

Is Cracking Down on Corruption Really Good for the Economy? Firm-Level Evidence from a Natural Experiment in China

by

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ABSTRACT

This paper investigates the negative consequences of anti-corruption measures on economic outcomes. By exploiting an unexpected corruption crackdown in Northeast China in 2004, we find that the crackdown significantly lowers firm productivity and reduces firm entry. The negative impacts are mainly borne by private and foreign firms while the state-owned firms are intact. We further find that private firms with personal connections to the government fare worse than the state-owned firms, while unconnected private firms do not perform differently from the state-owned firms after the crackdown. Our findings suggest that cracking down on corruption may weaken some connected private firms' political ties and remove the "grease of the wheels" that supports firm development in weak market institutions.

Keywords: anti-corruption, productivity, entry, political connections

JEL: L2, M1, O1

I. Introduction

Corruption is a global issue. Practitioners, NGOs, and political and economic leaders all around the world take serious measures to crack down on corruption. On December 9, 2003, 140 countries signed the United Nations Convention against Corruption (UNCAC), making the international anti-corruption multilateral treaty legally binding. States around the world are obligated to take anti-corruption efforts in both the public and private sectors in the hope to reduce corruption and promote economic growth. Despite all the zealous efforts to crack down on corruption, the impact of anti-corruption initiatives on economic development is not well understood.

Conventional wisdom on corruption holds that corruption harms the economy because it misallocates resources through secret deals (Shleifer and Vishny, 1993) and transfers revenues to corrupt officials instead of the treasury (Goulder et al., 1997). Besides, corrupt politicians may deliberately create market distortions to generate corruption potentials (Shleifer and Vishny, 1993; Djankov et al., 2002). Thus, anti-corruption measures, especially those targeting corrupt politicians, may remove market distortions and lead to better economic outcomes. Other scholars argue, however, that corruption can “grease the wheels of the economy” since it speeds up bureaucratic procedures (Lui, 1985) and introduces competitions for (scarce) government resources (Leff 1964; Beck and Maher, 1986). According to this view, eliminating corruption may lead to inefficiencies and worse economic outcomes. Furthermore, the literature on the value of political connections (Fisman, 2001) suggests that firms’ ties to corrupt officials prioritize their access to loans and bailouts (Charumilind et al., 2006; Faccio et al., 2006), lower their leverage ratio (Fan et al., 2008), and increase their returns to capital (Acemoglu et al., 2016). Thus, cutting the connections, as anti-corruption measures often do, may hurt the connected firms. In summary, previous literature does not provide a conclusive answer to the consequence of anti-corruption measures on the economy.

In this paper, we document negative impacts of anti-corruption efforts on firms’ productivity and entry. Our empirical strategy takes advantage of an unexpected corruption crackdown in 2004, triggered by a police assault involving taking control of

police guns in Heilongjiang Province (a province in Northeast China that is adjacent to Russia). The crackdown abruptly removed about one hundred high-ranking government officials in Heilongjiang. This exogenous event allows us to utilize a rich dataset on large-scale manufacturing firms in China from 1999 to 2007. Unlike most recent studies that examine the impact of anti-corruption campaigns on firms' financial outcomes such as stock market returns, we investigate the impact of an anti-corruption measure on firms' real outcomes including productivity and entry-exit dynamics.¹

By comparing firms in Heilongjiang to those in other 19 inland provinces in China,² we find that the corruption crackdown substantially decreases firms' labor productivity – measured as log real value added per employee – for both existing firms and newly entering firms, by 16% and 10% respectively. When we break up our sample by firms' ownership types, we find that the negative impact of the corruption crackdown is mainly borne by private (-20%) and foreign firms (-28%), whereas state-owned enterprises (SOEs) remain largely intact. We further construct a continuous measure of treatment intensity using the number of officials removed in each city and conduct a city-level analysis (325 cities) to address the concerns of a small number of clusters, potential unparallel trends between the treated and control provinces, and concurrent events around the treatment time. The results are consistent with our baseline analysis.

To disentangle the underlying mechanism of the above findings, we construct a direct measure of political connection for private firms in Heilongjiang (675 firms) using their top managers' employment history based on manually searched resumes (2,707 managers/resumes).³ We find that, in Heilongjiang, private firms with personal connections fare worse than SOEs in terms of productivity whereas unconnected private

¹ We are unable to use the China Stock Market & Accounting Research (CSMAR) database on listed firms since the CSMAR database only contains very few listed firms in Heilongjiang prior to 2004.

² China's coastal regions are very different from the inland areas and the northeastern regions. We thus exclude all coastal provinces and the four municipalities (i.e., Beijing, Shanghai, Tianjin, and Chongqing). See more details in Table 1.

³ Previous studies have used employment histories of the board members to code political connections for listed firms (e.g., Fan et al., 2008). As far as we are concerned, this paper is the first to provide such a measure of political connection for non-listed firms.

firms do not perform differently compared with the SOEs after the crackdown. This finding provides direct evidence for the breakup of political connections.

We then show that the corruption crackdown discourages firm entry. We find that, on average, there are three percentage points fewer entries in Heilongjiang relative to the other provinces after the crackdown, but the reduction in entry is only observed for private and foreign firms, with seven and four percentage points decreases in industry-wide entry rates respectively. SOEs, in contrast, even enjoy a one percentage point increase in entry rates after the crackdown despite that the entry barriers for all firms, especially SOEs, increase substantially.

Putting the above evidence together, we find that cracking down on corruption in a corrupt economy has a substantial negative impact on firm performance in the short run. It lowers non-state-owned firms' productivity and reduces firm entry. It also raises entry barriers for all types of firms, suggesting that the corruption crackdown removes the "grease of the wheels" that helps firm operate in weak market institutions.

We argue that the different impacts of the crackdown felt by the SOEs versus private firms are likely due to the breaking up of political connections among connected private firms. According to the political connection literature, there are two ways to form political connections: either through personal ties (Fisman, 2001) or through institutional ties (or both). As Calomiris et al. (2010) point out, institutional ties such as those formed through government ownership can substitute for personal ties as a good source of political connection. The corruption crackdown leads to the *removal of corrupt officials*, which, in turn, affects firms with personal connections either to the removed officials or to other officials. The reason is the following. The crackdown will certainly affect firms with ties to the removed officials. More importantly, the crackdown will likely affect other connected firms (to the surviving officials) as long as the personal connections involve some illegal exchanges (e.g., bribes, kickbacks, etc.), because the crackdown will deter other officials' corrupt behaviors to deliver favor to the connected firms.⁴ On the

⁴ Note that we do not need to assume that *all* personal connections involve corruption. As long as some connections are corruption-based as shown by a large body of literature on political connections (e.g., Fan et al., 2008), we should expect some effects of the crackdown on connected firms through personal ties.

other hand, SOEs do not rely on those personal connections since they are endowed with institutional connections through government ownership. Therefore, the SOEs tend to suffer less during the crackdown. Our findings provide the first direct comparison between personal connections and institutional connections after a corruption crackdown and suggest that private firms' personal connections are more prone to corruption crackdowns than SOEs' institutional connections.

The finding that the corruption crackdown negatively affects the economy carries important implications for the consequences of anti-corruption efforts in weak market institutions. It calls attention for an overlooked fact that, although corruption might be a second-best equilibrium to a corruption-free equilibrium (Fisman and Svensson 2007), cracking down on corruption may lead to even worse economic consequences due to institutional inertia, at least in the short run.

To further explore why and how the anti-corruption measure depresses labor productivity (and thus entry) in private versus state firms, we gather additional evidence on firms' financial performance and local land provision for industry use. We find that private firms have lower profits but higher leverages after the crackdown. The increase in firms' leverage is due to increases in debts, especially short-term debts. These results suggest that private firms may have hard time raising long-term debt (a preferred way in debt financing) after the crackdown, which is likely due to a weakening of their political connections. We further find that the corruption crackdown discourages officials in Heilongjiang to provide cheap land for industry use. Insufficient production resources (e.g., land) may contribute to a lower productivity in Heilongjiang after the crackdown. Private firms may suffer more due to the fact that their access to land depends heavily on their connections to the government (Chen and Kung, 2018) that are likely broken after the crackdown. SOEs are intact as they do not rely on personal connections to obtain production resources. These results provide additional explanations for the falling of productivity.

Fan et al. (2008) also find that the announcement of a corruption investigation has negative impact on connected firms' corporate financing choices even if the firms are not directly involved in the corruption cases.

In addition, we find that the crackdown increases the level of perceived corruption among individuals working in both the private and public sectors in Heilongjiang, which suggests that the crackdown has revealed corruption levels that are beyond past expectations. This provides additional evidence for fewer entries after the corruption crackdown, especially among private firms.

Our results are robust to different definitions of productivity and various model specifications, sample selections, and different ways of bootstrapping standard errors that correct for a small number of clusters and serial correlations. The results also hold for city-level analysis that uses the number of removed officials as a continuous measure of treatment intensity. We consistently observe a substantial negative effect of the corruption crackdown on private firms' productivity and entry but not on the state-owned firms'. Falsification tests find no evidence of pre-trends in labor productivity among the Heilongjiang firms. The results are unlikely driven by government dysfunction, political uncertainty, or other concurrent events in Heilongjiang and its nearby regions around the treatment time.

Our study directly contributes to a vast literature on the effect of corruption on economic development. Early studies using cross-country data and corruption index find a negative correlation between corruption and economic growth (see Mauro, 1995, for instance). More recent studies provide firm-level evidence that either finds support for the “grabbing hand” theory of corruption (Fisman and Svensson, 2007) or the “grease of the wheels” effect (Vial and Hanoteau, 2010). On the extensive margin, studies on corruption and firm entry mainly use country-level measures of entry barriers (see Djankov et al., 2002; Klapper et al., 2006 for example). In particular, Klapper et al. (2006) find that regulatory entry barriers have no adverse effect on firm entry in high-corruption countries, which is in line with the “grease of the wheel” argument.⁵

⁵ Similar studies that examine the relationship between entry regulation and entry include Desai et al. (2003), Scarpetta et al. (2002), Ciccone and Papaioannou (2007), Ovaska and Sobel (2005), Bjornskov and Foss (2008), Freytag and Thurik (2007), Dreher and Gassebner (2013) among others. Most studies along this line find a negative relationship between entry regulations and entry. Dreher and Gassebner (2013) find that corruption reduces the negative impact of entry regulation on entry.

This paper differs from the above studies in three important ways. First, while most of the existing studies focus on the role of corruption in economic development, we focus on the effect of a corruption crackdown on economic outcomes. We find that cracking down on corruption does not restore the economy to the first-best non-corruption equilibrium but leads to even worse outcomes. Second, we provide causal evidence from a natural experiment at sub-national levels on how anti-corruption efforts affect economic activities on both the intensive margin (i.e., firm productivity) and the extensive margin (i.e., firm entry and exit). Third, we address the negative impact of anti-corruption efforts by highlighting the role of political connections, which is largely absent in the classic debate between the grabbing hand and the grease-of-wheel effect of corruption.

Our paper also contributes to a growing literature on the consequences of anti-corruption campaigns in China. While some researchers find negative impacts of anti-corruption campaigns on luxury goods imports (Qian and Wen, 2015), financial performances (Kong et al., 2017), and provincial-level GDP growth (Wang, 2016), Lin et al. (2016) and Ding et al. (2017) find positive impacts of anti-corruption campaigns on firms' market values. Lin et al. (2016) also find heterogeneous impacts of anti-corruption campaigns on stock market valuations for different types of firms. Specifically, the state-owned enterprises gain in their valuations in all provinces after the announcement of an anti-corruption campaign, but the non-state-owned enterprises decline in valuations in provinces with weak market institutions.⁶ These findings are consistent with our finding that private firms in Heilongjiang suffer the most from the crackdown as Heilongjiang is considered to have less developed market institutions.

Nevertheless, our study differs from these studies in two important ways. First of all, most studies on anticorruption focus on the effect of government-launched anti-corruption campaigns. In contrast, our empirical strategy exploits an *unexpected* large-scale corruption crackdown triggered by a police assault, which is free of political motivations of usual anti-corruption campaigns such as political purge and appealing to

⁶ This is measured by the marketization index published by China's National Economic Research Institute (Fan et al., 2003). For more details about the NERI's publications, see <http://www.neri.org.cn/English.html>.

the public for political supports that may also affect economic growth.⁷ Second, our empirical strategy allows us to use a rich dataset on manufacturing firms to look at a more complete picture of the consequences of anti-corruption efforts. Rather than using stock market returns that reflect the market's *expectations* about anti-corruption campaigns as the recent literature does, we use *direct* measures of firm productivity as outcome variables. More importantly, this dataset allows us to analyze firms' entry and exit dynamics which has not been investigated by studies using the public-listed firms. Therefore, our study has general implications on the consequences of anti-corruption efforts.

Our paper also contributes to the study of the value of political connections. Since Fisman's (2001) seminal work on connected firms' stock market returns in light of negative rumors about the Indonesia president Suharto's health, numerous researches have examined the importance of political connections. For example, Fisman and Wang (2015) have identified the social cost of political connection and find that the connected coal-mining firms in China have much higher death rates. Political connections also affect firms' financial behaviors such as lending (Charumilind et al., 2006; Khawaja and Mian, 2005, Claessens et al., 2008), bailouts (Faccio et al., 2006), and abnormal returns (Acemoglu et al., 2016). In a cross-country study of political connections, Faccio (2006) shows that political connections are particularly common in countries with higher levels of corruption. Political connections are of particular importance in weak institutions because business owners need the connections to know whom to bribe and to be shielded away from bureaucratic harassments (Malesky and Samphantharak, 2008).⁸ Our study adds to the literature by identifying the economic consequences of the break-up of political connections due to a corruption crackdown: depressing firm productivity and discouraging firm entry. More importantly, our study provides the first evidence

⁷ Two other studies examine corruption crackdowns rather than anti-corruption campaigns, but both with different focuses from ours. Fan et al. (2008) examine the effect of cracking down on economic corruptions on public listed firms' financial performances. Di Tella and Schargrodsky (2003) studies the wage adjusting process during a corruption crackdown in the City of Buenos Aires.

⁸ While the value of political connection is more pronounced in weak market institutions as shown by previous studies, Acemoglu et al. (2016) find that political connections have a significant impact on firm performance even in the US during the financial crisis, although there are no impacts in normal times.

that during political turmoil political connections formed through institutional ties (via state ownership) are more stable than those through personal ties.⁹

A growing body of literature in Political Science finds adverse effects of anti-corruption campaigns on political transparency (Malesky et al., 2012; Hollyer et al., 2015). Wang and Dickson (2018) find that China's ongoing anti-corruption campaigns lower regime support. Our findings are in line with this literature by showing a negative impact of a corruption crackdown on economic development.¹⁰

The outline of the paper is as follows. Section II introduces the institutional background of the corruption crackdown in Heilongjiang Province, the data, and our empirical strategy. We present our findings in section III and discuss the main mechanisms in section IV. Section V discusses alternative mechanisms. Section VI concludes.

II. Institutional Background and Identification

A. Heilongjiang Province and the Han Guizhi Crackdown

Heilongjiang Province locates in the northeastern tip of China that is bordered by Russia to the east (Figure 1). It roughly equates the State of California in size with a population of more than 38 million and total area of 175,600 square miles. Heilongjiang and the adjacent Jilin and Liaoning Provinces are collectively known as the “Three Northeastern Provinces” (the Three). The Three provinces region is China's Rust Belt as it was one of the earliest regions to industrialize in China. It specializes in heavy machinery manufacturing and oil extractions even today.¹¹

⁹ Some previous work has examined the effect of government ownership on firm performance (Wang, 2005; Sun and Tong, 2003; Cull and Xu, 2005; Allen et al., 2005; Calomiris et al., 2010). Our study also contributes to this literature by finding that state ownership can shield firms away from the negative impact of corruption crackdowns.

¹⁰ Two other studies in the political science literature examine the effect of exogenous replacements of governors on firms' investment behaviors (Malesky and Samphantharak, 2008) and the effect of supporting politicians coming into power on firms' productivity during the Orange Revolution in Ukraine (Earle and Gehlbach, 2015). Our study differs from these studies in identification strategies, institutional backgrounds, and firm outcomes.

¹¹ For more details about this region, see https://en.wikipedia.org/wiki/Northeast_China.

On February 20, 2004, the Chairwomen of the People's Political Consultative Conference (CPPCC) in Heilongjiang, Han Guizhi, was arrested for corruption investigations. Unlike the famous anti-corruption campaign launched by the Chinese president Xi Jinping in recent years, Han's crackdown was triggered by a local-level unexpected incident where a business owner attacked the police officers and took the police gun during an investigation on prostitution. Since taking police gun in China is an extremely serious felony where the government strictly prohibits any private possession of firearms, a series of investigations were carried out. The investigations eventually unveiled the most notorious office-selling chains (i.e., selling government office positions to bribing individuals) in China's recent history that Han was at the center of (Zhu, 2008).

In the evening of April 5, 2000, after receiving a 110 call (China's emergency line), four police officers in Harbin (the provincial capital city of Heilongjiang) arrived at the East Sea Dragon Palace Bath House (the Bath House) to investigate a possible prostitution case. The Bath House's manager refused to cooperate, assaulted the police with his security force, and took one of the police guns. This police-assault case quickly evolved into a series of corruption investigations into the government officials behind this Bath House, the highest-ranked one being the then party secretary of Suihua City, Ma De. From 2002 to 2003, more than a hundred government officials in Suihua were investigated. Up to then, the corruption investigations were still at the local level until the uncovering of Han Guizhi in 2004.

On February 20, 2004, Han Guizhi was arrested for corruption investigations. During Han's investigation, she confessed that she received bribes amounts to more than 9.5 million RMB (\approx 1.5 million USD) from more than 67 officials in exchange for government office positions. Her confession led to the biggest "earthquake" in the Heilongjiang officialdom. The follow-up investigations in late 2004 involved about 100 more officials from all over Heilongjiang. More than 50 senior officials including at least 30 officials at prefectural or above levels were charged for corruption and misconducts. Ten out of Heilongjiang's (then) thirteen prefectures had their top leaders (mayors or party secretaries) removed due to this large-scale corruption investigation.

We consider the corruption crackdown in Heilongjiang as exogenous to the local economy for the following reasons. First, the unveiling of the large-scale office-selling chain was accidental. The law enforcement agency had no intention of investigating in corruption when they opened a case for police assault. This rules out the concern that the anti-corruption measure was due to weak economic performances or other political motives that are correlated with the status of economic development.¹² Second, the escalation of the corruption investigation (from the local level to the provincial level) was mainly due to Han's personality. Had she not told on so many other officials (or had she not been related to so many), there would not be such a large-scale event. Moreover, unlike firm-related corruption cases, office selling should not directly relate to firm performance. That is, economic concerns did not trigger the crackdown. This further reassures us to treat this event as exogenous to firms' economic performances.¹³

We choose 2004 as the cut-off time as Han was arrested in early 2004 after which the massive crackdown started. Note that although the investigations in 2002 to 2003 involved a large number of officials, the impact remained at the local level in Suihua City. We thus expect this event to have little impact on province-wide firm behaviors.

We expect impacts of political turmoil on firm performance because the Chinese economy depends heavily on business-government relations (Vial and Hanoteau, 2009). Not just in China, in developing countries with weak institutions such as Indonesia (Fisman, 2001), Uganda (Fisman and Svensson, 2007), and Cambodia (Malesky and

¹² In Table A1, we test directly if the crackdown was correlated with economic conditions. To be specific, we check whether the number of officials removed in each city in Heilongjiang in 2004 is correlated with city-level economic growth (measured as GDP per capita) as well as firms' productivity in that city. We find no significant correlations. The coefficients are actually positive, which means better economic conditions are correlated with more removed officials. This may be due to the fact that Harbin, the capital city of Heilongjiang province, has the most officials removed and Harbin is also a city with good economic conditions overall.

¹³ One might argue that Han's opponents may manipulate the latter investigations that lead to the remove of over 100 officials and they may also manipulate the business network behind Han. However, in order for this to bias our results, Han should be systematically more connected to private firms, which is very unlikely. Our findings using private firms' personal connection data further rule out this possibility since if our results were biased, Han would have to be disproportionately connected with only private firms whose managers used to work in SOEs. We further conduct city-level analysis and use the number of officials removed in each city during the crackdown as a continuous measure of treatment intensity to address this concern since it is unlikely that the Han's opponent can target Han's networks in each city so precise that the number of Han's people removed perfectly matches the level of economic distress (measured as lower firm productivity) that we observed in the data.

Samphantharak, 2008), political connections are essential to business operations. Consulting firms in Indonesia provide a survival kit for foreign investors to get connected with the Suharto family (Fisman, 2001). In China, firms get away with safety inspections, pollution fines, etc. if they have an executive in the C-suit who have once worked as high-level government officials (Fisman and Wang, 2015). Therefore, an earthquake in the officialdom resulting from Han's crackdown is very likely to affect firm performance in Heilongjiang province.

B. Data and Empirical Strategy

We obtain a panel of firms from the Chinese Industrial Enterprise Database on large-scale enterprises in China that cover 426,702 firms in manufacturing, mining, and utilities from the years 1999 to 2007.¹⁴ This database is constructed by the China National Bureau of Statistics (NBS) of China and includes all the state-owned enterprises and non-state-owned enterprises with annual sales above five million RMB.¹⁵ It serves as the micro support for the editing of the Statistical Yearbook of Chinese Economy by the NBS. In our analysis, we focus on the manufacturing sector since approximately 90% of the firms in our database are manufacturing firms. We exclude firms with missing values for key variables, firms that have changed provinces across years, and firms that only exist in the year 2004.¹⁶ We end up with 388,047 firms and 1,556,517 firm-year observations.

¹⁴ This database is proprietary and can be accessed through HuaMei Commercial Information Consulting Corporation (<http://www.allmyinfo.com/eng/services/index1-1.asp>), a large consulting firm in China. The unit of observation is at the firm level instead of at the establishment level. If a firm has multiple establishments, we get the firm-level aggregates for all the establishments. This dataset is widely used in papers analyzing firm performance in China, especially for the manufacturing sector. Many studies have exploited this database to investigate macro development (Hsieh and Klenow, 2009; Song et al., 2011), firm-level productivity growth (Brandt et al., 2012), international trade (Yu, 2015; Dai et al., 2016), and innovation in China (Liu and Qiu, 2016; Chen et al., 2017). We process the data following Brandt et al. (2012) to minimize potential measurement errors in calculating labor productivity.

¹⁵ See the *Standard of the Chinese National Statistical Bureau*, 1996 - 2007.

¹⁶ In Figure A1, we plot firms' entry, labor productivity, sales, fixed assets(capital), employment, and value-added against time for Heilongjiang and the control provinces. Since the data collection framework changed from a survey to a census in 2004, we observe a spike in the entry rate in the year 2004. We thus exclude data from 2004 for entry analyses. We also exclude Tibet as there are only 281 manufacturing firms in Tibet. Firms' migration across provinces may contaminate the treatment effect. However, only 61 firms or 311 firm-year observations (<0.02%) have changed provinces across the years. We thus do not think migration would be a big concern and delete those firms for a cleaner interpretation of our results. Multiple establishments might also affect the results if a firm has establishments in both the treatment and control regions. However, this potentially causes a downward bias to our estimates.

Heilongjiang is one of the largest industrial bases in China. The industrial value added in Heilongjiang is 47% of the total value added across all sectors, which outweighs the industrial share of 41% in China (Table A2). The large-scale manufacturing firms contribute 20% to 35% of the total GDP in China from 2002 to 2006. In Heilongjiang and the inland provinces, the average share of the large-scale firms' output in the province's GDP is between 8% and 13%.

Table 1 provides some descriptive statistics. We can see that Heilongjiang's economy is relatively closed. From Panel A in Table 1, only 4% of Heilongjiang manufacturing firms are foreign firms, while 19% of manufacturing firms in the coastal regions are foreign. Also, fewer than 9% of all the Heilongjiang firms are export-oriented while close to 40% of the coastal firms are export-oriented. In addition, there is a large public sector in Heilongjiang where 42% of the firms are state-owned compared to 17% in the coastal area. In addition, Heilongjiang has slightly lower entry rate and higher exit rate compared to the coastal China. As shown in Panel B, Heilongjiang firms have lower labor productivity compared to other inland firms and the coastal firms. Heilongjiang firms also have lower value-added and sales and larger employment and fixed assets.

Table 1 shows that Heilongjiang province and Heilongjiang firms are relatively similar to the other inland provinces but are very different from the coastal areas of China. Therefore, we use 19 inland provinces as the control group in our main analysis.

Our estimation strategy relies on difference-in-difference comparisons of firms in Heilongjiang and other inland provinces before and after the crackdown. To address the common trend assumption, we test directly for pre-existing trends in the robustness check section (section III.C). In addition, we construct a continuous measure of treatment intensity at the city-level to further address the concerns of potential unparallel trends between the treated and control provinces and concurrent events around the treatment periods. Third, we perform a difference-in-difference estimation on a matched sample for the analysis of labor productivity.¹⁷

¹⁷ Using the nearest-neighbor matching algorithm in Abadie et al. (2004), for each Heilongjiang firm in 2004, we draw five matches from the inland provinces based on industry, assets, employees, and sales.

Another empirical challenge in our estimation is to obtain the correct standard errors. As we only have a small number of clusters at the province level (20 in total), we bootstrap standard errors at the province level using the wild cluster bootstrap approach following Cameron, Gelbach, and Miller (2008) and Cameron and Miller (2015). The wild cluster bootstrap approach accounts for over-rejection of the null hypothesis when there is a small number of clusters. In Appendix A, we also report the results using the standard clusters at the province level.¹⁸

III. The Effect of the Corruption Crackdown on Firm Performance

A. Labor Productivity

To estimate the effect of the crackdown on firm productivity, we consider the following specification to utilize the panel data structure:

$$(1) \quad Y_{it} = \beta_1 Hei_i \times Post2004_t + \beta_2 Post2004_t + \beta_4 X_{it} \\ + \alpha_i + \tau_t + \lambda_j + \epsilon_{it},$$

where Y_{it} is firm i 's labor productivity in year t . We define labor productivity as the log of real value added per employee.¹⁹ $Post2004_t$ is an indicator that equals to one if the year is after 2004; X_{it} is a vector of controls including the firm's ownership type and log total sales in year t ; α_i is time-invariant firm characteristics; τ_t is a time trend; λ_j are industry dummies.

Since the wild cluster bootstrap approach is not compatible with panel data (Cameron and Miller, 2015), we first run a standard difference-in-difference specification treating our data as repeated cross sections by adding province dummies in equation (1).

The results are qualitatively unchanged compared to the results in Table 2. See Table A3 for details using the matched sample. Other studies that use this method include Matsa and Miller (2013).

¹⁸ The city-level treatment also addresses the small-number-of-clusters concern. We bootstrap our standard errors to correct for serial correlations in a panel setting following Bertrand and Duflo (2004) in the city-level analysis.

¹⁹ As this measure of labor productivity may pick up changes in capital investment, we also use two other control function approaches to compute total factor productivity: the OP method (Oley and Pakes, 1996) (at 10% and 5% depreciation) and the LP method (Levinsohn and Petrin, 2003). Appendix B provides more details on the two estimation strategies for total factor productivity. See Tables A4 for results using the OP and the LP methods. The results are qualitatively unchanged compared to the results using the simple labor productivity measure. We thus adopt the most straightforward measure of productivity. Other studies that use this productivity measure include Bernard et al. (2003) and Klapper et al. (2006).

To take advantage of the panel data structure and include firm-fixed effects, we then estimate equation (1) using demeaned data with the wild cluster bootstrap approach. The results are reported in Table 2. The demeaned estimators in columns 2 and 4 are comparable with the fixed-effect estimators in Table A5 using standard clustering approach at the province level.

We start with the effect of the corruption crackdown on all firms in columns 1 and 2. From column 1, labor productivity declined by 11% among Heilongjiang firms after 2004 relative to changes in productivity in firms in other inland provinces during the same period ($p < 0.1$). In column 2, after controlling for firm's time-invariant characteristics by demeaning the data, the point estimate becomes -0.166 and is statistically significant at one percent level. That is, labor productivity declined by a substantial 17% among Heilongjiang firms after 2004 compared to changes in productivity among firms in other provinces.

Columns 3 and 4 look at the impact of the crackdown on existing firms. We define existing firms as those enter before 2004 and exit after 2004 so that the firms are in the sample for at least three years. Again, we find a substantial adverse effect of the crackdown on the existing firms' labor productivity. To be specific, column 4 shows that firms in Heilongjiang after the crackdown have on average a 16% lower productivity compared to firms in other inland provinces. This effect is significant at one percent level.

To estimate the impact of the crackdown on firms' productivity among the newly entering firms, we estimate an equation that is slightly different from equation (1) by adding province dummies as we do not have panel data structure for firms in their entering year. To be specific, we consider the following specification:

$$(2) \quad Y_{it} = \beta_1 Hei_i \times Post2004_t + \beta_2 Post2004_t + \beta_3 X_{it} \\ + \gamma_s + \tau_t + \lambda_j + \epsilon_{it},$$

where γ_s is the province dummies.

The results are reported in columns 5 of Table 2. We find that newly entering firms in Heilongjiang after the crackdown had a 10% lower productivity compared to the productivity change in other inland provinces.

We next examine whether the corruption crackdown affects all types of firms (differ by ownership types) uniformly. Marketization in China and the privatization of state-owned enterprises (SOEs) make it challenging to define firms' ownership types. To complicate things even further, private firms, on the other hand, may seek government umbrella due to economic stringencies especially during corruption crackdowns. We thus use the classification adopted by Guariglia et al. (2011) that based on the majority share of paid-in-capital to define ownership types.²⁰ In our sample, 75,584 firms have one or more ownership type changes during the sampling period, which accounts for 7% of the firm-year observations. We thus exclude firms with ownership changes from our sample in analyses pertinent to ownership types.²¹

In Table 3, we re-estimate equations (1) and (2) for private, state-owned (i.e., the SOE), and foreign firms separately. We find that the negative impact of the crackdown was mainly borne by private and foreign firms. In particular, the existing private firms in Heilongjiang after the crackdown experienced a decline in labor productivity close to 20% (column 2) relative to firms in other provinces. The decrease in labor productivity among existing foreign firms amounts to a substantial 28% (column 8). Both estimates are statistically significant at one percent level. In contrast, the crackdown had no impact on the SOEs' labor productivity. The point estimators for the existing SOEs are even positive (column 5). When we look at firms in their entering years in columns 3, 6, and 9, we again

²⁰ There are six categories of ownership types: state-owned, collective investors, private legal entities, private individuals, foreign-owned, Hong Kong-Macao-Taiwan (HKMT) owned. We further combine state-owned and collective investors as state-owned firms; private legal entities and individuals as private firms; foreign and HKMT owned as foreign firms. Other studies using paid-in-capital to classify ownership types include Ayyagari et al. (2010) and Dollar and Wei (2007).

²¹ Table A6 reports the effect of the crackdown on firms' ownership changes. After the crackdown, the SOE reforms did not slowdown in Heilongjiang (column 1). Interestingly, there was an increase in private to state-owned conversion after the crackdown (column 2), which might occur if firms respond to the crackdown by seeking government umbrella for future political turmoil. Overall, the crackdown increases ownership type changes of all kinds in Heilongjiang (column 3). However, we do not find any difference in the type changing rate between Heilongjiang and the inland provinces before the crackdown (not reported).

find a strong negative impact of the crackdown on entering private and foreign firms' labor productivity with a 13% lower productivity for private firms (column 3) and a 32% lower productivity for foreign firms (column 9). In contrast, the entering SOEs' productivity in Heilongjiang did not change differently from the SOEs in other provinces (column 6).

In summary, we find a substantial negative impact of the corruption crackdown on firms' labor productivity both among the existing firms and the newly entering firms. However, those negative impacts are mainly born by non-state-owned firms.

B. Entry and Exit

In the previous subsection, we examined the effect of the crackdown on firms' labor productivity at the intensive margin. We now turn our focus to firms' entry and exit at the extensive margin as the crackdown may work on firms' production and entry/exit quite differently. Following Klapper et al. (2006), we calculate entry and exit rates at four-digit industry levels. There are 754 four-digit industries in our sample.

We estimate equation (2) using province-year-industry-level entry or exit rates as dependent variables, and we control for cell-level average log sales, a time trend, and province dummies. The results are reported in Table 4. In particular, Heilongjiang industries experienced a 0.027 lower entry rate compared to industries in other provinces (column 1). This number accounts for 16% of the mean entry rate. On the other hand, the crackdown has no impact on firm exits (column 2) in Heilongjiang relative to firms in other provinces.

When we break up our sample by firms' ownership types, we find that only private and foreign firms experienced declines in entry rate by 0.072 and 0.037, respectively. The crackdown even increases state-owned firms' entry rate in Heilongjiang.²²

Firms' entry decisions are mainly affected by entry costs and expected returns. We examine the impact of the crackdown on firms' entry costs in Table 5. If the

²² We find no impact of the crackdown on private firms' and SOEs' exits and positive impact on foreign firms' exits (i.e., decreases exits). The result is available upon request.

crackdown increases entry costs, only large firms can enter and thus we should see an increase in firm size. From Panel B, we can see that the entry barriers for the SOEs are higher in all measures. Newly entering firms' value-added and employment increased by 48% and 35%, respectively, while their sales and assets increased by a substantial 72% and 85%, respectively. We observe some moderate increases in sales and employment among private firms and an increase in assets among foreign firms in Heilongjiang. These patterns suggest that the entry barriers are higher after the crackdown, which may be due to the removal of the grease-of-the-wheels effect of corruption in a corrupt economy.

C. Robustness Checks

Pre-existing trend. The validity of our difference-in-difference estimator relies on the assumption that firms in Heilongjiang and those in other inland provinces follow a common trend. To test if there are pre-existing trends, we create placebo treatments in every year from 1999 to 2007 by interacting the indicator for Heilongjiang province with a year dummy. We plot the coefficients with confidence intervals from the wild cluster bootstrapping on demeaned data in Figure 2 and report the estimations in Table 6. Overall, we find no pre-trend before 2004 in firms' labor productivity. We address the issues with entry further in two subsections below.

Treatment intensity. The evidence that we have provided so far is based on one treatment group (i.e., Heilongjiang province) and a single event. This setup is sensitive to concurrent events in Heilongjiang around 2004. To further assess the effectiveness of our treatment (i.e., a corruption crackdown), we look into archival data and news reports in Chinese to identify the number of removed officials in each city in Heilongjiang during the crackdown. We first identify officials removed from city-level positions. For provincial-level officials, we assign them to the city from where they were promoted or born, since previous work experience and hometown connections are proven as good proxies of political connections (Fisman et al 2018). We assigned 36 affected officials to 12 cities (out of 14) in Heilongjiang to construct a continuous measure of city-level treatment

intensity from the corruption crackdown. Unaffected cities in Heilongjiang and in other control provinces are treated as if there were no officials removed. This measure avoids the problem of a small number of clusters in the province-level DID design as well as potential bias caused by concurrent events in Heilongjiang around 2004. It also addresses the concern of political purge as discussed in footnote 13. In particular, it is unlikely that the Han's opponent can target Han's networks in each city so precise that the number of Han's people removed perfectly matches the level of economic distress (measured as lower firm productivity) that we observed in the data. The results are reported in Table 7. From columns 1 and 5, existing private (foreign) firms in treated cities experience an 8.3% (8.5%) decrease in labor productivity with one more corrupted official removed. On the other hand, the SOEs are totally immune to the number of officials removed, which is consistent with our findings at the province level.

Entry measures. Another potential issue that may bias our results is the definition of entry. Our database contains SOEs of all sizes but only non-SOEs with annual sales higher than five million RMB. Using firms' in-sample entry and exit as measures of firm dynamics can be problematic since the negative impact of the crackdown on private and foreign firms' entry can occur if the crackdown prevents small non-state firms from growing large enough (in sales) to be included in our sample. That is, the entry dynamics that we observe might only reflect the dynamics of firm sales.

We address this issue from several angles. First, given that small-scale firms are not observable, we examine the effect of the crackdown on existing firms' sales. Table A10 shows that the crackdown has a negative impact on existing firms' sales. If we assume that the unobserved small-scale firms follow the same trend, we might observe fewer "newly entering firms" because the small-scale firms were not big enough to be included in our sample. However, we find more SOEs enter even though the crackdown reduces existing SOEs' size, which cannot be completely explained by sample selection bias. Second, we apply the same five-million size threshold to all the firms by excluding all SOEs with annual sales of less than 5 million. The results are reported in Table A11.

We find that private firms' entry rate decreases and SOEs' entry rate increases in Heilongjiang after the crackdown, which is consistent with our findings in Table 3 when using the full sample. We also re-estimate the effect on labor productivity while applying the five-million cutoff to all firms. The results are reported in Table A12. We find consistent results that the crackdown reduces private and foreign firms' productivity in Heilongjiang, but has no impact on SOEs' productivity. Nevertheless, we cannot rule out the possibility that the entry dynamics that we observe result from sample selections. We thus should interpret the results on entry and entry barriers with caution.

IV. Mechanism

A. *Political Connection: Personal vs. Institutional*

The above evidence on productivity and entry, especially the heterogeneous effects of the corruption crackdown on private, foreign, and the state-owned firms, points to the important role of political connections in a corrupt economy. As we discussed in the introduction, there are two types of political connections: personal connections and institutional connections. Personal connections are those ties with individual officials formed through former employment, kinship, clannism, bribing activities, etc. Institutional connections are formed through government ownership, with which the SOEs are endowed.

To explore whether and how political connections play important roles in explaining our empirical findings, we manually collect data on private firms' (personal) connections using their top leaders' employment history. To be specific, we have searched all private firm in Heilongjiang before 2004 (675 firms) by firm name and legal person's name using the National Enterprise Credit Information Publicity System and identified 2,707 top managers or shareholders of the firms.²³ We then searched each manager's CV on Baidu (the Chinese search engine) and Google to determine their

²³ Note that we are unable to identify private firms with missing information on legal persons as there are multiple firms with the same name. In Table A13, we present sample level comparisons for the key variables between the searchable firms (i.e., private firms in Heilongjiang with legal persons' names) versus non-searchable firms (private firms in Heilongjiang without legal persons). The searchable firms are larger in size but not different from the non-searchable firms in terms of labor productivity and profitability.

employment histories.²⁴ A firm is considered politically connected if at least one of its top managers once worked in government administrative positions (e.g., mayors or party secretaries), legislative positions in the National People's Congress (NPC) or the Chinese People's Political Consultative Conference (CPPCC), state-affiliated associations, or state-owned enterprises.

In Table 8, we first compare connected and unconnected private firms with SOEs in Heilongjiang (column 1). We find that connected firms experience a statistically significant 26% lower productivity relative to the SOEs after the crackdown, while unconnected private firms do not perform differently compared to the SOEs. When we examine the strength of different types of private connections relative to the institutional connections that the SOEs are endowed with in column 2, we find that private firms with top managers once worked in government administrative positions, the NPC, the CPPCC, or the state-affiliated associations are intact. But private firms with top managers who once worked in SOEs (hereafter, enterprise connections) have substantial 36% lower productivity relative to the (current) SOEs. When we repeat the analysis in columns 3 and 4 including all private firms in Heilongjiang, we find consistent results compared to the results in columns 1 and 2. To be specific, connected private firms experience a 21% decrease in productivity relative to the SOEs after the crackdown with a 31% decrease in productivity felt by private firms with enterprise connections.

The findings in Table 8 provide direct evidence to our argument that anticorruption measures negatively influence firm outcomes through the breakup of political connections. As discussed in the introduction, although not all connected firms are corrupt, a corruption crackdown will affect the connected firms as long as some of the political connections involves illegal exchanges (e.g., bribes, kickbacks, etc.) because it removes some officials and deters others' corrupt behavior. Furthermore, the institutional ties through government ownership tend to be more resilient than personal ties in the event of a corruption crackdown. One potential reason is that the state ownership connects

²⁴ Since very few firms in our database are publicly listed, their managers' CV information is very difficult to obtain. However, potential measurement errors on firms' connections should bias our estimates towards zero. The fact that we still find significant results in our sample is reassuring.

SOEs to the government regardless of who assumes the office. The state-owned firms are always protected as they literally belong to the government and are important source of government revenue and social welfare. But private and foreign firms *on average* may lose the favor from the government as their personal connections to the government may be removed or, if not removed, hesitate to deliver favor during this sensitive time. As a result, a crackdown on corrupt officials is likely to weaken the connections formed through personal ties but not the connections formed through institutional ties.

In addition, the fact that private firms with enterprise connections suffer the most relative to SOEs and firms with other types of private connections suggests that enterprise connections are more prone to corruption crackdown. There are two plausible explanations. First, enterprise connections are by nature weak since the firm does not directly connect to the local government but indirectly connected through former state enterprises. On the other hand, as shown in Fisman and Wang (2014), this type of connection is likely built through corruption, which are more prone to corruption crackdowns. Since we cannot observe which official the firms are connected to nor the bribing activities given that these are not high-profile firms, we are unable to disentangle these two channels.

Since the institutional ties to the government are more resilient during a corruption crackdown, it is not surprising to find that the SOEs are intact while the non-SOEs suffer significantly in labor productivity and entry. Had political connections not played a role, we would have observed fewer entries of the SOEs in Heilongjiang given that the entry barrier is higher after the crackdown. The fact that more SOEs enter suggests that the SOEs are well connected or at least they can rebuild their connections more easily.

B. Corruption Crackdown, Leverage, and Land Resource

We now explore in more detail how political connections (and the broken of such) affect firms' productivity. Productivity measures a firm's efficiency of organizing production using various resources. When the market institution is not perfect, firms rely on political connections to obtain production resources, especially land (Chen and Kung,

2018) and bank loans (Charumilind et al., 2006). Therefore, when political connections are broken, firms have limited access to production resources and thus tend to be less productive. We provide two additional pieces of evidence to support our argument.

First, we examine firms' financial performance in Table 9. We can see that existing private firms' profitability is negatively affected by the crackdown (column 1), which is consistent with a lower labor productivity and entry rate. However, foreign firms in Heilongjiang seem to be more profitable after the crackdown despite that their labor productivity decreases. In terms of leverage, private firms, both existing and new, have an increase in their leverage (columns 3 and 4). However, this increase in leverage is mainly from increases in debt since private firms' assets do not change significantly as shown in Table A9. Furthermore, the increases in debt is from an increase in short-term debt. As established in Flannery (1986) and He and Xiong (2012), long-run debt is usually preferred to short-run debt due to a lower credit risk. This suggests that private firms may run into some borrowing hurdles after the crackdown of corruption, which is probably because the connections to their government guarantors are broken. This finding is consistent with previous studies showing that politically connected firms have better access to bank loans (Charumilind et al., 2006; Khawaja and Mian, 2005, Claessens et al., 2008). Our results are also consistent with Fan et. al. (2008)'s findings on leverage and debt using the CSMAR database on listed firms to examine the impact of announced anti-corruption investigations on connected listed firms' financial performance.

Second, in Table 10 we provide evidence on land transactions in Heilongjiang from 2003 to 2011. Existing literature shows that Chinese local leaders use negotiated land transfer, often at discounted price, to attract more investment to their jurisdiction to stimulate local economic growth and employment (e.g. Tao et al 2010; Jin and Xu, 2019). Negotiated land transfers are used to distribute industrial land (*gongye yongdi*) as opposed to commercial land (*shangzhu yongdi*), whereas the latter is usually sold through auction, bid, and listing at (much higher) market price. Thus, we use the ratio of negotiated land sales to auction/bid/listing sales to measure land resource provision for industry use at the city level. We find that the corruption crackdown significantly reduces

the government provision of cheap industrial lands through negotiations in Heilongjiang after the crackdown, and the result is robust when adding controls such as Foreign Direct Investments (FDI), industrial structure (measured as the industry sector share of GDP), fixed asset investment, and real estate investment. Insufficient production resources (e.g., land) may contribute to a lower productivity in Heilongjiang after the crackdown. Private firms may suffer more due to the fact that their access to land depends on their connections to the government that are likely broken after the crackdown. SOEs are intact as they do not rely on personal connections to obtain production resources.

C. Perception of Corruption

Another factor that may deter firms' entry is the perceived levels of local corruption. Although we do not observe perceptions of corruption in our database, we construct a proxy for perceived corruption in Heilongjiang versus in the control regions by utilizing the Chinese General Social Survey (CGSS) in 2003 and 2005. The CGSS asks the question: "*in the past ten years, which group of people do you think benefit the most?*" One of the choices is "government officials". We use this choice as a proxy for individuals' perception of corruption. If more people think that government officials benefit the most, it means the perceived corruption is high. The results are rather interesting. From Table 11, we can see that individuals in both the private and public sectors in Heilongjiang feel that the level of corruption is higher after the crackdown relative to individuals in other provinces. One plausible explanation is that the crackdown in Heilongjiang reveals rampant corruption (more than 100 officials were affected and the total amount taken by Han amounts to 1.5 million USD) that people were not aware of before the crackdown. This finding is consistent with a growing literature on the unintended consequences of anti-corruption campaigns (Wang and Dickson, 2017). If firms, particularly private firms, perceive an (unexpectedly) high corruption in Heilongjiang, they might choose not to enter the market.

V. Alternative Explanations?

In this section, we discuss other possible explanations for our findings. The first possible explanation for the reduction in labor productivity is dysfunctions of the local government or a rise in political uncertainties in Heilongjiang after the crackdown. We find these explanations unlikely for the following reasons. First, if governments were worse functioning, the state-owned firms should have performed worse than the non-state-owned firms since the state-owned firms are heavily handicapped by the government. We find the opposite, however, that the state-owned firms fare better after the crackdown in terms of labor productivity and entry. Second, we find no evidence that existing firms are facing higher political uncertainty, as there is no decline in their capital intensity conditional on the firm's employment. In Table 12, we can see that the existing private firms' capital intensity does not change after the crackdown while SOEs and the foreign firms' capital intensities even increase after the crackdown (columns 1 and 3 through 6), which suggests that there is an increase (or at least non-decreasing) in capital deepening among Heilongjiang firms after the crackdown. This is unlikely to happen if firms perceive a higher degree of political uncertainty. We do, however, find certain degree of uncertainty faced by new private firms such that the crackdown decreases the capital intensity (column 2).

The second possible mechanism is that Heilongjiang firms are affected by China's entry to the WTO. One can argue that compared with private firms in other provinces, private firms in Heilongjiang have less access to free market so that they are worse off. We are less concerned about this mechanism for several reasons. First, China joined the WTO in December 2001. The literature (e.g., David et al., 2013; Brandt et al., 2017) considers 2002 as the post-treatment year for the analysis of the WTO effect, which is two years prior to the crackdown in Heilongjiang. As shown in the falsification test

(Figure 2), we do not see statistically significant differences between Heilongjiang and other provinces before 2005 in existing firms' labor productivity.

Second, in our analysis of political connections (Table 8), we use Heilongjiang firms only and look at different types of political connections. Thus, even if WTO influences Heilongjiang firms differently comparing with firms in other provinces, we still need the political connection argument to account for the differences across connected versus unconnected firms within Heilongjiang.

Third, our control group in the DID analysis has already excluded the export-oriented coastal provinces. One may suspect that entering the WTO would affect inland provinces differently compared to Heilongjiang in terms of firms' exporting behaviors and thus productivity. We test this conjecture directly in Table 13. We can see that from columns 2, 4, and 6, the crackdown in Heilongjiang does *not* make firms more likely to export. Also, the export intensity (export value over total sales) does not differ between Heilongjiang and other inland provinces before and after the crackdown among private and state-owned firms. If anything, the crackdown in Heilongjiang helped the foreign firms rather than hurting them. We thus do not consider the WTO a potential confounder to our proposed mechanism.

There are two other public and political events around the year 2004 in the Northeastern region that might affect our results. The first one is a pilot Value-added Tax Reform initiated by the central government on July 1, 2014. However, the Tax Reform applies to all three Northeastern provinces. We have repeated our analyses using only three Northeastern provinces, and we still find a strong negative impact of the corruption crackdown on Heilongjiang firms' productivity and entry, especially among the private sector.²⁵ The second event is a series of nuclear tests in North Korea starting in October 2006. North Korea is a neighboring country to the Northeastern regions. These atomic

²⁵ See Online Appendix C for details.

tests might drive out businesses and reduce entry in this region. As North Korea is adjacent to Jilin and Liaoning, we should observe a stronger negative impact on Ji-Liao regions relatively to Heilongjiang, but we have found the opposite in our three-province analysis. Furthermore, the beginning of these nuclear tests is towards the end of our sampling period. We thus do not find this event particularly concerning.

VI. Conclusion

This paper studies a large-scale corruption crackdown in Heilongjiang province in China around 2004. This unexpected event allows us to identify the causal impacts of a corruption crackdown on firms' productivity and entry at sub-national levels. Using a comprehensive database on Chinese manufacturing firms, we compare Heilongjiang firms' performance before and after the crackdown to firms in other provinces. We find that the crackdown has a substantial negative impact on Heilongjiang firms' labor productivity and entry. More interestingly, the negative impact is mainly borne by private and foreign firms while the SOEs are intact. We attribute these different impacts across firm types to political connections as only connected private firms are affected negatively while unconnected firms do not behave differently from the SOEs. The corruption crackdown also increases entry barriers for all types of firms, suggesting that it removes the "grease of the wheels" that helps firms in weak market institutions. We examine our argument against alternative mechanisms. We find that the decrease in labor productivity and entry cannot be attributed to government dysfunction, political uncertainty, WTO entry, or other reforms and events around our treatment period. We thus conclude that cracking down on corruption in a corrupt region has a substantial adverse effect on the economy, at least in the short run. Our findings are best reconciled with the argument that the crackdown on corruption weakens firms' political connections and removes the "grease of the wheels" that help firms perform in weak market institutions.

The effect of the corruption crackdown on the actual levels of corruption remains ambiguous. Unfortunately, we do not have direct measures of corruption levels after the crackdown. In the short run, if there are no improvements in the institutional environment

(such as a better court), the crackdown may lead to more strict monitoring and less supply of corrupt officials, and thus may even increase the level of corruption since now only firms that can afford high bribes will pay to get things done. In addition, government officials would take the high risk of being caught only when the return to corruption were high enough. In this case, we would observe an increase in corruption after the crackdown down and a decrease in firms' productivity and entry. On the other hand, the crackdown may eliminate corruption defined as bribing opportunities. However, this may be detrimental to the firms if they cannot find a way around the red tapes in weak market institutions. Moreover, it is unlikely that one corruption crackdown can lower the corruption level by changing the norm on corruption.²⁶ Nevertheless, without considering firms' political connections, we find it hard to explain the different impacts of the crackdown on firms that differ by their ownership types.

Although our dataset prevents us from making inferences about long-term outcomes of anti-corruption measures, we find strong negative impacts of an anti-corruption effort on economic outcomes in the short-run (a three-year period). We contend that an abrupt and short-lived corruption crackdown is less likely to change social norms towards corruption because there are no institutional improvements to contain corrupt behaviors. Future work is needed to examine long-term consequences of anticorruption on firms' performances.

²⁶ There is a difference between the anti-corruption measure that we focus on in this paper – a corruption crackdown – and the large-scale and long-term anti-corruption campaign launched by the Chinese president Xi Jinping. Xi's anti-corruption campaign might be able to change the social norm toward corruption. This may be why previous studies on the Xi's anti-corruption campaign find positive responses from the stock market (e.g., Ding et al., 2017).

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Fig. 1 Heilongjiang Province and Other Inland Regions in China

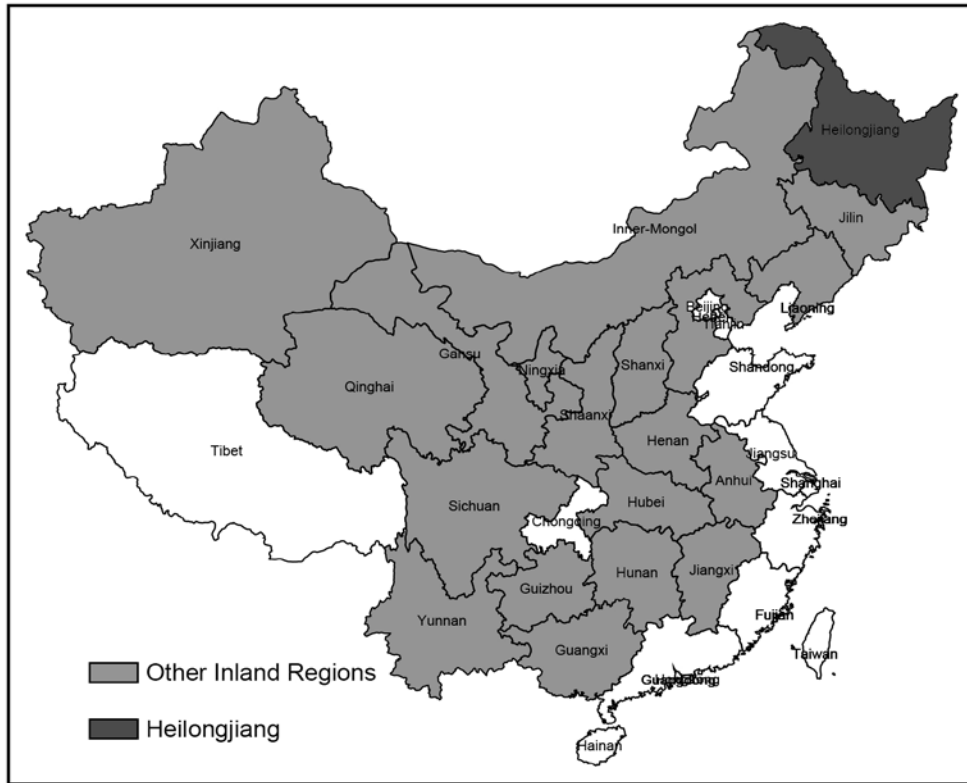
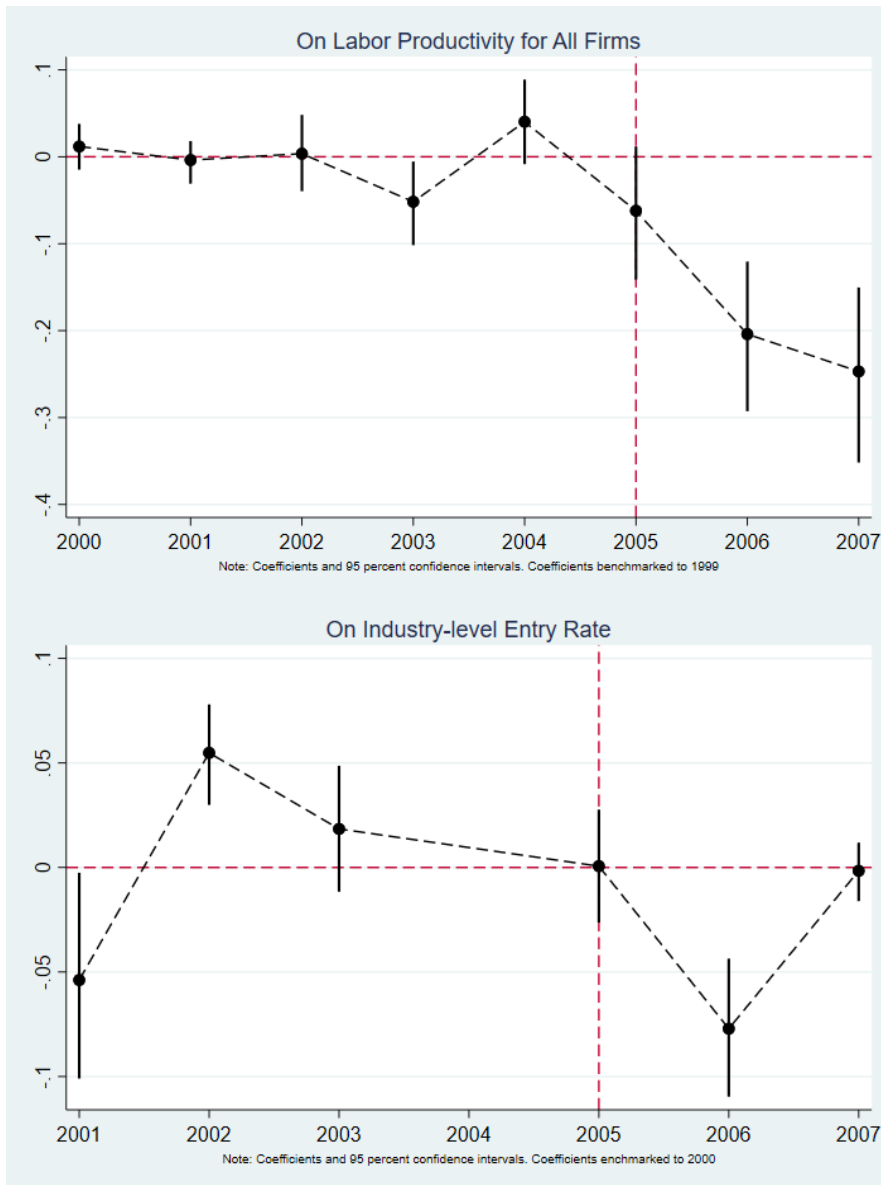


Fig 2. Pre-existing trends analysis



Note: Each graph represents coefficient from a regression of outcome variables on interactions of Heilongjiang with year dummies where 2004 is the outburst year. All estimates are benchmarked to effects in the beginning year. Standard errors are clustered at the province level using the wild cluster bootstrap method.

Table 1. Summary Statistics

| | <u>Heilongjiang</u> | <u>Inland (control) Regions</u> | <u>Coastal China</u> |
|--|---------------------|---------------------------------|----------------------|
| <u>A. Provincial-level Characteristics</u> | | | |
| Total Number of Manuf. Firms | 4,267 | 129,345 | 254,435 |
| % Agricultural product | 15.4% | 10.0% | 4.3% |
| % Heavy machinery | 23.9% | 25.3% | 34.9% |
| % Private firms | 54.6% | 62.1% | 64.2% |
| % State-owned Enterprises | 41.5% | 33.4% | 17.1% |
| % Foreign firms | 3.9% | 4.5% | 18.7% |
| % Export-oriented firms | 8.6% | 19.5% | 39.1% |
| Entry Rate | 18.8% | 20.2% | 19.4% |
| Exit Rate | 15.3% | 14.6% | 12.5% |
| <u>B. Firm-level Characteristics</u> | | | |
| Labor Productivity (log) | 3.42 | 3.64 | 3.77 |
| Employment (in 1,000) | 373.75 | 315.98 | 244.15 |
| Sales (in 1,000RMB) | 67,591.19 | 66,073.43 | 69,411.61 |
| Fixed assets (in 1,000RMB) | 32,538.16 | 27,639.03 | 18,272.16 |
| Value added (in 1,000RMB) | 17,377.73 | 20,455.97 | 17,198.13 |

Note: Inland (control) regions include the following 19 provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shanxi, Gansu, Qinghai, Ningxia, Xinjiang. Entry rates are averaged over the years 2000 to 2007. Exit rates are averaged over the years 1999 to 2006. Provincial FDI are from the Wind database (<http://www.wind.com.cn/en/>). Data on population are from China Statistical Yearbook from 2002 to 2007. All monetary values are deflated to 1999 RMB.

Table 2. The effect of a corruption crackdown on firm's labor productivity

| | All firms | | Existing firms | | New Firms |
|--------------------------|-----------|------------|----------------|------------|-----------|
| | (1) | (2) Demean | (3) | (4) Demean | (5) |
| Heilongjiang X After2004 | -0.106* | -0.166*** | -0.142*** | -0.158*** | -0.098* |
| | (0.057) | (0.059) | (0.051) | (0.056) | (0.058) |
| After2004 | 0.815*** | 0.651*** | 0.707*** | 0.727*** | 0.673*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Province Fixed Effect | X | | X | | X |
| Year Fixed Effect | X | X | X | X | X |
| Industry Fixed Effect | X | X | X | X | X |
| Firm characteristics | X | X | X | X | X |
| Observations | 489,729 | 489,729 | 222,643 | 222,643 | 88,389 |
| Number of firms | 132,854 | 132,854 | 36,654 | 36,654 | 88,389 |
| R ² | 0.261 | 0.168 | 0.224 | 0.205 | 0.147 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shannxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered at province and firm levels in columns (1), (3), and (5) and at province level in columns (2) and (4). Standard errors are bootstrapped at the province level using the wild cluster bootstrap method. Samples in columns (2) and (4) are demeaned to capture the panel data structure in the original data set. The samples in columns (1) and (2) include all large-scale manufacturing firms from years 1999 to 2007. The samples in columns (3) and (4) include firms that enter before 2004 and exit after 2004. The sample in column (5) includes firms in their entering year after 1999. Firm characteristics include firm's ownership type (i.e., private, state, or foreign owned) and assets (log).

*** p<0.01, ** p<0.05, * p<0.1

Table 3. The effect of a corruption crackdown on firm's labor productivity by firm's ownership types

| | Private | | | State | | | Foreign | | |
|----------------------------|----------------------|----------------------|---------------------|---------------------|---------------------|---------------------|----------------------|----------------------|----------------------|
| | Existing firms | | New firms | Existing firms | | New firms | Existing firms | | New firms |
| | (1) | (2) Demean | (3) | (4) | (5) Demean | (6) | (7) | (8) Demean | (9) |
| Heilongjiang X After2004 | -0.202*** (0.072) | -0.199*** (0.071) | -0.125* (0.065) | -0.018 (0.038) | 0.027 (0.061) | 0.095 (0.074) | -0.214*** (0.076) | -0.277*** (0.099) | -0.320*** (0.114) |
| After2004 | 0.760*** (0.000) | 0.782*** (0.000) | 0.567*** (0.000) | 0.727*** (0.000) | 0.620*** (0.000) | 1.086*** (0.000) | 0.408*** (0.000) | 0.527*** (0.000) | 0.205** (0.088) |
| Mean of dependent variable | | 3.96 | 3.71 | | 3.10 | 2.75 | | 4.22 | 3.81 |
| Province Fixed Effect | X | | X | X | | X | X | | X |
| Year Fixed Effect | X | X | X | X | X | X | X | X | X |
| Industry Fixed Effect | X | X | X | X | X | X | X | X | X |
| Firm Characteristics | X | X | X | X | X | X | X | X | X |
| Observations | 96,877 | 96,877 | 62,800 | 30,709 | 30,709 | 9,121 | 9,268 | 9,268 | 3,109 |
| Number of Firms | 17,281 | 17,281 | 62,800 | 4,815 | 4,815 | 9,121 | 1,507 | 1,507 | 3,109 |
| R ² | 0.203 | 0.240 | 0.129 | 0.191 | 0.137 | 0.189 | 0.243 | 0.108 | 0.178 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shanxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered at province and firm levels in columns (1), (4), and (7) and at province level in columns (2), (3), (5), (6), (8), and (9). Standard errors are bootstrapped at province level using the wild cluster bootstrap method. Samples in columns (2), (5), (8) are demeaned to capture the panel data structure in the original data set. Samples restricted to firms with no ownership changes during their sampling periods. The samples in columns (1), (2), (4), (5), (7) and (8) include firms enter before 2004 and exit after 2004. The samples in columns (3), (6), and (9) include firms in their entering year after 1999. Firm characteristics include assets (log).

*** p<0.01, ** p<0.05, * p<0.1

Table 4. The effect of a corruption crackdown on firm entry and exit

| | Entry | Exit | Entry by Firm Type | | |
|--------------------------|----------------------|---------------------|----------------------|----------------------|----------------------|
| | All (1) | All (2) | Private (3) | State (4) | Foreign (5) |
| Heilongjiang X After2004 | -0.027*** (0.010) | -0.003 (0.008) | -0.072*** (0.026) | 0.014* (0.009) | -0.037*** (0.013) |
| After2004 | -0.003 (0.024) | 0.063*** (0.000) | -0.046** (0.020) | -0.048*** (0.017) | -0.039 (0.029) |
| Mean of dependent var. | 0.173 | 0.157 | 0.261 | 0.110 | 0.192 |
| Province Fixed Effect | X | X | X | X | X |
| Year Fixed effect | X | X | X | X | X |
| Firm characteristics | X | X | X | X | X |
| Observations | 41,669 | 41,679 | 29,531 | 22,378 | 7,348 |
| R ² | 0.094 | 0.078 | 0.154 | 0.042 | 0.083 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shannxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered and bootstrapped at province level using the wild cluster bootstrap method. Entry and exit rates are calculated for each year-province-industry (four-digit)-ownership type cell. Firm characteristics include cell-level average log assets. Entry year is defined as the first year in sample after the year 1999. Exit year is defined as the last year in sample before the year 2007. Data in 2004 are excluded. Samples in columns (3), (4), and (5) are restricted to firms with no ownership changes during their sampling years.

*** p<0.01, ** p<0.05, * p<0.1

Table 5. The effect of a corruption crackdown on new firms' size by firm's ownership type

| | Log(sale) (1) | Log(vad) (2) | Log (asset) (3) | Log(labor) (4) |
|--------------------------|---------------------|---------------------|---------------------|----------------------|
| Panel A: Private firms | | | | |
| Heilongjiang X After2004 | 0.134* (0.072) | -0.022 (0.090) | -0.027 (0.057) | 0.103** (0.046) |
| After2004 | 0.209* (0.115) | 0.220** (0.094) | 0.265** (0.132) | -0.349*** (0.124) |
| Observations | 65,163 | 62,800 | 65,163 | 65,163 |
| R ² | 0.092 | 0.072 | 0.055 | 0.114 |
| Panel B: State Firms | | | | |
| Heilongjiang X After2004 | 0.704*** (0.000) | 0.470** (0.202) | 0.848*** (0.000) | 0.345* (0.187) |
| After2004 | 0.923*** (0.000) | 0.840*** (0.000) | 0.242 (0.241) | -0.278 (0.219) |
| Observations | 9,630 | 9,121 | 9,630 | 9,630 |
| R ² | 0.229 | 0.193 | 0.093 | 0.110 |
| Panel C: Foreign Firms | | | | |
| Heilongjiang X After2004 | 0.119 (0.113) | -0.141 (0.109) | 0.655*** (0.000) | 0.137 (0.107) |
| After2004 | -0.024 (0.292) | 0.036 (0.157) | -0.187 (0.270) | -0.160 (0.159) |
| Observations | 3,309 | 3,109 | 3,309 | 3,309 |
| R ² | 0.094 | 0.086 | 0.131 | 0.151 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shannxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered and bootstrapped at province level using the wild cluster bootstrap method. Each regression includes a time trend, province fixed effect, and industry fixed effect. Samples include firms in their entering year after 1999 with no ownership changes in their sampling years.

*** p<0.01, ** p<0.05, * p<0.1

Table 6. Pre-trend analysis with wild cluster bootstrap

| | On Labor Productivity | On Entry Rate |
|-----------------------|-----------------------|----------------------|
| | (1) | (2) |
| Heilongjiang X 2000 | 0.012 (0.016) | |
| Heilongjiang X 2001 | -0.004 (0.014) | -0.054* (0.028) |
| Heilongjiang X 2002 | 0.004 (0.014) | 0.055*** (0.000) |
| Heilongjiang X 2003 | -0.052* (0.030) | 0.018 (0.018) |
| Heilongjiang X 2004 | 0.040 (0.033) | |
| Heilongjiang X 2005 | -0.062 (0.050) | 0.001 (0.007) |
| Heilongjiang X 2006 | -0.204*** (0.073) | -0.077*** (0.027) |
| Heilongjiang X 2007 | -0.247*** (0.088) | -0.002 (0.007) |
| Year Fixed Effects | X | X |
| Province Fixed Effect | | X |
| Observations | 489,729 | 47,613 |
| R ² | 0.166 | 0.278 |

Note: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shanxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered and bootstrapped at province level using the wild cluster bootstrap method. Sample in columns (1) is demeaned to capture the panel data structure in the original data set. Entry rates are calculated for each year-province-industry (four-digit)-ownership type cell.

*** p<0.01, ** p<0.05, * p<0.1

Table 7. Number of arrested officials at the city level and firms' labor productivity by ownership type

| | Private | | State | | Foreign | |
|------------------------|----------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | Existing firms | New firms | Existing firms | New firms | Existing firms | New firms |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| N. Corrupt X After2004 | -0.083*** (0.020) | -0.025 (0.084) | 0.011 (0.023) | 0.064 (0.151) | -0.085** (0.038) | -0.102 (0.149) |
| After2004 | 1.216*** (0.038) | 1.401*** (0.066) | 0.991*** (0.045) | 1.410*** (0.119) | 0.799*** (0.069) | 0.790*** (0.251) |
| N. Corrupt | | 0.124 (0.082) | | -0.084 (0.150) | | 0.160 (0.308) |
| Firm Fixed Effect | X | | X | | X | |
| Province Fixed Effect | | X | | X | | X |
| Year Fixed Effect | X | X | X | X | X | X |
| Industry Fixed Effect | X | X | X | X | X | X |
| Firm Characteristics | X | X | X | X | X | X |
| Observations | 92,854 | 62,232 | 28,266 | 9,011 | 9,003 | 3,093 |
| Number of Firms | 16,673 | 62,232 | 4,465 | 9,011 | 1,471 | 3,093 |
| R ² | 0.241 | 0.130 | 0.140 | 0.188 | 0.108 | 0.183 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shanxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered and bootstrapped at city level. Samples restricted to firms with no ownership changes during their sampling periods. The samples in columns (1), (3), and (5) include firms enter before 2004 and exit after 2004. The samples in columns (2), (4), and (6) include firms in their entering year after 1999. Firm characteristics include log assets.

*** p<0.01, ** p<0.05, * p<0.1

Table 8. Productivity and Political connections in Heilongjiang: personal connections vs Institutional connections

| Dependent variable: Log Labor Productivity | Searchable firms | | All firms | |
|---|---------------------|---------------------|---------------------|---------------------|
| | (1) | (2) | (3) | (4) |
| POE Con X After2004 | -0.256** (0.126) | | -0.213* (0.118) | |
| POE Uncon X After2004 | -0.099 (0.078) | -0.099 (0.078) | 0.015 (0.042) | 0.014 (0.042) |
| POE Govt X After2004 | | 0.063 (0.134) | | 0.047 (0.114) |
| POE Renda X After2004 | | -0.048 (0.284) | | -0.015 (0.269) |
| POE Enterp X After2004 | | -0.362** (0.154) | | -0.307** (0.149) |
| After2004 | 1.018*** (0.079) | 1.019*** (0.079) | 0.961*** (0.055) | 0.961*** (0.055) |
| Year Fixed Effect | X | X | X | X |
| Industry Fixed Effect | X | X | X | X |
| Firm Characteristics | X | X | X | X |
| Observations | 5,779 | 5,779 | 15,187 | 15,187 |
| Number of num | 1,574 | 1,574 | 4,103 | 4,103 |
| R ² | 0.091 | 0.091 | 0.091 | 0.091 |

Notes: Samples in columns (1) and (2) include private firms with information on legal person and all state-owned firms in Heilongjiang from 1999 to 2007. Samples in (3) and (4) include all private and state-owned firms in Heilongjiang. Standard errors are clustered at firm level. POE Govt equals to 1 if at least one of the top leaders in a private firm used to hold government positions. POE Renda equals to 1 if at least one of the top leaders in a private firm used to hold positions in the People's Congress, the CPPCC, or any national non-government associations. POE Enterp equals to 1 if at least one of top leaders in a private firm used to work in an SOE. POE Con equals to 1 if a private firm has any of the aforementioned connections. POE Noncon equals to 1 if a private firm has none of the aforementioned connections. The omitted category is the State-owned Enterprises. Firm characteristics include assets (log).

*** p<0.01, ** p<0.05, * p<0.1

Table 9. The effect of a corruption crackdown on firms' financial performance by firm's ownership type

| | Log(Total Profit) | | Total Debt/Asset | | Short/Total Debt | |
|-------------------------------|-------------------|----------|------------------|-----------|------------------|----------|
| | (1) Existing | (2) New | (3) Existing | (4) New | (5) Existing | (6) New |
| Panel A: Private Firms | | | | | | |
| Heilongjiang X After2004 | -0.140* | -0.210 | 0.012*** | 0.049*** | 0.013 | 0.044*** |
| | (0.084) | (0.162) | (0.000) | (0.000) | (0.008) | (0.000) |
| After2004 | 0.921*** | 0.304* | -0.020** | -0.075*** | 0.017*** | 0.038*** |
| | (0.000) | (0.165) | (0.010) | (0.027) | (0.007) | (0.000) |
| Observations | 79,761 | 50,004 | 99,352 | 65,162 | 98,619 | 63,806 |
| Number of num | 16,758 | 50,004 | 17,284 | 65,162 | 17,261 | 63,806 |
| R ² | 0.137 | 0.069 | 0.002 | 0.038 | 0.002 | 0.024 |
| Panel B: State Firms | | | | | | |
| Heilongjiang X After2004 | -0.053 | -0.177 | -0.012 | -0.010 | 0.007 | 0.015 |
| | (0.054) | (0.213) | (0.010) | (0.020) | (0.005) | (0.010) |
| After2004 | 0.440*** | 0.805*** | 0.077*** | -0.098** | 0.030*** | 0.037** |
| | (0.000) | (0.000) | (0.000) | (0.040) | (0.000) | (0.015) |
| Observations | 19,363 | 5,868 | 32,460 | 9,629 | 32,371 | 9,533 |
| Number of Firms | 4,119 | 5,868 | 4,819 | 9,629 | 4,817 | 9,533 |
| R ² | 0.062 | 0.113 | 0.024 | 0.007 | 0.007 | 0.056 |
| Panel C: Foreign Firms | | | | | | |
| Heilongjiang X After2004 | 0.126* | 0.083 | 0.009 | -0.102*** | 0.053*** | 0.088*** |
| | (0.073) | (0.233) | (0.010) | (0.036) | (0.000) | (0.031) |
| After2004 | 0.573*** | -0.261 | -0.030 | -0.023* | 0.053*** | 0.009 |
| | (0.000) | (0.373) | (0.024) | (0.014) | (0.000) | (0.031) |
| Observations | 6,931 | 1,940 | 9,568 | 3,308 | 9,532 | 3,263 |
| Number of Firms | 1,448 | 1,940 | 1,507 | 3,308 | 1,507 | 3,263 |
| R ² | 0.044 | 0.093 | 0.011 | 0.038 | 0.019 | 0.030 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shanxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered at province and firm level in columns (1), (3), and (5) and are clustered at province level in columns (2), (4), and (6). Standard errors are bootstrapped at province level using the wild cluster bootstrap method. The samples in columns (1), (3), and (5) are demeaned to capture the panel data structure in the original dataset. Each regression includes a time trend and industry fixed effect. Columns (2), (4), and (6) also include province fixed effect. Samples in columns (1), (3), and (5) include firms enter before 2004 and exit after 2004 with no ownership changes in their sampling years. Samples in columns (2), (4), and (6) include firms in their entering year after 1999.

*** p<0.01, ** p<0.05, * p<0.1

Table 10 Industry land provision and corruption crackdown

| | (1) | (2) | (3) | (4) | (5) |
|--------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Heilongjiang X After2004 | -1.365*** (0.348) | -1.075*** (0.318) | -1.139*** (0.309) | -1.140*** (0.308) | -1.406*** (0.445) |
| After2004 | -3.964*** (1.100) | -0.994 (0.607) | -3.534*** (1.059) | -1.058 (0.726) | -0.777 (0.735) |
| Log GDP per Capita | 0.324 (1.288) | 0.228 (1.292) | 0.394 (1.248) | 0.360 (1.277) | 0.450 (1.233) |
| Log FDI | | -0.171** (0.0717) | -0.182** (0.0686) | -0.183** (0.0687) | -0.177** (0.0701) |
| Industry Share of GDP | | | -0.0208 (0.0155) | -0.0217 (0.0179) | -0.0204 (0.0164) |
| Log Investment | | | | 0.0564 (0.496) | |
| Log Real Estate | | | | | -0.627 (0.517) |
| Year Fixed Effect | X | X | X | X | X |
| Prefecture Fixed Effect | X | X | X | X | X |
| Constant | 0.959 (12.17) | 2.099 (12.20) | 1.589 (11.95) | 1.224 (12.28) | 7.983 (14.51) |
| Observations | 1,525 | 1,352 | 1,351 | 1,350 | 1,345 |
| Number of Prefecture | 205 | 204 | 204 | 204 | 204 |
| R-squared | 0.129 | 0.155 | 0.155 | 0.155 | 0.159 |

Note: Robust standard errors in parentheses. the Chinese Land and Resource Statistical Yearbooks 2003 to 2011.

*** p<0.01, ** p<0.05, * p<0.1

Table 11. The effect of a corruption crackdown on individuals' perceptions on corruption using wild cluster bootstrap, the CGSS 2003 and 2005

| | All individuals | Non-state Employees | State Employees |
|----------------------------|---------------------|------------------------|---------------------|
| | (1) | (2) | (3) |
| Heilongjiang X After2004 | 0.166*** (0.000) | 0.204*** (0.000) | 0.121*** (0.000) |
| After2004 | -0.063* (0.035) | -0.039 (0.050) | -0.035 (0.040) |
| Province Fixed Effect | X | X | X |
| Individual characteristics | X | X | X |
| Observations | 7,411 | 4,068 | 3,343 |
| R ² | 0.058 | 0.069 | 0.082 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 17 inland provinces where the CGSS is covering: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shanxi, Gansu, Xinjiang. Standard errors are clustered and bootstrapped at province level. Individual controls include gender, employment status (e.g., full-time or not), marital status, age, education attainment, income, and CCP affiliation. State employees are those who reported to work for the Central government or the state-owned agencies or enterprises.

*** p<0.01, ** p<0.05, * p<0.1

Table 12. The effect of a corruption crackdown on firms' capital intensity by firms' ownership types using wild cluster bootstrap

| | Private | | State | | Foreign | |
|--------------------------|---------------------|----------------------|---------------------|---------------------|--------------------|---------------------|
| | (1) Existing | (2) New | (3) Existing | (4) New | (5) Existing | (6) New |
| Heilongjiang X After2004 | -0.028 (0.022) | -0.188*** (0.073) | 0.120*** (0.043) | 0.389*** (0.000) | 0.127** (0.049) | 0.482*** (0.000) |
| After2004 | 0.590*** (0.000) | 0.492*** (0.000) | 0.443*** (0.000) | 0.445*** (0.000) | -0.028 (0.046) | -0.026 (0.518) |
| Province Fixed Effect | | X | | X | | X |
| Year Fixed Effect | X | X | X | X | X | X |
| Industry Fixed Effect | X | X | X | X | X | X |
| Observations | 98,747 | 64,525 | 32,346 | 9,490 | 9,540 | 3,287 |
| Number of firms | 17,281 | 64,525 | 4,819 | 9,490 | 1,507 | 3,287 |
| R ² | 0.111 | 0.086 | 0.087 | 0.074 | 0.008 | 0.230 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shanxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered at province and firm levels in columns (1), (3), and (5) and are clustered at province level in columns (2), (4), and (6). Standard errors are bootstrapped at province level using the wild cluster bootstrap method. The sample in columns (1), (3), and (5) are demeaned to capture the panel data structure in the original dataset. Samples restricted to firms with no ownership changes during their sampling periods. The sample in columns (1), (3), and (5) include firms enter before 2004 and exit after 2004. The sample in column (2), (4), and (6) include firms in their entering year after 1999.

*** p<0.01, ** p<0.05, * p<0.1

Table 13. Corruption crackdown and exporting behaviors

| | Private firms | | State-owned firms | | Foreign firms | |
|--------------------------|--------------------|-------------------|-------------------|-------------------|---------------------|---------------------|
| | (1) Intensity | (2) Dummy | (3) Intensity | (4) Dummy | (5) Intensity | (6) Dummy |
| Heilongjiang X After2004 | -0.003 (0.004) | -0.036 (0.085) | 0.000 (0.002) | -0.023 (0.086) | 0.040*** (0.000) | -0.007 (0.012) |
| After2004 | 0.019** (0.008) | 0.130* (0.078) | -0.004 (0.014) | 0.036 (0.214) | 0.034*** (0.000) | 0.090*** (0.000) |
| Observations | 255,546 | 255,546 | 97,130 | 97,130 | 17,233 | 17,233 |
| R ² | 0.006 | 0.036 | 0.003 | 0.009 | 0.022 | 0.038 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shanxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered at province and firm level and are bootstrapped at province level using the wild cluster bootstrap method. The samples are demeaned to capture the panel data structure in the original dataset. Each regression includes a time trend and industry fixed effect. Samples restricted to firms with no ownership changes during their sampling periods.

*** p<0.01, ** p<0.05, * p<0.1

APPENDIX A

Fig A1. Common Trend on Key Dependent and Control Variables

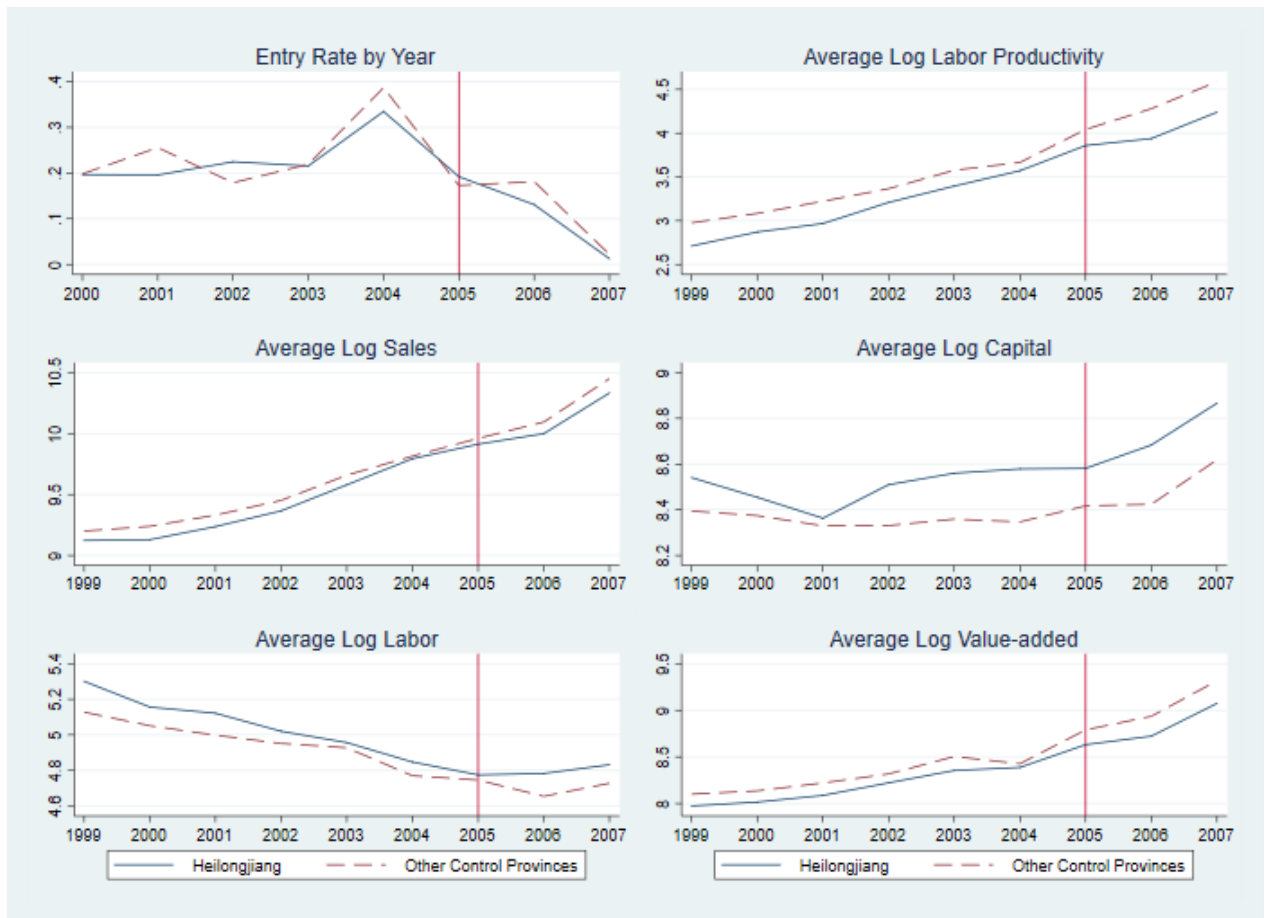


Table A1 Economic growth and anticorruption

| Dependent Var | (1) | (2) |
|-------------------------|----------|----------|
| <hr/> | | |
| N. of Officials removed | | |
| <hr/> | | |
| GDP per capital | 0.000 | |
| | (0.000) | |
| Log Labor Productivity | | 0.140 |
| | | (0.086) |
| Constant | 2.643*** | 4.437*** |
| | (0.720) | (0.327) |
| Observations | 12 | 1,652 |
| R-squared | 0.027 | 0.002 |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A2. Value Added by Industry in Treated and Control Regions (in 100 million RMB), 2002-2006 average

| Sectors | Heilongjiang | | Other Inland Regions | | China | |
|--|---------------|---------------|----------------------|---------------|-----------------|---------------|
| | Value-Added | % of total | Value-Added | % of total | Value-Added | % of total |
| Agriculture, forestry and fishing | 60.39 | 12.4% | 1271.80 | 16.1% | 2035.59 | 12.3% |
| Industry | 230.27 | 47.2% | 2977.76 | 37.7% | 6782.32 | 41.0% |
| Construction | 24.78 | 5.1% | 520.06 | 6.6% | 911.28 | 5.5% |
| Wholesale and retail trade | 40.31 | 8.3% | 680.19 | 8.6% | 1282.31 | 7.7% |
| Transportation, storage, and postal services | 32.36 | 6.6% | 584.51 | 7.4% | 951.41 | 5.7% |
| Accommodation and food service activities | 10.71 | 2.2% | 212.79 | 2.7% | 370.08 | 2.2% |
| Financial and insurance activities | 4.10 | 0.8% | 209.03 | 2.6% | 711.79 | 4.3% |
| Real estate activities | 14.83 | 3.0% | 261.77 | 3.3% | 751.60 | 4.5% |
| Other industries | 69.95 | 14.3% | 1180.03 | 14.9% | 2758.36 | 16.7% |
| Total | 487.70 | 100.0% | 7897.93 | 100.0% | 16554.75 | 100.0% |

Notes: Other inland regions include the following 19 provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shannxi, Gansu, Qinghai, Ningxia, Xinjiang. Value-added are in nominal terms. Due to missing data, data and statistics for the sector of accommodation and food service activities are between 2004 and 2006. Data source: China National Bureau of Statistics: <http://data.stats.gov.cn>.

Table A3. The effect of a corruption crackdown on firm's labor productivity, matched sample

| | Labor Productivity | TFP-OP Method 10% | TFP-OP Method 5% | TFP-LP Method |
|--------------------------|-----------------------|----------------------|----------------------|----------------------|
| | (1) | (2) | (3) | (4) |
| Heilongjiang X After2004 | -0.182*** (0.035) | -0.245*** (0.026) | -0.245*** (0.026) | -0.259*** (0.027) |
| After2004 | 1.159*** (0.068) | 0.816*** (0.044) | 0.816*** (0.044) | 0.730*** (0.043) |
| Firm Fixed Effect | X | X | X | X |
| Year Fixed Effect | X | X | X | X |
| Industry Fixed Effect | X | X | X | X |
| Firm characteristics | X | X | X | X |
| Observations | 46,175 | 20,915 | 20,915 | 20,915 |
| Number of firms | 9,066 | 3,537 | 3,537 | 3,537 |
| R ² | 0.191 | 0.166 | 0.167 | 0.145 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shanxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered at firm level. The sample include firms in Heilongjiang in 2004 with their five closest matched firms drawn from the 19 control provinces. Firm characteristics include firm's ownership type (i.e., private, state, or foreign owned) and assets (log).

*** p<0.01, ** p<0.05, * p<0.1

Table A4. The effect of a corruption crackdown on firm's Total Factor Product

| | OP Method, 10% depr | | OP Method, 5% depr | | LP Estimation | |
|--------------------------|----------------------|---------------------|----------------------|---------------------|----------------------|---------------------|
| | Existing (1) | New (2) | Existing (3) | New (4) | Existing (5) | New (6) |
| Heilongjiang X After2004 | -0.230*** (0.028) | 0.109** (0.048) | -0.230*** (0.028) | 0.109** (0.048) | -0.247*** (0.030) | 0.133** (0.050) |
| After2004 | 1.014*** (0.064) | 1.100*** (0.118) | 1.014*** (0.064) | 1.100*** (0.118) | 0.923*** (0.062) | 0.961*** (0.104) |
| Province Fixed Effect | | X | | X | | X |
| Firm Fixed Effect | X | | X | | X | |
| Year Fixed Effect | X | X | X | X | X | X |
| Industry Fixed Effect | X | X | X | X | X | X |
| Firm characteristics | X | X | X | X | X | X |
| Observations | 122,028 | 21,566 | 122,028 | 21,566 | 122,028 | 21,566 |
| Number of firms | 18,943 | 21,566 | 18,943 | 21,566 | 18,943 | 21,566 |
| R ² | 0.198 | 0.216 | 0.200 | 0.219 | 0.176 | 0.212 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shannxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered at province level. The samples in columns (1) and (2) include all large-scale manufacturing firms from years 1999 to 2007. The samples in columns (3) and (4) include firms that enter before 2004 and exit after 2004. The sample in columns (5) and (6) include firms in their entering year after 1999. Firm characteristics include firm's ownership type (i.e., private, state, or foreign owned) and assets (log).

*** p<0.01, ** p<0.05, * p<0.1

Table A5. The effect of a corruption crackdown on firm's labor productivity

| | All firms | | Existing firms | | New firms | |
|--------------------------|----------------------|----------------------|----------------------|----------------------|---------------------|---------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Heilongjiang X After2004 | -0.169*** (0.035) | -0.168*** (0.034) | -0.159*** (0.033) | -0.158*** (0.033) | -0.092* (0.047) | -0.098* (0.049) |
| After2004 | 1.201*** (0.054) | 1.167*** (0.055) | 0.944*** (0.044) | 0.912*** (0.044) | 1.599*** (0.068) | 1.452*** (0.074) |
| Province Fixed Effect | | | | | X | X |
| Firm Fixed Effect | X | X | X | X | | |
| Year Fixed Effect | X | X | X | X | X | X |
| Industry Fixed Effect | | X | | X | | X |
| Firm characteristics | | X | | X | | X |
| Observations | 489,729 | 489,729 | 222,643 | 222,643 | 88,389 | 88,389 |
| Number of firms | 132,854 | 132,854 | 36,654 | 36,654 | 88,389 | 88,389 |
| R ² | 0.168 | 0.170 | 0.203 | 0.206 | 0.093 | 0.148 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shanxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered at province level. The samples in columns (1) and (2) include all large-scale manufacturing firms from years 1999 to 2007. The samples in columns (3) and (4) include firms that enter before 2004 and exit after 2004. The sample in columns (5) and (6) include firms in their entering year after 1999. Firm characteristics include firm's ownership type (i.e., private, state, or foreign owned) and assets (log)

*** p<0.01, ** p<0.05, * p<0.1

Table A6. The effect of a corruption crackdown on firm's ownership type change

| | SOE to POE | | POE to SOE | | All Change | |
|--------------------------|---------------------|-------------------|---------------------|---------------------|---------------------|---------------------|
| | (1) | (2) Demean | (3) | (4) Demean | (5) | (6) Demean |
| Heilongjiang X After2004 | 0.002 (0.003) | 0.005 (0.004) | 0.015*** (0.000) | 0.011*** (0.004) | 0.017** (0.007) | 0.014* (0.008) |
| After2004 | 0.045*** (0.000) | 0.008* (0.005) | 0.022*** (0.000) | 0.113*** (0.000) | 0.079*** (0.000) | 0.136*** (0.000) |
| Firm Fixed effect | X | X | X | X | X | X |
| Year Fixed effect | X | X | X | X | X | X |
| Industry Fixed effect | X | X | X | X | X | X |
| Observations | 506,288 | 506,288 | 506,288 | 506,288 | 506,288 | 506,288 |
| Number of firms | 133,612 | 133,613 | 133,615 | 133,616 | 133,618 | 133,619 |
| R ² | 0.011 | 0.275 | 0.005 | 0.216 | 0.014 | 0.043 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include other 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shannxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered at province and firm levels in columns (1), (3), and (5) and at province level in columns (2), (4), and (6). Standard errors are bootstrapped at province level using the wild cluster bootstrap method. Samples in columns (2), (4), and (6) are demeaned to capture the panel data structure in the original data set. Firm characteristics include firm's assets (log). SOE stands for State-owned Enterprises. POE stands for private firms. FOE stands for foreign firms.

*** p<0.01, ** p<0.05, * p<0.1

Table A7. The effect of a corruption crackdown on firm's labor productivity by firm's ownership types

| | Private | | State | | Foreign | |
|--------------------------|----------------------|---------------------|---------------------|---------------------|----------------------|----------------------|
| | Existing (1) | New (2) | Existing (3) | New (4) | Existing (5) | New (6) |
| Heilongjiang X After2004 | -0.200*** (0.032) | -0.124** (0.051) | 0.029 (0.043) | 0.097 (0.069) | -0.279*** (0.045) | -0.315*** (0.042) |
| After2004 | 0.982*** (0.043) | 1.404*** (0.072) | 0.795*** (0.055) | 1.420*** (0.157) | 0.805*** (0.069) | 0.790*** (0.214) |
| Province Fixed Effect | | X | | X | | X |
| Firm Fixed Effect | X | | X | | X | |
| Year Fixed Effect | X | X | X | X | X | X |
| Industry Fixed Effect | X | X | X | X | X | X |
| Firm characteristics | X | X | X | X | X | X |
| Observations | 96,877 | 62,800 | 30,709 | 9,121 | 9,268 | 3,109 |
| Number of firms | 17,281 | 62,800 | 4,815 | 9,121 | 1,507 | 3,109 |
| R ² | 0.241 | 0.130 | 0.139 | 0.189 | 0.109 | 0.182 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shanxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered at province level. Samples restricted to firms with no ownership changes during their sampling periods. The samples in columns (1), (3), and (5) include firms enter before 2004 and exit after 2004. The samples in columns (2), (4), and (5) include firms in their entering year after 1999. Firm characteristics include assets (log).

*** p<0.01, ** p<0.05, * p<0.1

Table A8. The effect of a corruption crackdown on firm entry and exit

| | Entry | Exit | Entry by Firm Type | | |
|--------------------------|----------------------|---------------------|----------------------|----------------------|----------------------|
| | All (1) | All (2) | Private (3) | State (4) | Foreign (5) |
| Heilongjiang X After2004 | -0.027*** (0.009) | -0.003 (0.011) | -0.072*** (0.012) | 0.014* (0.008) | -0.037*** (0.011) |
| After2004 | -0.159*** (0.016) | 0.084*** (0.011) | -0.264*** (0.023) | -0.097*** (0.016) | -0.196*** (0.021) |
| Mean of dependent var. | 0.174 | 0.159 | 0.261 | 0.110 | 0.192 |
| Province Fixed Effect | X | X | X | X | X |
| Year Fixed Effect | X | X | X | X | X |
| Firm Characteristics | X | X | X | X | X |
| Observations | 41,669 | 41,679 | 29,531 | 22,378 | 7,348 |
| R ² | 0.094 | 0.078 | 0.154 | 0.042 | 0.083 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shannxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered at province level. Entry and exit rates are calculated for each year-province-industry (four-digit)-ownership type cell. Firm characteristics include cell-level average log assets. Entry year is defined as the first year in sample after the year 1999. Exit year is defined as the last year in sample before the year 2007. Data in 2004 are excluded. Samples in columns (3), (4), and (5) are restricted to firms with no ownership changes during their sampling years.

*** p<0.01, ** p<0.05, * p<0.1

Table A9. The effect of a corruption crackdown on new firms' size by firm's ownership type

| | Log(sale) (1) | Log(vad) (2) | Log (asset) (3) | Log(labor) (4) |
|--------------------------|---------------------|---------------------|---------------------|---------------------|
| Panel A: Private firms | | | | |
| Heilongjiang X After2004 | 0.134* (0.067) | -0.022 (0.068) | -0.027 (0.050) | 0.102** (0.036) |
| After2004 | 1.006*** (0.110) | 1.173*** (0.083) | 0.696*** (0.126) | -0.245** (0.093) |
| Observations | 65,163 | 62,800 | 65,163 | 65,163 |
| R ² | 0.092 | 0.072 | 0.055 | 0.115 |
| Panel B: State Firms | | | | |
| Heilongjiang X After2004 | 0.704*** (0.112) | 0.469*** (0.111) | 0.852*** (0.146) | 0.341** (0.137) |
| After2004 | 2.209*** (0.170) | 2.073*** (0.185) | 1.475*** (0.218) | 0.624*** (0.115) |
| Observations | 9,630 | 9,121 | 9,630 | 9,630 |
| R ² | 0.229 | 0.193 | 0.094 | 0.112 |
| Panel C: Foreign Firms | | | | |
| Heilongjiang X After2004 | 0.120 (0.085) | -0.138 (0.083) | 0.654*** (0.123) | 0.136* (0.078) |
| After2004 | 0.510** (0.187) | 0.741*** (0.213) | 0.174 (0.236) | -0.105 (0.141) |
| Observations | 3,309 | 3,109 | 3,309 | 3,309 |
| R ² | 0.094 | 0.087 | 0.131 | 0.152 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shannxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered at province level. Each regression includes a time trend, province fixed effect, and industry fixed effect. Sample includes firms in their entering year after 1999 with no ownership changes in their sampling years.

*** p<0.01, ** p<0.05, * p<0.1

Table A10. The effect of a corruption crackdown on existing firms' sales

| | Private | | State | | Foreign | |
|--------------------------|----------------------|----------------------|----------------------|---------------------|---------------------|---------------------|
| | (1) | (2) Demean | (3) | (4) Demean | (5) | (6) Demean |
| Heilongjiang X After2004 | -0.160*** (0.057) | -0.134*** (0.048) | -0.103*** (0.040) | -0.067* (0.040) | 0.065 (0.070) | -0.110* (0.058) |
| After2004 | 0.603*** (0.000) | 0.953*** (0.000) | 0.289*** (0.000) | 0.327*** (0.000) | 0.293*** (0.000) | 0.772*** (0.000) |
| Province Fixed Effect | X | | X | | X | |
| Firm Fixed Effect | X | X | X | X | X | X |
| Year Fixed Effect | X | X | X | X | X | X |
| Industry Fixed Effect | X | X | X | X | X | X |
| Firm characteristics | X | X | X | X | X | X |
| Observations | 99,352 | 99,352 | 32,460 | 32,460 | 9,568 | 9,568 |
| R ² | 0.158 | 0.358 | 0.182 | 0.104 | 0.133 | 0.269 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shannxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered at province and firm levels in columns (1), (3), and (5) and are clustered at province level in columns (2), (4), and (6). Standard errors are bootstrapped at province level using the wild cluster bootstrap. Samples in columns (2), (4), and (6) are demeaned to capture the panel data structure in the original data set. Sample includes firms enter before 2004 and exit after 2004 with no ownership changes in their sampling years.

*** p<0.01, ** p<0.05, * p<0.1

Table A11. The effect of a corruption crackdown on entry rate by firm's ownership type, sales larger than 5m

| | Private | State | Foreign |
|----------------------------|----------------------|--------------------|-------------------|
| | (1) | (2) | (3) |
| Heilongjiang X After2004 | -0.061*** (0.022) | 0.017** (0.007) | 0.002 (0.034) |
| After2004 | -0.025 (0.023) | -0.015* (0.008) | -0.036 (0.037) |
| Mean of dependent variable | 0.219 | 0.121 | 0.178 |
| Province Fixed Effect | X | X | X |
| Year Fixed effect | X | X | X |
| Firm characteristics | X | X | X |
| Observations | 27,196 | 15,993 | 6,783 |
| R ² | 0.159 | 0.043 | 0.084 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shannxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered and bootstrapped at province level using the wild cluster bootstrap. Entry and exit rates are calculated for each year-province-industry (four-digit)-ownership type cell. Columns (2) and (4) control for cell-level average log assets. Entry year is defined as the first year in sample after the year 1999. Data in 2004 are excluded. Samples restricted to firms with annual sales greater than 5 million and with no ownership changes in their sampling periods.

*** p<0.01, ** p<0.05, * p<0.1

Table A12. The effect of a corruption crackdown on firm's labor productivity by firm's ownership type, sales larger than 5m

| | Private | | | State | | | Foreign | | |
|--------------------------|-----------------------|----------------------------|---------------------|-----------------------|----------------------------|---------------------|-----------------------|----------------------------|----------------------|
| | Existing firms (1) | New firms (2) Demean | New firms (3) | Existing firms (4) | New firms (5) Demean | New firms (6) | Existing firms (7) | New firms (8) Demean | New firms (9) |
| Heilongjiang X After2004 | -0.182*** (0.065) | -0.189*** (0.067) | -0.153** (0.059) | 0.046 (0.041) | 0.021 (0.028) | -0.114 (0.076) | -0.171*** (0.061) | -0.266*** (0.095) | -0.362*** (0.129) |
| After2004 | 0.766*** (0.000) | 0.808*** (0.000) | 0.507*** (0.000) | 0.764*** (0.000) | 0.667*** (0.000) | 0.816*** (0.000) | 0.441*** (0.000) | 0.546*** (0.000) | 0.190*** (0.000) |
| Province Fixed Effect | X | | X | X | | X | X | | X |
| Year Fixed Effect | X | X | X | X | X | X | X | X | X |
| Industry Fixed Effect | X | X | X | X | X | X | X | X | X |
| Firm characteristics | X | X | X | X | X | X | X | X | X |
| Observations | 82,944 | 82,944 | 56,336 | 19,828 | 19,828 | 5,639 | 8,550 | 8,550 | 2,865 |
| Number of firms | 14,700 | 14,700 | 56,336 | 2,999 | 2,999 | 5,639 | 1,374 | 1,374 | 2,865 |
| R ² | 0.206 | 0.244 | 0.127 | 0.195 | 0.170 | 0.167 | 0.238 | 0.110 | 0.183 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shannxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered at province and firm levels in columns (1), (4), and (7) and at province level in columns (2), (3), (5), (6), (8), and (9). Standard errors are bootstrapped at province level using the wild cluster bootstrap method. Samples in columns (2), (5), (8) are demeaned to capture the panel data structure in the original data set. Samples restricted to firms with annual sales greater than 5 million and with no ownership changes in their sampling periods. The samples in columns (1), (2), (4), (5), (7) and (8) include firms enter before 2004 and exit after 2004. The samples in columns (3), (6), and (9) include firms in their entering year after 1999. Firm characteristics include assets (log).

*** p<0.01, ** p<0.05, * p<0.1

Table A13. Mean comparison for Heilongjiang firms, 1999 to 2004

| | Non- searchable (1) | Searchable (2) | Connected (3) | Non-connected (4) | |
|---------------------------|---------------------------|--------------------------|-------------------------------|--------------------------|-----|
| Labor Productivity | 57.09 (188.18) | 60.27 (100.43) | 55.06 (68.70) | 61.32 (105.73) | |
| Profit (in 1000 RMB) | 1090.21 (7404.36) | 929.92 (21604.19) | -137.60 (49765.48) | 1,145.32 (8190.03) | |
| Sale (in 1000 RMB) | 35912.24 (120964.05) | 69253.21 (158816.31) | *** 106,843.19 (233174.17) | 61,668.29 (138354.10) | *** |
| Labor (in 1000) | 263.01 (717.54) | 400.16 (777.72) | *** 506.70 (1010.85) | 378.66 (721.62) | |
| Capital (in 1000 RMB) | 20401.43 (81127.60) | 38600.63 (92687.14) | *** 59,805.40 (130626.20) | 34,321.92 (82569.34) | *** |
| Value added (in 1000 RMB) | 8653.26 (27063.42) | 17555.19 (34730.17) | *** 21,998.47 (39356.49) | 16,658.62 (33713.90) | |
| Total Asset (in 1000 RMB) | 65517.56 (307512.38) | 114455.63 (282408.68) | *** 201,204.29 (441493.85) | 96,951.44 (234942.23) | *** |
| Total Debt (in 1000 RMB) | 43706.66 (229188.24) | 70247.97 (187396.31) | 124,795.56 (314562.07) | 59,241.33 (147546.01) | *** |
| Firm Age | 16 (11.52) | 18 (12.51) | *** 19 (12.91) | 18 (12.45) | |
| N of Firms | 1829 | 405 | 68 | 337 | |

Note. Searchable firms are those with firm name and legal person's name. Non-searchable firms are those with legal person's name missing.

*** p<0.01, ** p<0.05, * p<0.1

Table A14. The effect of a corruption crackdown on firms' financial performance by firm's ownership type

| | Log(Total Profit) | | Total Debt/Asset | | Short/Total Debt | |
|-------------------------------|-------------------|----------|------------------|-----------|------------------|----------|
| | (1) Existing | (2) New | (3) Existing | (4) New | (5) Existing | (6) New |
| Panel A: Private Firms | | | | | | |
| Heilongjiang X After2004 | -0.145* | -0.216** | 0.012*** | 0.043*** | 0.013* | 0.045*** |
| | (0.074) | (0.109) | (0.004) | (0.016) | (0.007) | (0.014) |
| After2004 | 1.226*** | 1.442*** | -0.024*** | -0.086*** | 0.005 | -0.014 |
| | (0.134) | (0.066) | (0.007) | (0.010) | (0.010) | (0.009) |
| Observations | 79,761 | 50,004 | 99,352 | 65,162 | 98,619 | 63,806 |
| Number of num | 16,758 | 50,004 | 17,284 | 65,162 | 17,261 | 63,806 |
| R ² | 0.146 | 0.074 | 0.002 | 0.040 | 0.002 | 0.024 |
| Panel B: State Firms | | | | | | |
| Heilongjiang X After2004 | -0.054 | -0.115 | -0.012 | 0.002 | 0.007 | 0.014 |
| | (0.055) | (0.436) | (0.008) | (0.066) | (0.005) | (0.039) |
| After2004 | 0.776*** | 2.138*** | 0.095*** | 0.001 | 0.024*** | 0.002 |
| | (0.093) | (0.215) | (0.014) | (0.034) | (0.007) | (0.020) |
| Observations | 19,363 | 5,868 | 32,460 | 9,629 | 32,371 | 9,533 |
| Number of Firms | 4,119 | 5,868 | 4,819 | 9,629 | 4,817 | 9,533 |
| R ² | 0.071 | 0.164 | 0.024 | 0.040 | 0.007 | 0.061 |
| Panel C: Foreign Firms | | | | | | |
| Heilongjiang X After2004 | 0.147** | -0.366 | 0.009 | -0.139** | 0.053*** | 0.068 |
| | (0.055) | (0.551) | (0.007) | (0.066) | (0.004) | (0.050) |
| After2004 | 0.757*** | 0.657* | -0.012 | 0.026 | 0.050*** | 0.021 |
| | (0.098) | (0.342) | (0.015) | (0.042) | (0.008) | (0.032) |
| Observations | 6,931 | 1,940 | 9,568 | 3,308 | 9,532 | 3,263 |
| Number of Firms | 1,448 | 1,940 | 1,507 | 3,308 | 1,507 | 3,263 |
| R ² | 0.048 | 0.124 | 0.011 | 0.042 | 0.019 | 0.027 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shannxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered at province level. Each regression includes a time trend and industry fixed effect. Columns (1) and (2) include firm fixed effects. Sample includes firms enter before 2004 and exit after 2004 with no ownership changes in their sampling years.

*** p<0.01, ** p<0.05, * p<0.1

Table A15. The effect of a corruption crackdown on individuals' perceptions on corruption, the CGSS 2003 and 2005

| | All individuals | Non-state Employees | State Employees |
|----------------------------|---------------------|------------------------|---------------------|
| | (1) | (2) | (3) |
| Heilongjiang X After2004 | 0.166*** (0.029) | 0.205*** (0.040) | 0.121*** (0.033) |
| After2004 | -0.064** (0.030) | -0.040 (0.041) | -0.035 (0.035) |
| Province Fixed Effect | X | X | X |
| Individual characteristics | X | X | X |
| Observations | 7,380 | 4,047 | 3,333 |
| R ² | 0.058 | 0.069 | 0.082 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 17 inland provinces where the CGSS is covering: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shanxi, Gansu, Xinjiang. Standard errors are clustered at province level. Individual controls include gender, employment status (e.g., full-time or not), marital status, age, education attainment, income, and CCP affiliation. State employees are those who reported to work for the Central government or the state-owned agencies or enterprises.

*** p<0.01, ** p<0.05, * p<0.1

Table A16. The effect of a corruption crackdown on firms' capital intensity by firms' ownership types

| | Private | | State | | Foreign | |
|--------------------------|---------------------|----------------------|---------------------|---------------------|---------------------|---------------------|
| | (1) Existing | (2)New | (3) Existing | (4) New | (5) Existing | (6) New |
| Heilongjiang X After2004 | -0.028 (0.020) | -0.187*** (0.031) | 0.121*** (0.022) | 0.397*** (0.052) | 0.127*** (0.039) | 0.482*** (0.083) |
| After2004 | 0.712*** (0.047) | 0.830*** (0.053) | 0.493*** (0.027) | 0.954*** (0.099) | -0.003 (0.047) | 0.298 (0.194) |
| Province Fixed Effect | | X | | X | | X |
| Firm Fixed Effect | X | | X | | X | |
| Year Fixed Effect | X | X | X | X | X | X |
| Industry Fixed Effect | X | X | X | X | X | X |
| Observations | 98,747 | 64,525 | 32,346 | 9,490 | 9,540 | 3,287 |
| Number of firms | 17,281 | 64,525 | 4,819 | 9,490 | 1,507 | 3,287 |
| R ² | 0.112 | 0.089 | 0.087 | 0.081 | 0.008 | 0.230 |

Notes: Firms in Heilongjiang province are affected by the anticorruption campaign outbursts in 2004. Control regions include the following 19 inland provinces: Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Guizhou, Yunnan, Shannxi, Gansu, Qinghai, Ningxia, Xinjiang. Standard errors are clustered at province level. Samples restricted to firms with no ownership changes during their sampling periods. The sample in columns (1), (3), and (5) include firms enter before 2004 and exit after 2004. The sample in column (2), (4), and (6) include firms in their entering year after 1999.

*** p<0.01, ** p<0.05, * p<0.1

APPENDIX B

Notes on Productivity Estimation

B.1 Setup

We assume that the firm has following Cobb-Douglas production technology:

$$y_{it} = \exp(\omega_{it}) k_{it}^{\alpha} l_{it}^{\beta} \quad (\text{B1})$$

where i represents firm and t represents the time. y_{it} is the firm's value added, k_{it} is the capital stock, l_{it} is the labor input, and $\exp(\omega_{it})$ is the total factor productivity. The productivity is known by the firm while unobservable to the econometrician.

B.2 Productivity Measures

B.2.1 labor productivity

A commonly used measure for the firm's production efficiency is the labor productivity, which is defined as follow

$$lp_{it} = \frac{y_{it}}{l_{it}} \quad (\text{B2})$$

According to this definition, productivity is the value added per worker. Though it is not the actual total factor productivity, this measurement is used in the literature on international trade (e.g., Bernard et al., 2003). If we assume that the production function is as in (B1), then it is obvious that the labor productivity measure contains information of the production efficiency $\exp(\omega_{it})$ as well as the firm's capital intensity (capital stock per unit of labor). In particular, when $\alpha + \beta = 1$, i.e., the production technology is of constant return to scale, labor productivity can be expressed as follows:

$$lp_{it} = \exp(\omega_{it}) \left(\frac{k_{it}}{l_{it}} \right)^{\alpha} \quad (\text{B3})$$

Next we briefly explain the estimation method we implemented to obtain the total factor productivity.

B.3 Control function approach to estimate ω_{it}

In industrial organization literature, ω_{it} can be backed out using control function approaches. The two most popular approaches are OP (Olley and Pakes, 1996) method and LP (Levinsohn and Petrin, 2003) methodology. We introduce them briefly as below.

B.3.1 OP method

The problem facing the econometrician is the identification of α and β . Because firms make capital and labor choices by their own productivities, the OLS estimators for α and β are potentially biased because the productivity would be contained in the error term if not being controlled. More specifically, the bias will be upward because more productive firms will invest more in capital and employ more workers. Olley and Pakes (1996) propose to use the firm's capital investment to control for the firm's productivity. Under some mild assumptions, the firm's capital investment can be written as:

$$i_{it} = i(\omega_{it}, k_{it-1}, a_{it}) \quad (\text{B4})$$

where i_{it} represents the firm's capital investment and a_{it} is the firm's age. Moreover, the capital investment is increasing in the firm's productivity conditional on firm's previous capital stock and age. Therefore we can write the firm's productivity as

$$\omega_{it} = i^{-1}(i_{it}, k_{it-1}, a_{it}) \quad (\text{B5})$$

OP use a two-step procedure to estimate the productivity. In the first step, the firm's productivity is controlled using a polynomial function of l_{it} , k_{it-1} , and a_{it} . The first-step estimation uses the logged form of the production and can identify the labor coefficient β . The productivity process is assumed to be following a first-order Markov process:

$$\omega_{it+1} = \rho\omega_{it} + \xi_{it+1} \quad (\text{B6})$$

where ξ_{it+1} is the i.i.d error term. From the first-stage estimation, the productivity can be expressed as a function of the data and the remaining parameters to be identified. The moment conditions used to identify this parameter is thus given by:

$$\text{E} \left(\xi_{it+1} \otimes \begin{pmatrix} 1 \\ l_{it} \\ k_{it} \end{pmatrix} \right) = 0 \quad (\text{B7})$$

B.3.2 LP approach

OP method requires the investment to be positive. In application, this can cause the loss of a large portion of the sample. Levinsohn and Petrin (2003) suggest using the material input to control for the productivity. LP approach follows the logic of OP closely. The only difference is that in the first-stage estimation, the control function of productivity is based on the firm's static choice of materials. Specifically, the firm's first-order condition is of the material is:

$$m_{it} = m(\omega_{it}, k_{it}, a_{it}) \quad (\text{B8})$$

Using an estimation procedure similar to OP, the productivity can be backed out. The advantage of LP method is that the data on intermediates are usually available and are usually positive.

APPENDIX C

Table C1. The effect of a corruption crackdown on firm's labor productivity

| | All firms | | Existing Firms | | New Firms | |
|--------------------------|---------------------|---------------------|---------------------|----------------------|-------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Heilongjiang X After2004 | -0.145** (0.065) | -0.078** (0.034) | -0.156** (0.068) | -0.091*** (0.023) | -0.151 (0.122) | -0.240*** (0.078) |
| Firm characteristics | | X | | X | | X |
| Year Fixed effect | X | X | X | X | X | X |
| Industry Fixed effect | | X | | X | | X |
| Firm Fixed effect | X | X | X | X | | |
| Observations | 91,927 | 90,615 | 43,610 | 42,917 | 17,253 | 16,960 |
| Number of firms | 25,462 | 25,363 | 7,383 | 7,376 | 17,253 | 16,960 |
| R ² | 0.141 | 0.341 | 0.167 | 0.348 | 0.083 | 0.293 |

Notes: Firms in Heilongjiang province is affected by the anticorruption campaign outbursts in 2004. Standard errors are clustered at city level. Firm characteristics include firm's ownership type (i.e., private, state, or foreign owned), total sales (log), and capital intensity in columns (2), (4), and (6). The samples in columns (1) and (2) include all large-scale manufacturing firms in Heilongjiang, Jilin, and Liaoning provinces from years 1999 to 2007. The samples in columns (3) and (4) include firms that enter before 2004 and exit after 2004. The sample in columns (5) and (6) include firms in their entering year after 1999.

*** p<0.01, ** p<0.05, * p<0.1

Table C2. The effect of a corruption crackdown on firm's labor productivity by firm's ownership type

| | Private | | State | | Foreign | |
|--------------------------|----------------------|----------------------|------------------|----------------------|---------------------|--------------------|
| | Existing (1) | New (2) | Existing (3) | New (4) | Existing (5) | New (6) |
| Heilongjiang X After2004 | -0.175*** (0.047) | -0.249*** (0.078) | 0.024 (0.062) | -0.482*** (0.120) | -0.154** (0.061) | -0.417* (0.207) |
| Firm characteristics | X | X | X | X | X | X |
| Year Fixed effect | X | X | X | X | X | X |
| Industry Fixed effect | X | X | X | X | X | X |
| Firm Fixed effect | X | | X | | X | |
| Observations | 25,072 | 12,426 | 12,282 | 3,087 | 5,563 | 1,447 |
| Number of firms | 5,617 | 12,426 | 3,237 | 3,087 | 1,230 | 1,447 |
| R ² | 0.367 | 0.279 | 0.312 | 0.299 | 0.243 | 0.312 |

Notes: Firms in Heilongjiang province is affected by the anticorruption campaign outbursts in 2004. Standard errors are clustered at city level. Firm characteristics include total sales (log) and capital intensity. The samples in columns (1),(3), and (5) include firms enter before 2004 and exit after 2004. The samples in columns (2),(4), and (5) include firms in their entering year after 1999.

*** p<0.01, ** p<0.05, * p<0.1

Table C3. The effect of a corruption crackdown on firm entry and exit

| | Entry | | Exit | |
|--------------------------|----------------------|---------------------|------------------|-------------------|
| | (1) | (2) | (3) | (4) |
| Heilongjiang X After2004 | -0.038*** (0.013) | -0.036** (0.015) | 0.005 (0.020) | -0.001 (0.019) |
| Mean of dependent var. | 0.367 | | 0.338 | |
| Firm characteristics | | X | | X |
| Year Fixed effect | X | X | X | X |
| Observations | 6,880 | 6,844 | 6,357 | 6,324 |
| R ² | 0.432 | 0.437 | 0.365 | 0.380 |

Notes: Firms in Heilongjiang province is affected by the anticorruption campaign outbursts in 2004. Standard errors are clustered at two-digit industry level. Entry and exit rates are calculated for each year-province-industry (four-digit)-ownership type cell. Columns (2) and (4) control for cell-level average log sales and average capital intensity. Entry year is defined as the first year in sample after the year 1999. Exit year is defined as the last year in sample before the year 2007.

*** p<0.01, ** p<0.05, * p<0.1

Table C4. The effect of an anticorruption campaign on entry by firm's ownership type

| | Private | State | Foreign |
|--------------------------|----------------------|------------------|-------------------|
| | (1) | (2) | (3) |
| Heilongjiang X After2004 | -0.045*** (0.012) | 0.009 (0.021) | -0.022 (0.058) |
| Mean of dependent var. | 0.365 | 0.347 | 0.314 |
| Firm characteristics | X | X | X |
| Year Fixed effect | X | X | X |
| Observations | 5,811 | 3,753 | 2,224 |
| R ² | 0.396 | 0.393 | 0.296 |

Notes: Firms in Heilongjiang province is affected by the anticorruption campaign outbursts in 2004. Standard errors are clustered at two-digit industry level. Entry rates are calculated for each year-province-firm-type-industry (four-digit) cell. Controls include cell-level average log sales and average capital intensity. Entry year is defined as the first year in sample after the year 1999.

*** p<0.01, ** p<0.05, * p<0.1