect our findings or account for changes in performance in industries more exposed to corruption, as well as for cross-sectional differences in performance between large and small firms.[5]

In our empirical analysis, we design a test in the spirit of a difference-in-difference methodology and explore the mechanisms through which the effects of the campaign may arise to mitigate any concerns that the differential effects of the anti-corruption campaign are driven by concurrent policy shocks. In addition, by focusing on a relatively short window following the

[3] "China and Economic Reform: Xi Jinping's Track Record", March 4, 2017, The New York Times.
[4] "Xi Jinping's Dilemma", September 11, 2017, The New York Times.
[5] Any policy or other economy-wide changes would be a threat to the identification only if they benefited industries that are ex ante more exposed to corruption to a larger extent. Not only such policy changes would have to be specific, but we can also prove that our results hold for firms within an industry using variation in firms' ex ante exposure to corruption at the province level.

start of the campaign (two years), we capture the immediate effects, which have been shown to be substantial in a different context (Chen and Kung, 2019), while limiting the possible impact of eventual concurrent changes in policies.

2. Methodology

2.1 Empirical Strategy

We exploit the 2012 anti-corruption campaign as a plausibly exogenous and unexpected shock to the extent and effectiveness of corruption. While the campaign constitutes an economy-wide shock, we expect the shock to have affected firms in ex ante more corrupt business environments to a larger extent. In most of our empirical analysis, we isolate the effect of the anti-corruption campaign on firm behavior and allocational efficiency by studying differential changes across industries, based upon the degree of corruption in different industries prior to the campaign. This approach is similar to the one followed by Bertrand, Schoar and Mullainathan (2007), who evaluate the effects of bank deregulation in France, by studying differential post-reform changes across sectors, based upon the degree to which different sectors relied on bank finance prior to the reform.

Since the anti-corruption campaign should have increased the cost of corruption, we expect that any externalities of corruption on firm performance should have decreased after 2012, when the campaign started. Empirically, if corruption indeed causes negative externalities, we should observe that the negative shock to corruption is associated with a positive effect on firm performance, especially for firms operating in ex ante more corrupt environments. If instead corruption were oil in the wheels, we would expect deterioration in performance for firms operating in ex ante more corrupt environments, following the start of the anti-corruption

campaign. We thus exploit predetermined variation in the expected intensity of the treatment (the anti-corruption campaign) to investigate the externalities of corruption using a difference-in-difference methodology.

Our main proxy for a firm's exposure to a corrupt business environment is based on the level of entertainment expenses in the industry, relative to the industry's size. In robustness tests, we also consider a firm's exposure to a corrupt environment at the province level, instead of the industry level, and explore other proxies for political connections.

To ensure that entertainment expenses do not depend on industry shocks, which may affect firm performance, we compute our proxy during 2006-2008, a period antecedent to our estimation sample. We refer to this variable as $\overline{EE}_{i,0}(Industry)$. Measuring this variable over different intervals does not alter our main findings. We restrict our estimation sample to 2010-2014, two years before and two years after the start of the anti-corruption campaign.

2.2. Firm Performance

Our tests explore how various measures of firm performance vary following the 2012 anti-corruption campaign for firms in industry i, depending on industry i's ex ante level of corruption. We rely on the following model:

$$y_{f,i,p,t} = \alpha_1 + \alpha_2 \overline{EE}_{i,0}(Industry) \times Anti\text{-}corruption_t + \boldsymbol{\gamma X_{f,t-1}} + \delta_f + \vartheta_{p,t} + \varepsilon_{f,i,p,t},$$

where $y_{f,i,p,t}$ is a measure of performance of firm f belonging to industry i and based in province p during year t; $Anti\text{-}corruption_t$ is a dummy variable that takes value one for 2013 and 2014 and zero during 2010-2012, the years preceding the anti-corruption campaign.

Throughout the analysis, as suggested by Bertrand, Duflo and Mullainathan (2004), we bootstrap standard errors to allow for within-industry correlation of the observations using 1,000 iterations for each model. In this way, we take into account that our variable of interest

$\overline{EE}_{i,0}(Industry) \times Anti\text{-}corruption_t$ does not vary across firms within an industry, following the anti-corruption campaign.

We control for firm f's own entertainment expenses to sales ratio, $EE_{f,i,p,t-1}$. We also control for a vector of time-varying firm characteristics, $\boldsymbol{X_{f,t-1}}$, firm fixed effects (δ_f), and time fixed effects, which, depending on the specifications, we allow to vary across provinces ($\vartheta_{p,t}$).

Since our results are robust to the inclusion of interactions of province and time fixed effects, any effect of $\overline{EE}_{i,0}(Industry) \times Anti\text{-}corruption_t$ cannot be interpreted to spuriously depend on provincial shocks. The firm fixed effects (δ_f) absorb any time-invariant firm characteristics as well as the effect of ex ante entertainment expenses in the industry ($\overline{EE}_{i,0}(Industry)$). Thus, our specifications identify the differential response to the anti-corruption campaign of firms that face different levels of corruption in their industry.

We expect $\alpha_2 > 0$ if the anti-corruption campaign limits the negative spillovers of corruption. On the contrary, $\alpha_2 \leq 0$ if corruption helps to overcome frictions and bureaucracy.

We also test whether the anti-corruption campaign has differential effects on firms with different characteristics. In particular, since large firms, thanks to their sheer size, can easily outspend small firms, we expect corruption to hamper the performance of small firms in comparison to that of their larger peers. If this were the case, the anti-corruption campaign should benefit small firms in ex ante more corrupt industries to a larger extent. To test this conjecture, we augment our baseline regression framework as follows:

$$y_{f,i,p,t} = \alpha_1 + \alpha_2 \overline{EE}_{i,0}(Industry) \times Anti\text{-}corruption_t + \alpha_3 \overline{EE}_{i,0}(Industry) \times Anti\text{-}corruption_t \times Size_{f,i,p,t} + \boldsymbol{\gamma X_{f,t-1}} + \delta_f + \vartheta_{p,t} + \varepsilon_{f,i,p,t},$$

where $Size_{f,i,p,t}$ is the logarithm of the number of employees.

We expect $\alpha_3 < 0$ if small firms benefit to a larger extent from the anti-corruption campaign. Importantly, in these specifications, we are able to absorb industry shocks by including interactions of industry and year fixed effects. Given our focus on the differential effect of firm size, throughout the analysis, we allow the exposure to year shocks to change with firm size, by including also interactions of the year dummies with the variable firm size in the regressions. These terms absorb the direct effect of firm size and capture that firms of different sizes may receive different amount of funding or subsidies in different years.

The interpretation of our results is subject to a number of identifying assumptions. First, as we verify, there should not be pre-existing differences in performance between firms in industries with different levels of corruption before the start of the campaign. Second, larger entertainment expenses in an industry before the start of the campaign should not be associated with uncontrolled firm characteristics, which could independently lead to an improvement in firm performance following the anti-corruption campaign.

To mitigate this concern, we consider the entertainment expenses of firms headquartered in the same province as firm f. Firms in the same province as firm f are likely to compete for services and funding, even if they are not competitors in the product market. Their corruption may thus generate negative externalities, similar to that of firms in the same industry. In these specifications, we can control for interactions of industry and year effects, even when we do not consider the differential effects of the anti-corruption campaign on firms of different sizes. Therefore, any effect of the entertainment expenses of firms in the same province as firm f cannot be interpreted as driven by industry shocks. The stability of the effects across these alternative specifications would imply that industry and province shocks do not drive our findings.

Finally, our empirical framework surmises that the anti-corruption campaign should have affected officials' willingness to concede political favors simultaneously in all Chinese provinces. While the timing of enforcement may have differed across regions, the valuations of politically connected firms in different regions have been shown to drop synchronously, in anticipation of future crackdowns, after the announcement of the campaign. Thus, the initial effects of the campaign appear independent from the particular provinces that were singled out at different points in time (Ding, Fang, Lin and Shi, 2017), suggesting that the effectiveness of political connections decreased uniformly across China. Nevertheless, to account for the possibility of differential enforcement across geographical areas, we exploit a province level index of the intensity of the anti-corruption campaign, which we describe in Subsection 3.3, and show that our results are robust.

2.3 Allocational Efficiency

We also evaluate the welfare effects of corruption by examining how it affects capital and labor allocation. A more corrupt economic environment may improve the allocation of resources if special treatment is directed to the most efficient firms. If, instead, the firms obtaining special treatment are not as efficient as other firms, corruption could hamper an efficient allocation of resources and ultimately result in lower growth.

Hsieh and Klenow (2009) propose a methodology to evaluate to what extent resources are misallocated between firms. In their framework, large differences in the marginal productivity of the factors of production between firms indicate that less productive firms are able to employ more resources and that resources are therefore not allocated efficiently. Instead of directly comparing the level of the marginal productivity of capital and labor across firms, we consider the scale of production speed of adjustment to differences in productivity. This

approach, which follows Wurgler (2000) and Bai, Carvalho and Phillips (2018), has the advantage that measurement errors in the productivity gaps would bias the analysis against finding any systematic evidence of factor reallocation.[6] In addition, by measuring the marginal productivity of the factor of production, we are immune to the criticism that even very efficient firms with high Tobin's Q and total factor productivity may have reached optimal scale. We capture, as the theory would imply, that the use of a factor of production should increase in the firms where at the margin the factor of production makes greater contributions to the output production.

We test whether the change in firm f's share of labor (capital) input between year t and $t-1$, $\Delta l_{f,i,p,t}$ ($\Delta k_{f,i,p,t}$), is positively related to the marginal productivity of labor (capital) input of firm f at time $t-1$, $MPL_{f,i,p,t-1}$ ($MPK_{f,i,p,t-1}$), and whether $\overline{EE}_{i,0}(Industry)$ decreases this correlation. We further test whether the effect of $\overline{EE}_{i,0}(Industry)$ is muted after the start of the anti-corruption campaign.

We estimate the following models considering as dependent variables a firm's employment share and its share of fixed assets, respectively:

$$\Delta l_{f,i,p,t} = \beta_1 MPL_{f,i,p,t-1} + \beta_2 MPL_{f,i,p,t-1} \times \overline{EE}_{i,0}(Industry) + \beta_3 MPL_{f,i,p,t-1} \times \overline{EE}_{i,0}(Industry) \times Anti\text{-}corruption_t + \boldsymbol{\gamma X_{f,t-1}} + \delta_f + \vartheta_{p,t} + \varepsilon_{f,i,p,t}.$$

$$\Delta k_{f,i,p,t} = \beta_1 MPK_{f,i,p,t-1} + \beta_2 MPK_{f,i,p,t-1} \times \overline{EE}_{i,0}(Industry) + \beta_3 MPK_{f,i,p,t-1} \times \overline{EE}_{i,0}(Industry) \times Anti\text{-}corruption_t + \boldsymbol{\gamma X_{f,t-1}} + \delta_f + \vartheta_{p,t} + \varepsilon_{f,i,p,t}.$$

As in the previous specifications, we control for a vector of firm time-varying characteristics, $\boldsymbol{X_{f,t-1}}$, which may affect performance, interactions of province and time fixed

[6] To affect our inference, measurement errors in the marginal productivity of capital and labor would have to be correlated with $\overline{EE}_{i,0}(Industry)$ and vary after the start of the anti-corruption campaign. This is implausible.

effects ($\vartheta_{p,t}$) as well as firm fixed effects (δ_f), which control for systematic differences in the rate of growth of the factors of production across firms.

We expect $\beta_1 > 0$ if more productive firms increase the amounts of factors of production they employ. If corruption decreases allocational efficiency, we expect that $\beta_2 < 0$. Furthermore, we expect $\beta_3 > 0$ if the anti-corruption campaign decreases any negative effects of corruption.

3. Data Sources and Sample Construction

3.1 Firm-Level Data

Similarly to Bertrand, Schoar and Thesmar (2006), we use firm level accounting data extracted from tax files, which allow us to study both public and private firms and offer a more comprehensive view of the effects of the anti-corruption campaign than existing studies relying merely on listed companies. Specifically, our main data source is the Annual Tax Survey (ATS) Database, an annual survey administered by the Ministry of Finance and the State Administration of Taxation of China. The ATS was started in 2004 and is implemented by regional tax authorities. The survey is conducted using a uniform, comprehensive survey system. Firms have to provide detailed reports on their financial statements, tax status, operations, founding year, industry, and ownership characteristics. Survey answers are collected and subsequently verified by local tax authorities. The process is facilitated by the fact that all firms in China, even if unlisted, have to file annual accounting reports. All information reported is further verified using technical algorithms to minimize reporting errors. A special task force of the local tax authorities also audits survey respondents. Thanks to this process, the quality of the firm level financial information in the ATS database is higher than in the Chinese Industrial Enterprises database,

which is widely used in influential research (see, e.g., Hsieh and Klenow, 2009; Song, Storesletten and Zilibotti, 2011).[7]

In particular, concerns that any improvements in firm performance derive from reduced underground activities due to the campaign should be mitigated by the fact that firms in our sample were always audited by the tax authority. In Subsection 4.3, we report additional tests to further address this issue.

Our database includes a unique tax ID for each firm. Since the first six digits of Chinese tax IDs refer to the city where a firm is headquartered, we can trace firms' locations as well as their financial information and operating performance.

The survey covers two types of firms: the "key surveyed enterprises", which are relatively large local firms, and a sample of entrepreneurial firms drawn from the tax collection and management system at the State Administration of Taxation with the goal of covering a representative sample of the local firm population.[8]

Our sample goes from 2006 to 2014 and, after excluding firms in the financial industry, nonprofit organizations and social groups, and firms missing industry and location information, it includes 2,507,221 firm-year observations (743,858 unique firms) operating in 47 industries and located in 31 provinces, of which 2,373,549 firm-year observations (721,150 unique firms) refer to private firms. The sample thus provides comprehensive industry and geographical coverage.

We use our comprehensive set of firms to compute $\overline{EE}_{i,0}(Industry)$ (henceforth, $EE_0(Industry)$ to simplify notation) over the period 2006-2008. In the estimation sample, which goes from 2010 to 2014, we lose observations because of missing values for the dependent and

[7] As explained below, the ATS database also offers more extensive coverage and includes non-manufacturing firms.
[8] All firms in our sample are stand-alone companies as, differently from other Asian countries, business groups are not common in China. Thus, it is implausible that small unrelated firms pay bribes for larger private or public companies.

independent variables. We also exclude firms with fewer than three employees. The estimation sample contains 1,120,003 firm-year observations (385,182 unique firms), 1046,548 of which refer to private firms (365,587 unique firms). Panel A of Table 1 summarizes the firm characteristics for the 2010-2014 period.

3.2 Exposure to a Corrupt Environment

An important item in the profit and loss accounts of Chinese firms is the entertainment expenses. Cai, Fang and Xu (2011) show that a more comprehensive account consisting of entertainment and travel expenses is highly correlated with the grease money firms spend to obtain political favors and to pay lower taxes. From the Selling, General and Administrative expenses (SG&A) of the income statements in the ATS database, we observe firms' entertainment expenses. Since travel expenses may include legitimate business travel, entertainment expenses are arguably more correlated than entertainment and travel expenses with any money spent to obtain political favors and to corrupt officials.

Entertainment expenses can be inferred not only from firms' profit and loss accounts but also from their tax returns. Therefore, if entertainment expenses are unavailable from the income statements, we use tax returns information.

As explained before, we identify industries more exposed to corruption using the amount of entertainment expenses in the industry, $EE_0(Industry)$. To construct $EE_0(Industry)$, we first divide the entertainment expenses by the firm's sales and multiply it by 100. Dividing by sales helps avoiding that any differences in the size distribution or the number of firms affect our findings. We then identify industries more exposed to corruption by averaging the ratios of

entertainment expenses to sales of firms with the assets in the top quartile of their industry during a year over the 2006-2008 period.[9]

We consider the largest firms in an industry for computing an industry's exposure to corruption because the ratio of entertainment expenses to sales of large firms is larger and the dollar amount of their aggregate entertainment expenses is several times the entertainment expenses of other firms in the sample. Ultimately, the larger the entertainment expenses that a company could afford, often based on its sheer size, the stronger the personal ties that it could establish with government officials and more significant the privileges it could obtain in terms of access to government services, financing, and contractual relationships before the anti-corruption campaign. Thus, the behavior of the largest firms in the industry should be what matters for making the industry more or less corrupt and for tilting the level playing field in favor of a few players. However, the results we present hereafter are not sensitive to the specific sample we use to calculate $EE_0(Industry)$.[10]

Panel B of Table 1 validates the level of entertainment expenses of a firm as a proxy for corruption and ability to obtain political favors. Consistent with our conjecture, a firm's profitability in comparison to other firms in the same industry is positively associated with the value of the entertainment expenses during the 2006-2008 period. Firms that spend more on entertainment expenses also seem to have more financial debt, suggesting easier access to financial loans, and more government subsidies. This evidence confirms the findings of previous literature and validates the use of entertainment expenses as a proxy for the extent of corruption in our sample. The findings also support our conjecture that higher entertainment expenses by

[9] The ratio of entertainment expenses to sales is highly persistent over time. The majority of firms that are in the top (bottom) quintile in one year remain in the same quintile the following year. This is consistent with evidence that political contributions and lobbying efforts tend to persist over time (e.g., Yu and Yu, 2011).
[10] We control for the percentage of entertainment expenses over sales of each firm in all specifications.

some firms in an industry tilt the level playing field in favor of these firms. It is therefore legitimate to ask to what extent higher entertainment expenses in an industry may have externalities on the allocation of resources and firm performance.

In what follows, to evaluate the robustness of our results, we also use an alternative proxy for corruption based on political connections. In particular, we use the proportion of politically connected firms in an industry, defined as the proportion of privately-owned listed companies in an industry with directors that were previous government officials. We measure also this variable over the 2006-2008 period.

Panel C compares some salient characteristics of firms. Although statistically significant, differences between many of the variables are not economically significant. We observe however that in high $EE_0(Industry)$ industries, firms have worse performance, as measured by the profitability and the TFP. This suggests that high entertainment expenses in an industry may create negative externalities. To allay any concerns that firms in industries with different $EE_0(Industry)$ are heterogeneous along dimensions that may invalidate our tests, in our empirical models, we control for observed and unobserved differences between firms including an extensive range of fixed effects. As a consequence, as we show in Subsection 4.5 and Table 7, industries with higher entertainment expenses do not have better performance before the anti-corruption campaign once we saturate the specifications with fixed effects.

3.3 The Anti-corruption Campaign and Provincial Level Enforcement

While the inspections spurred by the anti-corruption campaign occurred at different times in different provinces, the announcement of the campaign has been shown to have nationwide

effects, which do not depend on the timing of enforcement (Ding, Fang, Lin and Shi, 2017; Chen and Kung, 2019).[11]

Nevertheless, to capture that the intensity of the anti-corruption campaign may have varied across provinces, we construct a provincial level index of enforcement from the websites of the Central Commission for Discipline Inspections (CCDI), its local agencies, and various internet search engines and news reports in the China Core Newspaper Databases.

Ultimately, we identify 1,576 individuals that are investigated for corruption, 1,152 of which are government officials, and 424 senior executives of SOEs. Figure 1 illustrates the number of individuals in a given province being investigated for corruption during the 2012-2014 period. The darker the color, the stronger the crackdown on corruption.

Using this information, we construct the "Convicted Officials" index, defined as the natural logarithm of one plus the number of individuals investigated for corruption in a province during the year in 2013, and the natural logarithm of one plus the number of individuals investigated for corruption in a province during 2013-2014 in 2014. The index is set to zero prior to 2012.

While this index may be higher in provinces with higher ex ante level of corruption, it allows us to capture changes in the economic environment faced by entrepreneurial firms after the start of the anti-corruption campaign. We can therefore study whether, as a consequence of the investigations, the spillovers associated with firms' efforts to corrupt officials, measured by the entertainment expenses of large firms, weakened.

[11] Also in our sample, the average ratio of entertainment expenses with respect to sales went from nearly 0.60% in 2012 and previous years to 0.50% in 2013 and to 0.42% in 2014.

4. Results

4.1 Entrepreneurial Firms' Performance

Table 2 explores how the anti-corruption campaign affected the performance of firms in industries with ex ante more corruption. The results provide evidence in favor of negative externalities of corruption. In columns 1 and 2, profitability increases, on average, following the anti-corruption campaign for firms in industries that were ex ante more exposed to corruption. The effect is both statistically and economically significant. For instance, in column 1, following the start of the anti-corruption campaign, a one-standard-deviation increase in $EE_0(Industry)$ is associated with a 0.72 percentage points increase in firm f's profitability, which is equivalent to a 22% increase in profitability for the average firm.

Estimates are obtained including firm and year fixed effects and interactions of year dummies with firm size, which makes unlikely that differential shocks affecting firms of different sizes drive our findings. The results are, if anything, stronger when we include interactions of province and year fixed effects in column 2. This not only indicates that we are not capturing shocks associated with firms' local economic environment, but also allows us to exclude that the better performance of firms in high $EE_0(Industry)$ industries is driven by a change in allegiances after the change in administration. The Xi administration could have favored different provinces with more loyal leaders, where firms had to spend more to obtain officials' favors with the previous, less friendly, administration. The robustness of the results allows us to exclude such an alternative explanation.

Another possible concern is that, if firm exit rate is higher in high $EE_0(Industry)$ industries after the anti-corruption campaign, we observe better performance in these industries, because the less profitable firms exit. However, high $EE_0(Industry)$ industries do not experience

higher exit rates after the start of the anti-corruption campaign and all our results are robust if we consider a balanced sample.

Columns 3 and 4 explore how the gains in profitability are distributed within an industry. High corruption may disadvantage small firms that are unable to spend as much as large firms to obtain the favors of politicians. If the externalities of corruption at least partially derive from tilting the level playing field in favor of large incumbents, we should observe that improvements in profitability are more pronounced for small firms.[12] This is precisely what we find. The result is robust to the inclusion of province times year fixed effects as well as of industry times year fixed effects (column 4), which control non-parametrically for any industry shocks, but also absorb the effect of $EE_0(Industry) \times Anti\text{-}corruption$.[13] This indicates that neither province-specific nor industry-specific shocks drive our findings and that the negative spillovers of corruption are indeed stronger for small firms.

Columns 5 to 8 of Table 2 repeat the same set of exercises considering a firm's total factor productivity (TFP) as a measure of performance. Following previous research in finance (see, e.g., Bai, Carvalho and Phillips, 2018), we estimate a firm's TFP, using the Levinsohn and Petrin (2003) model, which considers labor, capital (fixed assets), and material as inputs in a log-linear production function, estimated for each industry and year.[14] Once again, our results are consistent with corruption creating negative externalities and reducing efficiency. TFP increases for firms in industries more exposed to corruption following the anti-corruption campaign. For instance, in column 6, a one-standard-deviation increase in $EE_0(Industry)$ is associated with an

[12] In column 4, the anti-corruption campaign appears to have a positive effect for firms up to 7,332 employees, a condition satisfied by nearly all firms in our sample.
[13] All results in Table 2 are invariant if we consider only firms that entered before the start of the anti-corruption campaign in 2012.
[14] In particular, we use the algorithm described by Petrin, Poi, and Levinsohn (2004). The summary statistics of the estimates of the TFP are broadly in line with the ones reported in other samples of Chinese firms using this methodology (see, e.g., Huang et al., 2016).

increase in TFP of 0.57 percentage points, which is equivalent to almost 0.8% of the TFP's standard deviation (Panel A of Table 1). Also, in this case, the negative and significant coefficient on $EE_0(Industry) \times Anti\text{-}corruption \times Size$ indicates that small firms benefit to a larger extent.[15]

Overall, these results suggest that the negative spillovers associated with large firms' corruption efforts become smaller after the start of the anti-corruption campaign. To the extent that the campaign decreased the effectiveness of corruption, this suggests that corruption affects negatively firm performance.

4.2 Alternative Measures of Corruption

In Table 3, we perform a number of tests to probe that our results do not depend on the specific measure of ex ante exposure to corruption that we use. In columns 1-3 of Panels A and B, instead of entertainment expenses, we use the fraction of privately-owned listed companies in an industry that are politically connected, computed as an average over the 2006-2008 period. It is comforting that firms' profitability and TFP appear to improve in industries with ex ante more politically connected firms, following the start of the anti-corruption campaign. Also, consistent with our earlier results, the improvements are larger for relatively small firms.

In columns 4-6, instead of industry level corruption, we consider that firms may compete for services and resources, such as land and financing, with large corrupting firms in the same province, even if these firms are not competitors in the product market. By considering entertainment expenses in a firm's province, we can absorb industry level omitted factors by saturating the regression with interactions of industry and time fixed effects. It is thus comforting that the effects we uncover are similar to the ones we estimate when we use the entertainment

[15] The relative magnitude of the coefficients of $EE_0(Industry) \times Anti\text{-}corruption \times Size$ and $EE_0(Industry) \times Anti\text{-}corruption$ is such that all firms benefit, even though the TFP of large firms improves to a lower extent.

expenses of large firms in the same industry. This indicates that industry shocks cannot drive our findings.

Finally, in columns 7-9, we consider differences in enforcement across provinces. Instead of using the anti-corruption campaign dummy, we use the province level index capturing the strength of the anti-corruption drive in a province over time. Also in this case, the improvements in profitability and TFP appear to accrue disproportionately to small firms.[16]

4.3 Corrupting Firms

One may wonder whether the anti-corruption campaign benefits all firms, or if instead firms with ex ante larger entertainment expenses, which presumably had been successful in obtaining political favors, lose once their ability of corrupting officials is curtailed.

In Table 4, we test whether firms better poised to gain from a corrupt environment lose from the anti-corruption campaign. We proxy for a firm's ability to tilt the level playing field in its favor by using the average of the logarithm of the firm's entertainment expenses during the 2006-2008 period. We interact this variable with the anti-corruption dummy and with $EE_0(Industry) \times Anti\text{-}corruption$ to evaluate whether the anti-corruption campaign had a differential effect on the performance of firms with ex ante higher entertainment expenses and how the effect varies between industries with ex ante different exposure to corruption.

Firms that spent more on entertainment expenses appear to perform worse after the start of the anti-corruption campaign, but the effect is attenuated in the most corrupt industries. This is

[16] The estimates in column 8 of Panel A indicate that the profitability of firms with up to 11,309 employees improves, while the TFP of all firms increases (the coefficients in column 8 of Panel B suggest that the TFP of companies with up to 8,103 employees improve).

intuitive as spending on entertainment expenses is less effective when many other firms do so. Thus, the negative shock to corruption would be expected to have a smaller impact.[17]

These tests also help mitigating the concern that the performance improvements we observe simply capture a decrease in underground economy and lower tax evasion after the start of the anti-corruption campaign. If the underground economy and tax evasion were indeed related to entertainment expenses, any of these activities should be more closely related to firm level entertainment expenses rather than to entertainment expenses of the industry or province in which the firm operates. It is therefore comforting that firms with ex ante higher entertainment expenses do not experience as large performance improvements after the start of the anti-corruption campaign.

4.4 Possible Alternative Interpretations

The ability to control for different sets of fixed effects, including interactions of industry and year fixed effects, allows us to exclude a wide-range of alternative explanations related to industry and province specific shocks.

Yet, one may wonder whether entertainment expenses are correlated with the proportion of SOEs. Central and provincial governments typically convey lots of resources to SOEs in China. The presence of SOEs may confound the interpretation of our findings if the preferential treatment of SOEs decreased after the anti-corruption campaign. While anecdotal evidence suggests that Xi's administration continued to favor SOEs, we include controls for the proportion of value added produced by SOEs in an industry and an interaction between this variable and the anti-corruption dummy. Table 5 shows that our results are invariant after the inclusion of this

[17] Throughout the analysis we also control for firm level entertainment expenses at $t-1$. This variable has a negative effect on performance. Our empirical strategy is not well suited to identify the effect of this variable in a causal way and we do not wish to over-emphasize this finding. Nevertheless, we view as plausible that firms experiencing weak performance spend more in trying to corrupt officials.

control. While the performance of firms in industries with more SOEs, if anything, deteriorates after the start of the anti-corruption campaign, we continue to find that performance improves on average for firms in high EE_0*(Industry)* industries.

We also consider that the differential reaction to the campaign may depend on other industry characteristics, which may be correlated with EE_0*(Industry)*, even though the tests in which we consider entertainment expenses at the province level and include interactions of industry and time fixed effects tend to exclude that. Nevertheless, in Table 6, we control for the average size and leverage of firms in an industry during the 2006-2008 period. Including these additional interaction terms leaves our results unchanged.

4.5 Testing for Pre-existing Trends

Table 7 provides more general evidence that industries with different levels of EE_0*(Industry)* did not start experiencing improvements in performance already before the anti-corruption campaign. To evaluate this possibility, we interact EE_0*(Industry)* with year dummies.

We find no evidence that high EE_0*(Industry)* firms performed better before the reform. If anything, firms in industries with higher entertainment expenses had lower profitability in the year of the launch of the campaign. This is consistent with the narrative indicating that the costs of corruption were increasing up to 2012 and justifies the sense of urgency of Xi's administration in fighting corruption. More importantly, our main findings are qualitatively and quantitatively invariant.

4.6 Mechanisms

The results so far indicate that corruption has negative spillovers on firm performance, in particular for small firms. To provide evidence on the mechanisms that drive our findings, we

explore how corruption in an industry affects firms' ability to expand their sales and access to external finance.

Columns 1 to 3 of Table 8 investigate the effect of the anti-corruption campaign on firms' sales growth. Sales growth increases on average after the anti-corruption campaign, but it increases to a lower extent for large firms.[18] Overall, it appears that corruption slows down firms' ability to expand their markets possibly because it acts as a tax on their profits.

Corruption efforts are often associated with easier access to external finance. This is particularly likely to be the case in China, not only because formal financial markets are underdeveloped, but also because provincial and central governments support connected businesses by funneling cheap credit. Columns 4 to 6 show that following the start of the anti-corruption campaign, firms in ex ante more corrupt industries are more likely to secure financial debt. However, only relatively large firms (with more than 80 employees in column 3) are able to use financial debt following the campaign, indicating that our results are not due to government policies channeling credit to small firms.

Small firms, however, also benefit. Columns 7 to 9 of Table 8 explore the effect of corruption on firms' cost of debt, calculated as interest expenses scaled by total liabilities. Following the anti-corruption campaign, the cost of debt decreases for firms that are ex ante more exposed to corruption. The decrease is more pronounced for small firms, which faced a relatively higher cost of debt before the campaign. This suggests that small firms with access to financial debt are able to increase their internal cash flows for investment by decreasing their financial expenses.

[18] The estimates in column 2 imply that sales growth decreases for firms with more than 173 employees.

5. The Aggregate Effects of Corruption on the Economy

So far, we have shown that following the anti-corruption campaign, performance improves especially for small firms. However, this does not necessarily imply that corruption is inefficient. Corruption may be welfare-enhancing if the most productive (large) firms employ more capital and labor as a result of their higher entertainment expenses. In addition, high-quality small firms could ultimately grow and overcome the initial scale disadvantage. If corruption does not discourage entry, the frictions it creates are not expected to have any lasting impact on the economy. Below, we evaluate these channels to be able to infer whether corruption harms economic performance.

5.1 Corruption and Resource Allocation

In this section, we test whether higher productivity firms attract more resources over time and to what extent higher corruption constitutes sand in the wheels for this adjustment process. As discussed in Subsection 2.3, a higher correlation between the growth in the use of a factor of production and a firm's marginal productivity for that factor of production implies greater allocational efficiency.

Table 9 shows how corruption affects the allocation of labor and capital. The dependent variable is the logarithmic change in a firm's share of the industry's number of employees between t and $t-1$ in Panel A and the logarithmic change in a firm's share of the industry's fixed assets between t and $t-1$ in Panel B. We measure the productivity of labor (capital) as the logarithm of the ratio of sales to employees (fixed assets), as implied by a Cobb-Douglas production function. Our regressions include firm fixed effects to account for the fact that some firms may be in industries with higher productivity or high growth. We also include interactions

of province and year fixed effects to account that some provinces are subject to shocks that affect their growth rate.

As one would expect, columns 1 and 4 indicate that a firm's use of labor (capital) in an industry increases with its marginal productivity of labor (capital). However, higher entertainment expenses in an industry decrease the extent to which the most productive firms in the industry are able to attract more capital and labor (columns 2 and 5). Thus, corruption appears to slow down the reallocation of resources to the most productive firms. A one-standard-deviation increase in $EE_0(Industry)$ (equivalent to 0.184) is associated with a 13% (=0.184×0.47/0.67) drop in the speed of labor reallocation and a 5.5% (=0.184×0.167/0.56) drop in the speed of capital reallocation.

While corruption continues to hamper the reallocation of resources, following the launch of the anti-corruption campaign (columns 3 and 6), the correlation between the marginal productivity of labor (capital) and the growth of labor (capital) shares increases for firms in ex ante more corrupt industries, suggesting that a decrease in corruption improves allocational efficiency.

These tests indicate that even if corruption benefits firms that are able to obtain political favors, it leads to an inefficient allocation of resources and is therefore harmful for an economy.

5.2 Corruption and Industry Structure

In this section, we explore how corruption affects industry structure. To address this question, we start considering variation between industries and provinces and compute the fraction of young firms relative to all firms in a province and industry in a given year. We consider firms that are four years old or less as young. We test how the entertainment expenses

of large firms in an industry and province affect the proportion of young firms in that industry and province.

Considering differences between industries and provinces allows us to control for different entry and exit rates across industries as well as different levels of economic development across provinces, which could affect the proportion of new firms. For instance, some provinces could have more entry because they have experienced recent improvements in economic performance or because industries are younger. We absorb this variation by including industry fixed effects and interactions of province and year fixed effects.

Panel A of Table 10 shows that following the start of the anti-corruption campaign, the proportion of young firms increases if the industry was ex ante relatively corrupt in a given province (columns 1 and 2). EE_0*(Industry × Province)* appears to be negatively associated with firm entry in column 2 before the start of the campaign.

More importantly, columns 3 and 4 show that the proportion of high quality young firms, defined as firms with TFP in the top quartile, increases in ex ante more corrupt industries and provinces, following the start of the anti-corruption campaign. The effects are not only statistically, but also economically significant. For instance, the proportion of new (new high-quality) firms is on average 15% (3%). Therefore, in column 2 (4), a one-standard-deviation increase in EE_0*(Industry × Province)* is associated to a 1.49 (0.65) percentage-point increase in the proportion of new (new high-quality) firms following the campaign.[19]

Columns 5 to 6 of Table 10 Panel A show that entry of young firms is not accompanied by higher exit of large firms following the start of the anti-corruption campaign. Thus, the improvements in performance of firms operating in ex ante corrupt environments derive from a

[19] The economic effect of 1.49 percentage is computed using the coefficients in column 2 as 0.048×0.31. Similarly, the economic effect of 0.65 percentage points is computed from the coefficients in column 4 as 0.021×0.31.

decrease in the negative externalities created by corruption, rather than a decrease in competition. These results suggest that corruption hampers economic performance because the net formation of new firms is lower in higher corruption industries.

Finally, Panel B of Table 10 explores the effect of the anti-corruption campaign on industry concentration. Columns 1-3 consider an industry's Herfindahl index during a year, based on sales, assets, and number of employees, respectively, while columns 4-6 present the proportion of sales, assets, and number of employees of the top 5 firms in an industry. Consistently with the higher entry and survival of young firms following the campaign, industry concentration appears to decrease in industries ex ante more exposed to corruption.

Overall, these findings also help explain why large firms in ex ante more corrupt industries gain less from the anti-corruption campaign. By preventing firm entry, corruption limits competition and allows large incumbents to enjoy monopoly rents.

6. Conclusions

Using a comprehensive firm-level dataset in the world's largest emerging economy, we provide evidence that corruption constitutes sand in the wheels for an economy and is detrimental to growth.

We document that firms operating in an ex ante more corrupt environment become more profitable and productive after a negative shock to the effectiveness of corruption. We also identify the channels through which corruption has negative spillovers on the economy. A high level of corruption in an industry prevents labor and capital from being allocated to the most productive firms and deters entry and small firm growth.

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Appendix: Variable Definitions

Variable	Definition and Data Source
Age	The natural logarithm of one plus the difference between the current year and the year in which the firm was founded. Winsorized at the 1% and 99% levels. Source: ATS Database.
Anti-corruption	A dummy variable equal to one if the year is equal or greater than 2013, and zero otherwise.
Capital Reallocation	The difference between the natural logarithms of a firm's share of industry fixed assets between year t and year $t-1$, winsorized at the 1% and 99% levels. A firm's share of industry fixed assets in a given year is computed as its fixed assets divided by the aggregate fixed assets of all firms in the industry. Source: ATS Database.
Cost of Debt	A firm's interest expenses divided by the average of its total liabilities at the beginning and end of the year. Winsorized at the 1% and 99% levels. Source: ATS Database.
Convicted Officials	This variable is set to zero before 2013, it is equal to the natural logarithm of one plus the number of convicted ex-officials in a province in 2013, and to the natural logarithm of one plus the number of convicted ex-officials during the 2013-2014 period in 2014. Winsorized at the 1% and 99% levels. Source: Manual Collection.
EE	A firm's business entertainment expenses divided by sales, multiplied by 100. Winsorized at the 1% and 99% levels. Source: ATS Database.
EE_0(Industry)	The average EE of large firms in an industry during 2006-2008. Winsorized at the 1% and 99% levels. A firm's EE is computed as its total business entertainment expenses scaled by sales, multiplied by 100. A firm is considered large if the number of employees is in the top quartile of the sample in a given year. Source: ATS Database.
EE_0(Province)	The average of the EEs of large firms in a province during 2006-2008. Winsorized at the 1% and 99% levels. A firm's EE is computed as its total business entertainment expenses scaled by sales, multiplied by 100. A firm is considered large if the number of employees is in the top quartile of the sample in a given year. Source: ATS Database.
Labor Reallocation	The difference between the natural logarithms of a firm's share of industry employment between year t and year $t-1$. Winsorized at the 1% and 99% levels. A firm's share of industry employment in a given year is computed as its number of employees divided by the aggregate number of employees for all firms in the industry. Source: ATS Database.
Leverage	Total liabilities divided by total assets, measured at the beginning of the year. Winsorized at the 1% and 99% levels. Source: ATS Database.

$Leverage_0$(Industry)	The average leverage ratios of firms in an industry during 2006-2008. Winsorized at the 1% and 99% levels. Source: ATS Database.
Log(ee)	Natural logarithm of a firm's annual entertainment expenses. Source: ATS Database.
$Log(ee_0)$	The average of natural logarithm of a firm's annual entertainment expenses during 2006-2008, divided by 100. The missing value is set to zero. Source: ATS Database.
MPK	The marginal productivity of capital, approximated by the natural logarithm of sales divided by fixed assets. Winsorized at the 1% and 99% levels. Source: ATS Database.
MPL	The marginal productivity of labor, approximated by the natural logarithm of sales divided by the number of employees. Winsorized at the 1% and 99% levels. Source: ATS Database.
PC_0(Industry)	The average fraction of politically connected non-SOE listed firms in an industry during 2006-2008. Winsorized at the 1% and 99% levels. A firm is considered politically connected if at least one of its directors was previously employed as a bureaucrat by the central government or a local government. Source: Manual Collection.
ROA	Operating income divided by total assets. Winsorized at the 1% and 99% levels. Source: ATS Database.
Sales Growth	The difference between the natural logarithm of a firm's sales between year t and year $t-1$. Trimmed at the 1% and 99% levels. Source: ATS Database.
Size	Natural logarithm of the number of employees. Winsorized at the 1% and 99% levels. Source: ATS Database.
$Size_0$(Industry)	Natural logarithm of the average number of employees of firms in an industry during 2006-2008. Winsorized at the 1% and 99% levels. Source: ATS Database.
SOE_0(Industry)	The proportion of value added produced by SOEs relative to that of all the firms in the same industry during 2006-2008. Winsorized at the 1% and 99% levels. Source: ATS Database.
SOE	A dummy variable equal to one if a firm is government controlled or owned, and zero otherwise. Source: ATS Database.
TFP	Levinsohn-Petrin estimate of total factor productivity. Winsorized at the 1% and 99%. Source: ATS Database.

Figure 1

The Anti-Corruption Movement across Chinese Provinces

This figure reports the number of ex government officials and SOE executives investigated across Chinese provinces between 2012 and 2014. A darker color indicates a larger number. The convicted officials index used in Table 3 has mean 0.955 and standard deviation 1.504.

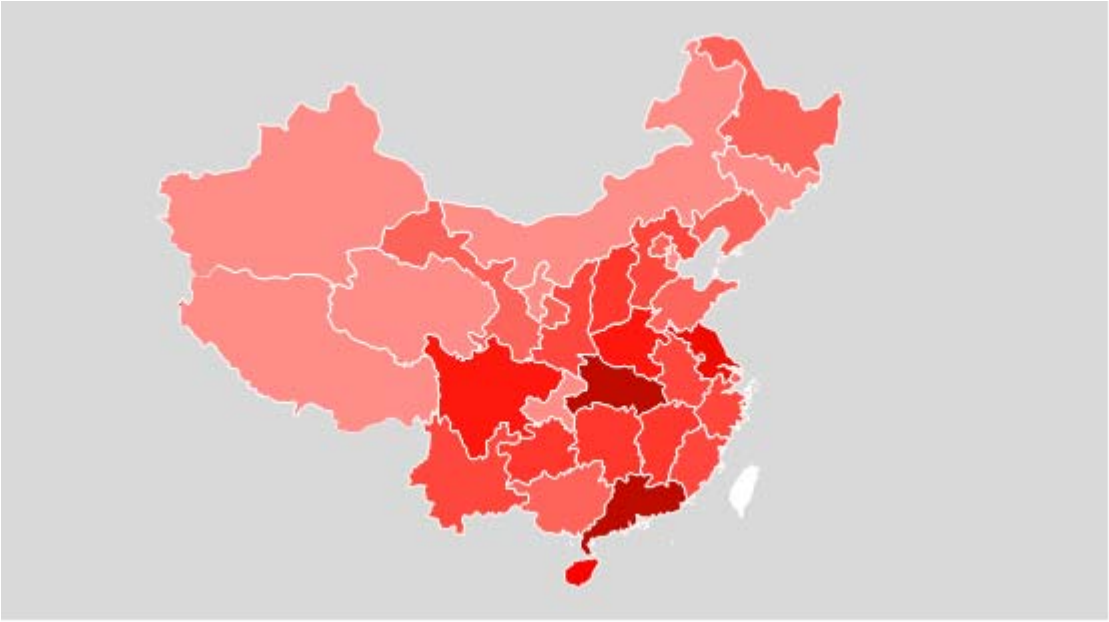

Table 1: Descriptive Statistics

The sample period for Panel A is the estimation period of 2010-2014, and for Panels B and C is the pre-estimation period of 2006-2008. The unit of observations is the firm-year. Panel A summarizes the main firm characteristics for the estimation sample. In Panel B, we regress firm ROA, TFP, the logarithm of total debt and government tax subsidies on "Log(ee)", defined as the logarithm of a firm's entertainment expenses plus one. Panel C compares some salient characteristics of firms with "EE_0(Industry)" above and below the median. T-statistics comparing the differences in mean values between the two subsamples are in the last column. All the regression models include a constant and fixed effects as indicated on the table, but the coefficients are not reported. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Summary Statistics

	# of obs.	Mean	Median	Std. Dev.
ROA	1,120,003	0.033	0.016	0.1
TFP	1,106,662	9.013	8.927	0.753
Sales Growth	1,097,602	0.056	0.063	0.412
Interest Rate	1,104,309	0.009	0.01	0.037
EE	1,120,003	0.384	0.126	0.753
EE_0(Industry)	1,120,003	0.497	0.418	0.184
Assets (million RMB)	1,120,003	381.546	84.176	973.784
Employee	1,120,003	286.875	112	533.148
Leverage	1,119,999	0.651	0.676	0.329
Age (years)	1,120,003	10.814	10	6.008
SOE	1,120,003	0.119	0	0.324
Capital Reallocation	1,100,879	-0.013	-0.077	0.618
Labor Reallocation	1,087,757	-0.219	-0.014	1.351
MPK	1,108,029	2.394	1.994	2.15
MPL	1,119,997	13.617	13.393	1.479

Continued Table 1: Descriptive Statistics

Panel B: Firm Level Entertainment Expenses and Performance

	ROA	TFP	Log (Debt)	Government Subsidies/Sales×100
	(1)	(2)	(3)	(4)
Log(ee)	0.001***	0.042***	0.092***	0.016***
	(27.96)	(104.18)	(149.68)	(26.75)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	720,761	703,777	716,552	721,141
R-squared	0.030	0.235	0.132	0.036

Panel C: Firms in Industries with High and Low Entertainment Expenses

	Low EE_0(Industry)			High EE_0(Industry)			T-Statistics
	# of obs.	Mean	Median	# of obs.	Mean	Median	
ROA	365,687	0.031	0.013	355,074	0.022	0.007	36.366***
TFP	356,178	11.59	11.467	347,599	11.079	10.983	188.361***
Sales Growth	244,353	0.067	0.076	233,222	0.092	0.095	-21.296***
Interest Rate	362,774	0.005	0.006	352,379	0.017	0.012	-108.619***
EE	365,854	0.383	0.187	355,287	0.63	0.332	-116.08***
EE_0(Industry)	365,854	0.364	0.364	355,287	0.623	0.576	-888.982***
Assets (million RMB)	365,854	126.221	28.084	355,287	192.397	44.12	-68.006***
Employee	365,602	240.351	85	354,853	273.07	110	-29.177***
Leverage	365,700	0.678	0.705	355,080	0.632	0.649	63.853***
Age (years)	365,854	7.838	6	355,287	9.026	7	-86.460***
SOE	365,854	0.105	0	355,287	0.183	0	-95.048***
Capital Reallocation	242,975	-0.001	-0.068	235,522	-0.001	-0.059	-0.126
Labor Reallocation	247,938	-0.02	-0.013	238,682	-0.011	0.006	-6.107***
MPK	356,433	2.656	2.222	349,719	1.627	1.426	220.733***
MPL	365,602	13.28	13.086	354,853	12.738	12.591	164.067***

Table 2: The Anti-Corruption Campaign and Firm Performance

This table relates the anti-corruption campaign to firm performance. The unit of observation is the firm-year. The dependent variable is the firm's ROA in columns 1-4 and the firm's total factor productivity (TFP) in columns 5-8. The estimation sample is 2010-2014. "EE_0(Industry)" is measured during 2006-2008. "Size" is the natural logarithm of number of employees. Control variables are measured at year $t-1$. All variables are defined in the Appendix. T-statistics computed with bootstrapped standard errors at the industry level are reported in parentheses. All models include a constant and fixed effects as indicated on the table, but the coefficients are not reported. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable	ROA				TFP			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
EE_0(Industry) × Anti-corruption	0.039***	0.041***	0.089***		0.029***	0.031***	0.053***	
	(36.06)	(37.39)	(22.19)		(6.38)	(6.55)	(2.62)	
EE_0(Industry) × Anti-corruption × Size			-0.010***	-0.002**			-0.005	-0.020***
			(-12.79)	(-2.15)			(-1.33)	(-4.82)
EE_0(Industry) × Size			0.004**	-0.002			-0.040***	-0.042***
			(2.27)	(-1.08)			(-5.01)	(-5.27)
Log(Assets)	-0.001*	-0.001*	-0.001	0.000	0.091***	0.091***	0.091***	0.093***
	(-1.87)	(-1.77)	(-1.59)	(0.34)	(62.48)	(62.69)	(62.71)	(63.95)
Leverage	0.014***	0.014***	0.014***	0.014***	0.059***	0.059***	0.059***	0.059***
	(20.35)	(20.10)	(20.24)	(20.67)	(22.14)	(22.33)	(22.39)	(22.37)
Age	-0.018***	-0.018***	-0.018***	-0.010***	-0.037***	-0.038***	-0.039***	0.005
	(-14.85)	(-14.89)	(-15.22)	(-8.56)	(-7.38)	(-7.44)	(-7.54)	(0.91)
State	-0.002**	-0.002**	-0.002**	-0.002*	0.006	0.006	0.006	0.004
	(-2.12)	(-1.99)	(-1.99)	(-1.96)	(1.33)	(1.44)	(1.45)	(1.07)
EE	-0.001***	-0.001***	-0.001***	-0.001***	-0.009***	-0.009***	-0.009***	-0.008***
	(-8.10)	(-7.90)	(-7.93)	(-7.40)	(-11.12)	(-11.02)	(-11.02)	(-9.58)
Observations	1,004,330	1,004,330	1,004,330	1,004,330	992,773	992,773	992,773	992,773
R-squared	0.668	0.669	0.669	0.678	0.902	0.903	0.903	0.905
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	NO	NO	NO	YES	NO	NO	NO
Size x Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Province x Year FE	NO	YES	YES	YES	NO	YES	YES	YES
Industry x Year FE	NO	NO	NO	YES	NO	NO	NO	YES

Table 3: Alternative Measures of Corruption

This table considers various measures of corruption in an industry and their impact on firm performance. The unit of observation is the firm-year. The dependent variable is the firm's ROA in Panel A, and the firm's TFP in Panel B. In columns 1-3, "PC_0(Industry)" is the average fraction of politically connected directors of privately-owned listed companies in a firm's industry between 2006 and 2008. A board director of a listed company is considered politically connected if he or she was previously employed as bureaucrat by the central government or a local government. In columns 4-6, we measure corruption using the EE of large firms in the same province as firm f. In columns 7-9, we measure the intensity on the anti-corruption campaign in the province of firm f with "Convicted Officials", computed as the natural logarithm of one plus the sum of ex-officials in a province investigated for corruption during the 2013-2014 period for year 2014; the natural logarithm of one plus the number of ex-officials in a province investigated for corruption in 2013 for year 2013; and set equal to zero before 2013. Control variables, measured at year $t-1$, include "Log(Assets)", "Leverage", "Age", "State", and "EE", but coefficients are not tabulated. All variables are defined in the Appendix. T-statistics computed with bootstrapped standard errors at the industry level are reported in parentheses. All models include a constant and fixed effects as indicated on the table, but the coefficients are not reported. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: ROA

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PC_0(Industry) × Anti-corruption	0.038***	0.035***							
	(4.94)	(4.63)							
PC_0(Industry) × Anti-corruption × Size	-0.008***	-0.008***	-0.007***						
	(-5.77)	(-5.39)	(-4.53)						
PC_0(Industry) × Size	0.011***	0.010***	0.008***						
	(3.72)	(3.58)	(2.62)						
EE_0(Province) × Anti-corruption				0.058***	0.056***				
				(7.67)	(7.48)				
EE_0(Province) × Anti-corruption × Size				-0.012***	-0.012***	-0.011***			
				(-8.19)	(-8.18)	(-7.72)			
EE_0(Province) × Size				-0.008***	-0.009***	-0.009***			
				(-3.02)	(-3.46)	(-3.44)			
EE_0(Industry) × Convicted Officials							0.019***	0.028***	
							(17.74)	(21.39)	

EE_0(Industry) × Convicted Officials × Size							-0.002***	-0.003***	-0.001***
							(-8.72)	(-13.31)	(-2.93)
EE_0(Industry) × Size							0.001	0.003**	-0.002
							(0.42)	(2.10)	(-1.14)
Convicted Officials × Size							-0.001***	0.002***	0.000**
							(-11.18)	(8.55)	(2.42)
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	984,648	984,648	984,648	1,004,330	1,004,330	1,004,330	1,004,330	1,004,330	1,004,330
R-squared	0.667	0.668	0.678	0.667	0.677	0.678	0.668	0.669	0.678
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	NO	NO	YES	NO	NO	YES	NO	NO
Size x Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Province x Year FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Industry x Year FE	NO	NO	YES	NO	NO	YES	NO	NO	YES

Continued Table 3: Alternative Measures of Corruption

Panel B: TFP

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PC_0(Industry) × Anti-corruption	0.527***	0.518***							
	(15.68)	(15.46)							
PC_0(Industry) × Anti-corruption × Size	-0.086***	-0.083***	-0.052***						
	(-13.72)	(-13.38)	(-8.31)						
PC_0(Industry) × Size	-0.057***	-0.057***	-0.078***						
	(-4.45)	(-4.45)	(-6.08)						
EE_0(Province) × Anti-corruption				0.096***	0.087***				
				(2.93)	(2.68)				
EE_0(Province) × Anti-corruption × Size				-0.021***	-0.019***	-0.015**			
				(-3.38)	(-3.04)	(-2.37)			
EE_0(Province) × Size				-0.050***	-0.052***	-0.052***			
				(-3.64)	(-3.81)	(-3.73)			
EE_0(Industry) × Convicted Officials							0.027***	0.027***	
							(4.84)	(4.02)	
EE_0(Industry) × Convicted Officials × Size							-0.004***	-0.003***	-0.004***
							(-3.36)	(-2.70)	(-4.98)
EE_0(Industry) × Size							-0.037***	-0.037***	-0.046***
							(-4.63)	(-4.66)	(-5.89)
Convicted Officials × Size							-0.001***	-0.000	0.000
							(-3.26)	(-0.31)	(0.54)
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	973,263	973,263	973,263	992,773	992,773	992,773	992,773	992,773	992,773
R-squared	0.903	0.903	0.905	0.902	0.904	0.905	0.903	0.903	0.905
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	NO	NO	YES	NO	NO	YES	NO	NO
Size x Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Province x Year FE	NO	YES	YES	NO	NO	YES	NO	YES	YES
Industry x Year FE	NO	NO	YES	NO	YES	YES	NO	NO	YES

Table 4: Corrupting Firms and the Anti-Corruption Campaign

This table relates the anti-corruption campaign to firm performance distinguishing between firms with different levels of entertainment expenses before the start of the anti-corruption campaign ("Log(ee_0)"). The dependent variable is the firm's ROA in columns 1-3, and the firm's TFP in columns 4-6. We define "Log(ee_0)" as the average of the logarithm of a firm's entertainment expenses plus 0.001 over the period of 2006-2008. The estimation sample is 2010-2014. "EE_0(Industry)" is measured during 2006-2008. "Size" is the natural logarithm of number of employees. Control variables, measured at year $t-1$, include "Log(Assets)", "Leverage", "Age", "State", and "EE", but coefficients are not tabulated. All variables are defined in the Appendix. T-statistics computed with bootstrapped standard errors at the industry level are reported in parentheses. All models include a constant and fixed effects as indicated on the table, but the coefficients are not reported. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable	ROA			TFP		
	(1)	(2)	(3)	(4)	(5)	(6)
Anti-corruption × Log(ee_0)	-0.018**	-0.014	-0.029***	-0.342***	-0.338***	-0.216***
	(-2.08)	(-1.58)	(-3.21)	(-8.89)	(-8.71)	(-5.48)
EE_0(Industry) × Anti-corruption × Log(ee_0)	0.009	0.007	0.034*	0.294***	0.294***	0.079
	(0.49)	(0.40)	(1.89)	(3.59)	(3.58)	(0.94)
EE_0(Industry) × Anti-corruption	0.038***	0.041***		0.006	0.006	
	(21.36)	(22.42)		(0.74)	(0.76)	
Control Variables	YES	YES	YES	YES	YES	YES
Observations	1,004,330	1,004,330	1,004,330	992,773	992,773	992,773
R-squared	0.668	0.669	0.678	0.903	0.903	0.905
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	NO	NO	YES	NO	NO
Size x Year FE	YES	YES	YES	YES	YES	YES
Province x Year FE	NO	YES	YES	NO	YES	YES
Industry x Year FE	NO	NO	YES	NO	NO	YES

Table 5: SOEs

In this table, we control for the fraction of value-added produced by SOEs in an industry ("SOE_0(Industry)") during 2006-2008, and its interaction with the anti-corruption dummy. We also consider how "SOE_0(Industry)" affects firms of different size. The dependent variable is ROA in columns 1-5 and TFP in columns 6-10. The unit of observation is the firm-year. Control variables, measured at year $t-1$, include "Log(Assets)", "Leverage", "Age", "State", and "EE", but coefficients are not tabulated. All variables are defined in the Appendix. T-statistics computed with bootstrapped standard errors at the industry level are reported in parentheses. All models include a constant and fixed effects as indicated on the table, but the coefficients are not reported. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable	ROA					TFP				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
EE_0(Industry) × Anti-corruption	0.040***	0.042***	0.092***	0.093***		0.016***	0.016***	0.117***	0.119***	
	(36.24)	(36.95)	(22.33)	(22.55)		(3.19)	(3.13)	(5.82)	(5.87)	
EE_0(Industry) × Anti-corruption × Size			-0.011***	-0.011***	-0.002*			-0.022***	-0.023***	-0.022***
			(-13.19)	(-14.02)	(-1.68)			(-5.59)	(-5.71)	(-4.99)
EE_0(Industry) × Size			0.004**	0.008***	0.002			-0.030***	-0.012	-0.020**
			(2.52)	(4.96)	(1.39)			(-3.82)	(-1.39)	(-2.37)
SOE_0(Industry) × Anti-corruption	-0.004***	-0.001	0.004***	-0.033***		0.057***	0.073***	0.082***	0.025	
	(-4.28)	(-1.17)	(3.19)	(-7.77)		(12.69)	(15.84)	(18.18)	(1.37)	
SOE_0(Industry) × Anti-corruption × Size				0.007***	-0.001				0.010***	0.009**
				(8.60)	(-1.58)				(2.90)	(2.57)
SOE_0(Industry) × Size				-0.022***	-0.021***				-0.093***	-0.109***
				(-12.97)	(-12.22)				(-10.80)	(-12.54)
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,004,330	1,004,330	1,004,330	1,004,330	1,004,330	992,773	992,773	992,773	992,773	992,773
R-squared	0.668	0.669	0.669	0.670	0.678	0.903	0.903	0.903	0.903	0.905
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	NO	NO	NO	NO	YES	NO	NO	NO	NO
Size x Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Province x Year FE	NO	YES	YES	YES	YES	NO	YES	YES	YES	YES
Industry x Year FE	NO	NO	NO	NO	YES	NO	NO	NO	NO	YES

Table 6: Controlling for Other Industry Characteristics

In this table, we control for the average leverage of firms in an industry ("Leverage$_0$(Industry)") and the natural logarithm of the average number of employees of firms in an industry ("Size$_0$(Industry)") during 2006-2008, and their interactions with the anti-corruption dummy. The dependent variable is ROA in Panel A and TFP in Panel B. The unit of observation is the firm-year. Control variables, measured at year $t-1$, include "Log(Assets)", "Leverage", "Age", "State", and "EE", but coefficients are not tabulated. All variables are defined in the Appendix. T-statistics computed with bootstrapped standard errors at the industry level are reported in parentheses. All models include a constant and fixed effects as indicated on the table, but the coefficients are not reported. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable	ROA					TFP				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
EE$_0$(Industry) × Anti-corruption	0.040***	0.042***	0.088***	0.090***		0.023***	0.025***	0.064***	0.045**	
	(36.47)	(37.92)	(21.94)	(22.12)		(4.95)	(5.06)	(3.16)	(2.17)	
EE$_0$(Industry) × Anti-corruption × Size			-0.010***	-0.010***	-0.002**			-0.009**	-0.003	-0.011**
			(-12.33)	(-12.65)	(-2.23)			(-2.24)	(-0.81)	(-2.51)
EE$_0$(Industry) × Size			0.004**	0.004**	-0.002			-0.039***	-0.044***	-0.048***
			(2.20)	(2.41)	(-1.07)			(-4.89)	(-5.34)	(-5.88)
Size$_0$(Industry) × Anti-corruption	-0.002***	-0.002***	-0.002***	0.005***		0.018***	0.019***	0.019***	0.117***	
	(-6.92)	(-7.29)	(-6.61)	(5.02)		(13.21)	(13.56)	(13.85)	(23.72)	
Leverage$_0$(Industry) × Anti-corruption	0.000**	0.000*	0.000	0.005***		-0.002***	-0.002**	-0.002**	0.006	
	(1.98)	(1.83)	(1.36)	(5.76)		(-2.76)	(-2.33)	(-2.51)	(1.54)	
Size$_0$(Industry) × Anti-corruption × Size				-0.001***	-0.001***				-0.021***	-0.015***
				(-6.68)	(-3.65)				(-22.16)	(-13.97)
Leverage$_0$(Industry) × Anti-corruption × Size				-0.001***	-0.001***				-0.001**	-0.001*
				(-5.49)	(-3.78)				(-2.01)	(-1.79)
Size$_0$(Industry) × Size				0.006***	0.005***				0.016***	0.011***
				(14.17)	(11.35)				(7.14)	(5.00)
Leverage$_0$(Industry) × Size				0.001***	0.001*				0.001	0.001
				(3.26)	(1.88)				(1.03)	(0.41)
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,004,330	1,004,330	1,004,330	1,004,330	1,004,330	992,773	992,773	992,773	992,773	992,773

R-squared	0.668	0.669	0.669	0.670	0.678	0.903	0.903	0.903	0.903	0.905
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	NO	NO	NO	NO	YES	NO	NO	NO	NO
Size x Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Province x Year FE	NO	YES	YES	YES	YES	NO	YES	YES	YES	YES
Industry x Year FE	NO	NO	NO	NO	YES	NO	NO	NO	NO	YES

Table 7: Pre-existing Trends

This table tests for pre-existing trends. The dependent variable is the firm's ROA in column 1, and TFP in column 2. "Year 2011 (2012, 2013, 2014)" is a dummy variable equal to one for year 2011 (2012, 2013, and 2014) and zero otherwise. Control variables, measured at year $t-1$, include "Log(Assets)", "Leverage", "Age", "State", and "EE", but coefficients are not tabulated. All variables are defined in the Appendix. T-statistics computed with bootstrapped standard errors at the industry level are reported in parentheses. All models include a constant and fixed effects as indicated on the table, but the coefficients are not reported. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	ROA	TFP
	(1)	(2)
EE_0(Industry) × Year 2011	0.000	-0.001
	(0.20)	(-0.24)
EE_0(Industry) × Year 2012	-0.013***	0.010
	(-8.77)	(1.46)
EE_0(Industry) × Year 2013	0.040***	0.023***
	(24.34)	(3.24)
EE_0(Industry) × Year 2014	0.029***	0.054***
	(15.67)	(6.48)
Control Variables	YES	YES
Observations	1,004,330	992,773
R-squared	0.669	0.903
Firm FE	YES	YES
Size x Year FE	YES	YES
Province x Year FE	YES	YES

Table 8: Mechanisms

This table relates corruption to firms' sales growth in columns 1-3, a dummy capturing whether a firm makes use of formal financing (financial debt) in columns 4-6, and firms' financing costs in columns 7-9. The unit of observation is the firm-year. The estimation window is 2010-2014. "EE_0(Industry)" is measured during 2006-2008. "Size" is the natural logarithm of number of employees. Control variables, measured at year $t-1$, include "Log(Assets)", "Leverage", "Age", "State", and "EE", but coefficients are not tabulated. All variables are defined in the Appendix. T-statistics computed with bootstrapped standard errors at the industry level are reported in parentheses. All models include a constant and fixed effects as indicated on the table, but the coefficients are not reported. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable	Sales Growth			Use of Formal Finance			Cost of Debt		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
EE_0(Industry) × Anti-corruption	0.010*	0.134***		0.045***	-0.669***		-0.017***	-0.042***	
	(1.69)	(5.24)		(7.61)	(-32.33)		(-38.73)	(-25.10)	
EE_0(Industry) × Anti-corruption × Size		-0.026***	-0.010**		0.148***	0.161***		0.005***	0.003***
		(-5.61)	(-2.00)		(36.43)	(36.30)		(16.85)	(7.20)
EE_0(Industry) × Size		-0.042***	-0.052***		-0.077***	-0.056***		-0.006***	-0.004***
		(-4.41)	(-5.43)		(-10.15)	(-7.23)		(-9.43)	(-6.62)
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	982,452	982,452	982,452	1,004,330	1,004,330	1,004,330	989,413	989,413	989,413
R-squared	0.359	0.359	0.366	0.457	0.458	0.469	0.550	0.551	0.558
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	NO	NO	NO	NO	NO	NO	NO	NO	NO
Size x Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Province x Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry x Year FE	NO	NO	YES	NO	NO	YES	NO	NO	YES

Table 9: Corruption and the Allocation of Resources

This table studies the effect of corruption on capital and labor allocation. The unit of observation is the firm-year. The dependent variable is the change in the natural logarithm of the share of industry employment of firm f from year $t-1$ to year t in columns 1-3 and the change in the natural logarithm of the share of industry fixed assets of firm f from year $t-1$ to year t in columns 4-6. The estimation period is 2010-2014. "EE_0(Industry)" is measured during 2006-2008. Control variables include "Size", "Leverage", "Age", "State", and "EE", but coefficients are not tabulated. All variables are defined in the Appendix. T-statistics computed with bootstrapped standard errors at the industry level are reported in parentheses. All models include a constant and fixed effects as indicated on the table, but the coefficients are not reported. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable	Allocation of Labor			Allocation of Capital		
	(1)	(2)	(3)	(4)	(5)	(6)
MPL	0.416***	0.670***	0.833***			
	(81.09)	(57.77)	(71.20)			
MPL × EE_0(Industry)		-0.470***	-0.849***			
		(-17.18)	(-31.17)			
MPL × EE_0(Industry) × Anti-corruption			0.220***			
			(118.11)			
MPK				0.471***	0.560***	0.561***
				(235.78)	(106.65)	(106.68)
MPK × EE_0(Industry)					-0.167***	-0.171***
					(-17.65)	(-18.04)
MPK × EE_0(Industry) × Anti-corruption						0.009***
						(5.13)
Control Variables	YES	YES	YES	YES	YES	YES
Observations	979,427	979,427	979,427	988,294	988,294	988,294
R-squared	0.364	0.365	0.395	0.440	0.441	0.441
Firm FE	YES	YES	YES	YES	YES	YES
Province x Year FE	YES	YES	YES	YES	YES	YES

Table 10: Corruption and Industry Structure

Panel A: Entry of Young Firms and Exit of Large Firms

The unit of observation is the province-industry-year. The estimation period is 2010-2014. "EE_0(Industry × Province)" is measured as the average EE of firms in the top quartile for number of employees in an industry and province during 2006-2008. Columns 1-4 relate corruption to the proportion of young firms. The dependent variable is the proportion of young firms among all firms in a province and industry (columns 1-2) and the proportion of high-quality young firms among all firms in a province and industry (columns 3-4). Each year, we classify a firm to be high quality if its TFP belongs to the top quartile of the sample. A firm is considered young if it is less than five years old. Columns 5-6 relate corruption to the exit of large firms. The dependent variable is the natural logarithm of one plus the number of large firms in year $t-1$ that exit in year t. "Average Size" is the average of the natural logarithm of the number of employees of all firms in a province and industry; "Average Leverage" is the average of the leverage of all firms in a province and industry. T-statistics computed with robust standard errors clustered at the industry and province level are reported in parentheses. All models include a constant and fixed effects as indicated on the table, but the coefficients are not reported. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable	Proportion of Young Firms				Exit of Large Firms	
	All Young Firms		High Quality Young Firms		# of Exits	
	(1)	(2)	(3)	(4)	(5)	(6)
EE_0(Industry × Province)	-0.011	-0.014*	-0.010***	-0.010***	-0.029	-0.029
	(-1.36)	(-1.68)	(-3.36)	(-3.30)	(-0.68)	(-0.69)
EE_0(Industry × Province) × Anti-corruption	0.039***	0.048***	0.021***	0.021***	-0.153***	-0.150***
	(5.57)	(7.10)	(7.52)	(7.05)	(-4.21)	(-4.17)
Average Size	-0.012**	-0.009	0.003	0.003	0.353***	0.331***
	(-2.25)	(-1.57)	(1.23)	(1.09)	(8.67)	(7.84)
Average Leverage	0.016***	0.020***	0.006**	0.007**	0.328***	0.353***
	(2.91)	(3.57)	(2.15)	(2.53)	(4.75)	(5.08)
Observations	5,099	5,098	5,099	5,098	6,756	6,756
R-squared	0.602	0.631	0.582	0.591	0.623	0.644
Year FE	YES	NO	YES	NO	YES	NO
Province FE	YES	NO	YES	NO	YES	NO
Industry FE	YES	YES	YES	YES	YES	YES
Province x Year FE	NO	YES	NO	YES	NO	YES

Continued Table 10: Corruption and Industry Structure

Panel B: Industry Concentration

The unit of observation is the industry-year. The estimation period is 2010-2014. "EE_0(Industry)" is measured during 2006-2008. The dependent variable in columns 1-3 is the Herfindhal index of an industry based on sales, assets and employees, respectively. In columns 4-6, the dependent variable is the fraction of sales and assets, respectively, of the largest five firms in the industry. T-statistics computed with robust standard errors clustered at the industry level are reported in parentheses. All models include a constant and fixed effects as indicated on the table, but the coefficients are not reported. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Herfindhal Index			% of largest 5 firms		
	Sales-based	Assets-based	Employee-based	Sales-based	Assets-based	Employee-based
	(1)	(2)	(3)	(4)	(5)	(6)
EE_0(Industry) × Anti-corruption	-0.001**	-0.001**	-0.000*	-0.008**	-0.006*	-0.005**
	(-2.41)	(-2.56)	(-1.70)	(-2.57)	(-1.98)	(-2.49)
Observations	235	235	235	235	235	235
R-squared	0.967	0.967	0.959	0.982	0.981	0.975
Year FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES

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