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IDE DISCUSSION PAPER No. 748

Corruption, Productivity, and Import Liberalization in China: A Firm-Level Analysis*

Jiankun LU[1], Bo MENG[2], Hongsheng ZHANG[3]

March 2019

Abstract: Understanding whether and how corruption impacts firm productivity in China is crucial for promoting good governance of economic development. Based on our econometric model developed with China's firm-level data, including detailed firm heterogeneity information and provincial records of government official-related corruption, we confirm that corruption acts as "sand" rather than "grease" in the wheels of firm productivity improvement. The hampering effect of corruption on firm productivity is not obvious for state-owned, relatively large-sized, and low productive firms, but it is quite significant for private, relatively small-sized, and high productive ones. More importantly, we find that a firm's productivity gains from import liberalization are significantly inhibited by corruption. Therefore, if the institutional environment can be improved, firms in China possess great potential—especially private and small-sized firms—to be more efficient or be able to obtain more productivity gains from import liberalization.

Keywords: Corruption, productivity, firm heterogeneity, import liberalization, Chinese economy

JEL classification: D73, F14, O24

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1. School of Public Finance and Economics, Zhejiang University, China. 2. IDE-JETRO, Japan; Columbia Business School, USA. 3. Corresponding author. School of Economics, Zhejiang University, China. Contact: hzhang30@163.com. *We thank Prof. Shang-Jin Wei (Columbia University), Prof. Miaojie YU (Beijing University) for their helpful comments.

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INSTITUTE OF DEVELOPING ECONOMIES (IDE), JETRO
3-2-2, WAKABA, MIHAMA-KU, CHIBA-SHI
CHIBA 261-8545, JAPAN

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Abstract: Understanding whether and how corruption impacts firm productivity in China is crucial for promoting good governance of economic development. Based on our econometric model developed with China's firm-level data, including detailed firm heterogeneity information and provincial records of government official-related corruption, we confirm that corruption acts as "sand" rather than "grease" in the wheels of firm productivity improvement. The hampering effect of corruption on firm productivity is not obvious for state-owned, relatively large-sized, and low productive firms, but it is quite significant for private, relatively small-sized, and high productive ones. More importantly, we find that a firm's productivity gains from import liberalization are significantly inhibited by corruption. Therefore, if the institutional environment can be improved, firms in China possess great potential—especially private and small-sized firms—to be more efficient or be able to obtain more productivity gains from import liberalization.

Acknowledgments: Jiankun LU's contribution in this paper is supported by the Youth Fund Project of Humanity and Social Sciences Research of Ministry of Education of China (No.18YJC790111). Bo MENG's contribution in this paper is partly supported by the IDE-JETRO's 2018 international joint research project "The Impact of Technological Innovation in Global Value Chains." Hongsheng ZHANG's contribution in this paper is supported by the National Natural Science Foundation of China (No. 71803173), the Youth Fund Project of Humanity and Social Sciences Research of Ministry of Education of China (No. 18YJC790215), and the China Postdoctoral Science Foundation (No. 2017M620237 and No. 2018T110579). We also thank Prof. Shang-Jin WEI (Columbia University), Prof. Miaojie YU (Beijing University) for his helpful comments.

1. School of Public Finance and Taxation, Zhejiang University of Finance and Economics, China.
2. Institute of Developing Economies, Japan; Columbia Business School, USA.
3. Corresponding author. School of Economics, Zhejiang University, China. Contact: hzhang30@163.com

1. Introduction

Most developing countries are troubled by serious domestic corruption and slow economic growth (Mauro, 1995; Svensson, 2005). However, as the biggest developing country and the second largest economy, China has—paradoxically, it seems—enjoyed rapid economic growth coupled with a relatively high level of corruption, becoming the principal model for the "East Asian Paradox" (Rock & Bonnett, 2004). According to the *Corruption Perceptions Index*[1] published by Transparency International, China is perceived as a fairly corrupt country, ranking 43rd out of 44 economies in 1995 (between Pakistan and Indonesia), 63rd out of 90 economies in 2000 (between Thailand and Egypt), 78th out of 158 economies in 2005 (between Laos and Morocco), 78th out of 178 economies in 2010 (between Vanuatu and Colombia), and 77th out of 180 economies (equally ranked with Serbia and Suriname) in 2017. Meanwhile, similar to Krugman's critics with respect to other East Asian economies, China's extraordinary record of economic growth without "exceptional efficiency growth" has been doubted (Krugman, 1994; Yong, 2000, 2003). For example, there is some evidence suggesting that China did garner high productivity growth in its manufacturing sectors, especially after entering the World Trade Organization (WTO) (Holz, 2006; Perkins & Rawski, 2008; Brandt et al., 2012, 2017).

Is China unique among nations in a way that corruption may not hinder its economic efficiency? Does the corruption in China "grease" rather than "sand" the wheels of firms' productivity improvement[2]? Given what we know through massive empirical studies on the impact of corruption for many countries, the answer might be "No." For example, Mauro (1995), Wei (1997), Kaufmann and Wei (1999), Fisman and Svensson (2007), and Nguyen and van Dijk (2012) have shown the negative impacts of corruption on economic growth, business development, firms being driven to unofficial economy, public expenditures, domestic and foreign investments, and firms' management time and cost of capital. However, for China, the answer may be a bit more complicated given that China is a transition economy with great social and economic complexities. For example, Wang and You (2012) argued that corruption in China appears to substitute for underdeveloped financial markets as a means to release constraints and thus contribute to firms' growth. Jiang and Nie (2014) portray a similar story that corruption in fact helps private firms in China circumvent unproductive government regulations, enabling access to import and export businesses and thus allowing them to generate more profits. Contrary to these findings pertaining to China, Cai et al. (2011) show that while some kinds of involvement with corruption can help firms obtain better government services or lower taxation that may bring positive returns, the overall effect of corruption on firm productivity is negative. However, the data used by Cai et al. (2011) are quite limited in both number of observations and sample scope (three different small-scale surveys' data are pooled together, making the sample less general; especially the second survey that was only conducted in 1 of 31 provinces in mainland China, covering 1,070 firms). At the same time, their conclusion may be biased to some extent due to their choice of a proxy for the level of corruption, which was based on the firm's entertainment and travel expenditures without direct information regarding the reality of corruption itself. Moreover, the key firm-level corruption measure "entertainment and travel expenditures" are observed for only one year per firm in the dataset, making causal inferences difficult. Given the limitation in the existing studies as mentioned above, the first purpose of this paper is to provide a better understanding about whether and how corruption impacts firm productivity in China. This is crucial to review the so-called "East Asian Paradox" and "Efficient Grease" hypotheses, which can help improve policymaking for healthy and sustainable economic development.

Additionally, a large body of literature has shown that firms may improve productivity through various channels including taking advantage of good policies externally, such as import liberalization—mainly represented by tariff reductions (Lu et al., 2010; Brandt et al., 2012, 2017; Yu, 2015; Dai et al., 2016). However, very little research has paid attention to clarifying how and to what extent factors in the institutional environment, such as corruption, impact firm productivity through the channels of import liberalization. Hsieh and Klenow (2009) found that TFP (Total Factor Productivity) in developing countries such as China and India is always inhibited by resource misallocation. Their conclusion provides a bridge to consider how corruption influences firm TFP

[1] https://www.transparency.org/news/feature/corruption_perceptions_index_2017

[2] For the details concerning the so-called "Effective Grease" hypothesis, see Kaufmann and Wei (1999).

as corruption is considered one of the main factors causing resource misallocation (Nguyen & van Dijk, 2016; Liu et al., 2015). Edmond et al. (2015) showed that international free trade can reduce the misallocations by increasing competition, while domestic institutions weakened the effects of trade liberalization. Further, evidence from China shows that productivity gains could be increased by improving domestic trade managing institutions even under export quota policies (Khandelwal et al., 2013). Furthermore, based on Indian firm-level data, Topalova and Khandelwal (2011) found that firm productivity is further increased from import liberalization in industries with weak domestic regulations. Ahsan (2013) also found that contract enforcement and judicial efficiency play important roles in firm productivity, when gaining from import liberalization. Given the importance of the impact of import liberalization on firm productivity, the second purpose of the paper is to investigate whether the effect of import liberalization on firm productivity could be influenced by corruption. Discussion on this issue has critical policy implications. Import liberalization, such as tariff reduction, easily reaches a ceiling at some point, as does its marginal impact on firm productivity. If it is true that corruption significantly crowds out the positive impact of import liberalization on firm productivity, this implies that even if there is no more room to increase import liberalization (e.g., a country has a high level of import liberalization or is facing serious challenges from trade protectionists), reducing the level of corruption can still help import liberalization release more positive impacts on firm productivity.

Compared to the data used in the extant literature about corruption, the Chinese firm-level data used in this paper covers all state-owned enterprises (SOEs) and non-SOEs whose annual sales exceed RMB 5 million in China, with detailed information about firm heterogeneity, such as firm ownership, firm size, and export patterns. The dataset is most widely used by scholars (Hsieh & Klenow, 2009; Brandt et al., 2012, 2017; Yu et al., 2015). For the corruption level, we use direct information coming from the official statistics on corruption cases published in *China Procuratorial Yearbook*, government audit data from *China Audit Yearbook*, and information on personal characteristics of the main anti-corruption bureau leaders from officials' resumes.

The remainder of this paper is organized as follows. In Section 2, we describe our dataset measures and present descriptive statistics. In Section 3, we present our strategies for empirical analyses. In Section 4, we report and explain the regression results, and in Section 5, we conclude our findings and offer some policy implications.

2. Data and Measures

2.1. Data Resources

To investigate the impact of corruption on firm productivity, we relied on the following panel datasets spanning from 1998 to 2007: firm-level production data, provincial corruption data, and product-level trade data.

2.1.1. Annual Survey of Industrial Production (ASIP) Data

We use the data for Chinese industrial manufacturing production from the *ASIP* for 1998–2007, which includes information for all SOEs and non-SOEs with annual sales above 5 million RMB (about US $630,000 at the 2006 exchange rate or US $760,000 at the 2018 exchange rate). The dataset was collected through annual surveys administered by the National Bureau of Statistics of China and discussed in detail in Brandt et al. (2014). On average, more than 200,000 firms per year from 1998 to 2007 are included in the dataset, spanning 480 four-digit-manufacturing industries and 31 provinces or province-equivalent municipalities. The aggregate value of exports, output, employment, sales, and capital for these firms are nearly equal to the totals reported annually in China's *Statistical Yearbook*. Compared to the universe of firms observed in the *2004 China Economic Census*, our sample of above-scale industrial firms represents the lion's share of industrial production in China. As with Brandt et al. (2017), these firms accounted for 91% of gross output, 71% of employment, 97% of exports, and 91% of total fixed assets in 2004. During the sample period, Chinese Industry Classification (CIC) codes changed in 2002, which were identified as GB/T4754-2002 and were applied from 2003. Before 2003, an older version (GB/T4754-1994), set in 1994, was applied. We converted the old CIC version (GB/T4754-1994) into the new one (GB/T4754-2002) using Dean and Lovely (2010)'s concordance. We utilized information on firms' registered type (variable *dengji zhuce leixing*) to construct ownership categories.[3] As with Brandt et al. (2017), if a firm had mixed ownerships, we assigned the category with the largest ownership share in registered capital. Firms are divided into three categories: state-owned, foreign-invested, and privately owned, wherein foreign-invested firms included subsidiaries of firms from Hong Kong, Macao, or Taiwan, along with wholly invested-foreign enterprises and joint ventures with local governments (JVs).

2.1.2. Provincial Corruption Data

We used filed corruption cases as a proxy for the provincial corruption level of mainland China. Both the number of registered cases and the number of registered cases of corruption per hundred public officials were utilized. The corruption cases documented by the Supreme People's Procuratorate of China in the *Procuratorial Yearbook of China* were the only panel data available on corruption in China. The filed cases were negatively related with usual anti-corruption indexes, such as expenditure by local government on police, procuratorate, court, and judiciary, which qualified them as proxies for the degree of corruption in China (Dong & Torgler, 2013; Jiang & Nie, 2014). Similar measures had been adopted in previous studies about the U.S. (Fisman & Gatti, 2002; Glaeser & Saks, 2006) and Italy (Del Monte & Papagni, 2007). To deal with the potential measures of error and possible endogenous problems in regressions, data of government audits targeted at inspecting illegal or irregular behavior of government departments and information of key provincial anti-corruption bureau leaders were collected, especially from the Provincial Secretary of the Committee for Discipline Inspection, e.g., work experience, position in the Communist Party system, etc., as instrument variables for the corruption index. The raw data was collected mostly from the *Chinese Party and Government Leading Cadres Database*[4] and partially from China's search engine giant, Baidu (a Chinese version of Google).

2.1.3. Product-level Trade Data

Tariff data was available directly from the WTO and the trade analysis and information system. China's tariff data were available at the harmonized system (HS) six-digit disaggregated level for 1998–2007. Following Brandt et al. (2017), we map the six-digit level of the HS product classification into the CIC system at the four-digit level, to correspond with the product-level tariff data for analysis.

2.2. Measures

2.2.1. TFP

Our key dependent variable is the firm-level TFP. Two classical approaches have been popular and widely used to calculate firm-level TFP. Olley and Pakes (1996) developed an approach that measured TFP by its investment function (OP method). Levinsohn and Petrin (2003) developed another approach that estimated the TFP by its intermediate input function (LP method). However, these two approaches have been identified as suffering from functional dependence problems, e.g., the labor function depending on other key factors (Ackerberg et al., 2015).

To avoid such problems, we applied the ACF method (developed by Ackerberg, Caves, and Frazer 2015) to estimate firm-level TFP. The main difference between ACF method and OP or LP approaches is that ACF inverts "conditional" rather than "unconditional" input demand functions to control for unobserved productivity. Consequently, coefficients on variable inputs, e.g., labor, do not have to be identified in the first stage and all coefficients will be estimated in the second stage, avoiding the functional dependence issues in the LP/OP first stage.

2.2.2. Corruption

One of our key independent variables is the provincial corruption proxy, which can be represented by either filed corruption cases or filed corruption cases per hundred public officials. The corruption cases filed include embezzlement and bribery. During our sample period of 1998–2007, all the embezzlement or bribery with an amount above 5,000 Chinese yuan shall be filed and investigated

[3] Stipulations on how to distinguish firm ownerships between registered types can be found in the website of China's NBS: http://www.stats.gov.cn/tjsj/tjbz/200610/t20061018_8657.html.

[4] http://ldzl.people.com.cn

by the procuratorate according to the law. According to the Criminal Law of the People's Republic of China, a state functionary who, by taking his office to take public money or property into his own possession, and any person authorized by State organs, State-owned companies, enterprises, institutions, or people's organizations to administer and manage State-owned property who, by taking his office illegally takes said property into his own possession shall be regarded as being guilty of embezzlement. Additionally, any State functionary who takes advantage of his position to extort money or property from another person, or illegally accepts another person's money or property in return for securing benefit for the person, and any State functionary who, in economic activities, violates State regulations by accepting rebates or services charges of various description and taking into his own possession shall be regarded as guilty of acceptance of bribes. In addition, for avoiding the potential endogeneity problems caused by using this variable, three instrument variables (the amount of violations identified in government audits, provincial anti-corruption bureau leaders' previous experience in anti-corruption institution, and position in provincial government) were selected based on the government audit data and the main anti-corruption leaders' experiences.

2.2.3. Import Liberalization

Two kinds of measures are used to capture the effect of import liberalization on firm TFP. First, import tariff at the CIC4 (the four-digit) industry level, both input and output import tariffs, are calculated[5]. Intuitively, the lower the industry import tariffs, the higher the import liberalization. Second, imports at the firm level, such as total imports, imports for intermediate goods, capital goods, raw materials, and household consumption goods are identified by the UNSD's classification of Broad Economic Categories.

The definitions and measures of other variables can be found in Table 1. The statistical features of sample are shown in Table 2.

Insert Tables 1 and 2 about here.

3. Empirical Specification

To investigate the effects of corruption on firm productivity, the following empirical framework as a benchmark model is considered:

$$TFP_{it} = \beta_1 Corruption_{pt} + \mathbf{X\beta} + \varepsilon_i + \varepsilon_p + \varepsilon_j * \varepsilon_t + \varepsilon_{it} \quad (1)$$

The dependent variable is firm-level TFP which is computed by the above-mentioned ACF method. Provincial filed corruption cases per hundred local officials (CRPTR) are used as corruption indexes[6]. ε_i, ε_p, and $\varepsilon_j \times \varepsilon_t$ stand for time-invariant firm fixed effect, provincial fixed effect, and time-variant two-digit industry fixed effect. X stands for control variables. ε_{it} stands for random errors of individual firm. To investigate the mechanism of corruption on firm productivity, Equation (1) was extended by including concerned intermediate variables on the right side, such as industry-level tariffs and different types of firm-level imports (imports for intermediate goods and capital goods and their interaction terms with corruption indexes). Consistent with Bertrand et al. (2004) and Amiti and Konings (2007), standard errors were clustered at the firm level to deal with the potential heteroscedasticity and serial autocorrelation.

[5] Please see Brandt et al. (2017) for the detailed method of computing China's input and output tariff at four-digit CIC level.

[6] Total corruption cases have been employed in the analysis, and the results are robust. However, total corruption cases are related with the number of officials in the province. CRPTR will be better to capture the true level of corruption.

4. Estimation Results

4.1. Baseline Results

4.1.1. Average Effect

Table 3 reports the baseline relationship between domestic corruption and the TFP of manufacturing firms in China. Fixed effect at the firm, province, and two-digit industry levels by year are controlled, and standard errors are clustered at the firm level in all regressions. Columns (1)–(3) present the results of provincial corruption cases per hundred local officials (CRPTR) on firm TFP. All results show that corruption has a statistically negative effect on firm-level TFP. After controlling the firm's industrial value added (IVA), the results of the firm's capital–labor ratio (KLR) and new products (NEW)[7], which are significantly related to the firm-level TFP, stay robust. The coefficient of corruption is stable around −0.02, which means a 1% increase of corruption will reduce the firm-level TFP by 0.02 on average; this also means a 1.86% loss at the mean value of the firm TFP. Overall, the firm IVA, capital–labor ratio, and new products have a positive effect on firm TFP. The result with corruption measured by filed corruption cases are reported in Appendix Table 1.

Insert Table 3 about here

4.1.2. Ownership Heterogeneity

First, firms with different ownership types may behave differently in their performance for various probabilities in either confronting or suffering from corruption. China's transition from a centrally planned, dominated economic system to a market economy complicated the relationship between the government and the firms. SOEs forged embedded and enduring relationships with local governments, which may protect them from market obstacles and government intervention. Usually, they enjoy some privileged access to resources in underdeveloped markets. The Chinese government usually serves foreign-invested enterprises (FIEs) as honored guests as local governments prioritize attracting FDI (foreign direct investment) and must compete with each other to attract the investment. However, privately owned enterprises (POEs) are considered to have some disadvantages in the relationship with the government and in accessing resources or markets (Brandt & Li, 2003; Cull et. al, 2015; Ge & Qiu, 2007). Table 4 presents the results of corruption's effect on performance of firms with different kinds of ownership. The coefficients of corruption are negative in all columns, but only significant for POEs and FIEs. The coefficient of FIEs is −0.013, the magnitude of which is smaller than half of POEs' −0.033. The result with corruption measured by filed corruption cases for different types of firm are reported in Appendix Table 2, which stays robust. On average, the results show that the TFP of SOEs suffers little; even FDI is welcomed by local governments in China, and the TFP of FIEs accepts negative effects from corruption. This result helps explain why multinationals investing in China prefer to invest in those regions that have lower level of government corruption (Du et. al, 2008). Even in such a fast-growing economy, POEs suffer the most from corruption. On average, the TFP loss from a 1% increase in government corruption of the POEs is twice those of the FIEs. Moreover, the coefficients of firm IVA are significantly positive for POEs and FIEs but significantly negative for the SOEs. Given China's imperfect market economy, this means the expanding of non-SOEs positively affects productivity, whereas the expanding of SOEs negatively affects productivity. The coefficients of the capital–labor ratio and new products are positive but not significantly in some regressions.

Insert Table 4 about here

[7] Because of the missing data problem of firm R&D during 1998–2000 and 2002–2004 in the dataset, firm new products data is used to control the R&D effect, which is only missing in 2004. To ensure the proxy will not bias the results, the subsample data with full R&D data is also analyzed. The regression results controlling firm R&D are in Appendix Table 5. The results are robust.

4.2. Endogeneity Issues

Dummy variables for firms, provinces, and two-digit industries×years are controlled to remedy potential problems of endogeneity. The results are robust; however, there are still potential endogeneity problems that might contaminate the results in two ways. First, there may be some missing variables that cannot be remedied by fixed effects. Second, reverse causality problem may make our findings ambiguous. To clear up these concerns, we apply IV regressions. China's political system is characterized with top-down controls and supervision. Key local leaders such as mayors and party secretaries are nominated, supervised, and evaluated by the upper-level leaders. Their career concerns depend on the evaluations and connections in the bureaus (Jia et al., 2015; Li & Zhou, 2005). Therefore, regional corruption should be highly related with political supervision. Two kinds of instrumental variables are selected in the paper.

First, the amount of violation identified in government ***Audits***. The National Audit Office of China and its provincial branches regularly audit the departments and affiliations of local governments every year. The number of units audited and violations identified in the government audits of each province are recorded in the *China Audit Yearbook* series. Empirical studies show that increased audits will reduce government corruption (Olken, 2007), and releasing the audit reports of local governments publicly has been proven to be a good measure to monitor government corruption in Brazil (Ferraz & Finan, 2008). According to the official introductions, the audit system of China shoulders the duty of monitoring the government branches and key government leaders to maintain regularity and avoid corruption. We believe that the amount of violation identified in audits is correlated with corruptions and exogenous with firm's behavior, which qualifies them to be instrument variables for the provincial corruption indexes.

Second, two dummy variables coded from anti-corruption leaders' (the Provincial Secretary of the Committee for Discipline Inspection) characteristics. The Committee for Discipline Inspection is one key supervisory institution for officials, tasked with enforcing internal rules and regulations and combating corruption and malfeasance in the Communist Party. As the vast majority of officials at all levels of government are also Communist Party members, the commission is, in practice, the anti-corruption body in China. The leaders of such institutions have great influence on local corruption. Thus, information from every in-office Provincial Secretary of Committee for Discipline Inspection (PSCDI) was collected for the sample period, such as work experience and position in the provincial government, as instrument variables for the corruption index. The secretaries are mainly nominated, appointed, and evaluated by the upper-level Committee for Discipline Inspections. The characteristics of these secretaries have great influence on local anti-corruption policies and enforcements but no direct influence on the local firms' behavior. This qualifies the coded information of PSCDI as instrument variables for the provincial corruption indexes. Two dummy instrument variables were generated. ***DS***, a dummy variable, equals 1 if the secretary serves as Deputy Secretary of the Provincial Party Committee at the same time and 0 if not. The double positions mean more power in inspecting corruptions. ***Experience***, another dummy variable, equals 1 if the secretary's work experience is mainly in the supervisory department before taking the position and 0 if not. Experience may influence the effect of corruption inspection.

We apply TSLS regressions with each instrument separately. For brevity, we report the results with ***Audits*** as IVs in the text and report the results with dummy IVs in the appendix. Table 5 reports the results of the first-stage regressions with the amount of violations identified in audits as IV. Columns (1)–(4) in Table 5 show that instrumental variables are significantly and negatively related with corruption cases averaged by the number of local officials. Consistent with the existing literature, the results of the first-stage regressions confirm that government audits help reduce corruptions (Olken, 2007). F-test values much larger than 10 signify the validity of IVs.

Insert Table 5 about here

Table 6 reports results of the second-stage regressions with the ***Audits*** as IVs. For all kinds of firms pooled together, Column (1) shows that the coefficient of corruption index is significantly negative, while its magnitude is larger than those of OLS regression results in Table 3. For the SOEs, Column (2) shows that the coefficient of corruption index is negative but not significant with firm TFP, similar to the result in Table 4. For the POEs, Column (3) shows that the coefficient of the corruption index is significantly negative, while the magnitude is larger than those of OLS regression results in Table 4. For the FIEs, Column (4) shows that that coefficient of corruption index is significantly negative, while the magnitude is larger than those of OLS regression results in Table 4. In Table 6, the magnitude of coefficient of corruption index in Column (4) is smaller than those in Column (3). The results of IV regressions confirm the results in baseline regressions. The results with the ***Audits*** as IVs are essentially robust when filed corruption cases are used that are reported in Appendix Table 3 and Appendix Table 4 for first-stage and second-stage regressions, respectively.

Therefore, corruption causes significantly negative effects on firm TFP, the SOEs suffer little, the FIEs suffer in some degree, and the POEs suffer the most. The results are confirmed in Appendix Table 6 with ***DS*** as IV and in Appendix Table 7 with ***Experience*** as IV. The results are robust.

The results of IV regressions also confirm that the coefficients of IVA of SOEs are significantly negative. On average, the expanding of SOEs has a negative effect on firm TFP, whereas the expanding of the non-SOEs has a positive effect. The coefficients confirm that the capital–labor ratio and new products or R&D have positive effects on TFP.

Insert Table 6 about here

4.3. Effects with More Firm Heterogeneity Information

4.3.1. Exporting Status

The existing studies have found that differences in productivity may exist between exporters and non-exporters, between domestic and foreign-invested firms, and among firms in different sectors (Bernard et al., 1999; Blalock & Gertler, 2004; Brandt et al., 2017; Dai et al., 2016; Lu et al., 2010). We group the firms by exporting or non-exporting to investigate the effects of corruption on firm TFP. The results with ***Audits*** as IV in regressions are reported in Table 7. Columns (1) and (2) in Table 7 show that the coefficients of corruption are significantly negative, and the magnitudes are close to the results in the IV regressions on pooled data reported in Table 6. Our observations show that neither exporting nor non-exporting firms are safe from corruption.

Insert Table 7 about here

4.3.2. Firm Size

Corruption and other legal problems have different effects on firms depending on a firm's size (Beck et al., 2005). In confronting corruption, firms with greater bargaining power may pay fewer bribes (Svensson, 2003). The firms were grouped by the official firm size category of the ASIP to investigate the effects of corruption on TFP[8]. The results with *Audits* as IV in regressions are reported in Table 8. Column (1) in Table 8 shows that the coefficient of corruption for officially defined "Large" firms is negative but not significant. The coefficient of corruption for the "Medium" firms in Column (2) and that of the "Small" firms in Column (3) are significantly negative. Overall, larger firms suffer little from corruption, whereas small- and medium-sized firms suffer a lot.

Insert Table 8 about here

4.3.3. Quantile Regressions

Corruptions may diverge the investments and managerial efforts of the firm from innovative activities to non-innovative activities (Paunov, 2016; Dal Bó & Rossi, 2007), but the marginal TFP loss may be different for firms with heterogeneous productivity. Firms are grouped by the TFP

[8] According to the No. 17 Document of the National Bureau of Statistics of China (NBS [2003] No. 17) "Statistical Measures for the Classification of Large, Medium and Small-sized Enterprises (Interim)," enterprises that meet all of the following three requirements are classified as large-scale enterprises (labeled as Large in this paper): More than 2,000 employees are employed, sales of more than 300 million, with total assets of more than 400 million RMB. Enterprises that meet all of the following three requirements are listed as medium-sized enterprises (Medium in this paper): the number of employees up to 300,000 and sales between 30 and 300 million, total assets of 40–400 million. Companies that do not meet the above conditions are small businesses (Small in this paper).

quantiles in regressions. The results of quantile regressions with *Audits* as IV are reported in Table 9. Columns (1)–(4) in Table 9 show that the coefficients of corruptions are significantly negative for all quantiles. On average, the magnitudes are much larger in the higher half than those in the lower half. Columns (1) and (2) show that the magnitudes of the highest 25% and second highest 25% are between 0.15 and 0.20. Columns (3) and (4) show the magnitudes of the lowest 25% and second-lowest 25% are between 0.05 and 0.10. Column (1) shows that the magnitudes of the highest 25% are the largest. Overall, the more productive firms suffer more TFP loss from corruption. This is easily understood, just like the fact that a more productive boss' time is much expensive.

Insert Table 9 about here

4.4. Discussion of Mechanisms

As mentioned in previous sections, corruption may influence firm TFP through import liberalization. This paper investigates this channel by including the import liberalization indexes on the right side of Equation (1), as follows:

$$TFP_{it} = \beta_1 Corruption_{pt} + \beta_2 Corruption_{pt} * ImportLib_{ijt} + X\beta + \varepsilon_i + \varepsilon_p + \varepsilon_j * \varepsilon_t + \varepsilon_{it} \quad (2)$$

Two kinds of measures are used to capture the mechanism of import liberalization (***ImportLib***) on firm TFP. First, input tariff (***ITariff***) and output tariff (***YTariff***) at CIC4 industry level are measured respectively in Equation (2). Second, different types of imports at the firm level are measured (***TM***, firm-level total imports; ***InteM***, firm-level imports of intermediate goods; ***CapiM***, firm-level import of capital goods; ***MateM***, firm-level imports of raw materials; and ***ConsM***, firm-level imports of household consumption goods). All measures are used in the natural logarithm form in regressions. Tables 10 and 11 report the results of regressions with ***Audits*** as IV, respectively.

Table 10 shows the results of industry-level import liberalization measures. Firstly, for the input import liberalization, Column (1) shows that the coefficient of corruption is significantly negative, that of input import liberalization is significantly negative, and of the interaction term is significantly positive. On average, the reduction of industry-level input tariff has a positive effect on firm TFP, but the productivity gains will be reduced by corruption. These are confirmed by the results in Column (3) of POEs and the results in Column (4) of FIEs. However, Column (2) shows that the coefficients of corruption, industry-level input import tariff, and the interaction term are not significant for SOEs. Preliminarily, the SOEs enjoy relatively good accessibility to inputs even when there are cases of corruption, so the import liberalization has no obvious effect on TFP. Secondly, Column (1) also shows that the coefficient of output import liberalization is significantly positive and that of the interaction term with corruption is significantly negative. On average, the reduction of industry-level output import tariff has negative effect on firm TFP, but the loss may be mitigated by corruption. Again, these are confirmed by the results in Column (3) of POEs and the results in Column (4) of FIEs but not by the results in Column (2) of SOEs. Overall, the results in Table 10 confirm that the TFP gains received from import liberalization accept negative impacts from corruption, especially for private and foreign firms.

Insert Table 10 about here

Table 11 shows the results with more firm-level import information in regressions. Columns (1) and (2) show the coefficients of corruption are significantly negative for both importing and non-importing firms. The magnitude of non-importing firms is larger than those of the importing firms. To probe how TFP is further influenced by corruption, more firm-level import information is regressed. For such firm-level import information availability, the sample is limited to importing firms only through columns (3) and (4). Column (3) shows that the coefficient of a firm's total imports is significantly positive and that of the interaction terms with corruption is significantly negative. On average, importing has a positive effect on firm TFP at the micro level, but corruption dampens the productivity gains. Column (4) includes more detailed firm importing-category information in regressions. The results show that the coefficients of all categories of imports are positive, that of intermediate goods, imports, capital goods, and household consumption goods are significant, whereas that of raw material imports is not. The coefficient of corruption of the interaction terms with different categories of imports is significantly negative for imports of intermediate goods, whereas the others are not significant. On average, the importing of intermediate goods, capital goods, and household consumption goods has a positive effect on firm TFP, whereas the effect of raw material importation is negative. More intermediate goods imported by the firm equals more productivity gained by the firm, but the gains will be reduced by corruption. The results confirm those in previous sections and are robust.

Insert Table 11 about here

5. Conclusions

This paper first addressed a gap in literature by examining the relation between domestic corruption and firms' productivity gains for China with consideration of firm heterogeneity. Using China's firm-level data along with subjective corruption measures at the provincial level, the corruption was found to have a significant negative effect on firm's TFP. The SOEs suffered little, whereas FIEs suffered to some degree, but POEs suffered the most from corruption. There is no significant difference in the negative effects of corruption on firm's TFP for exporting and non-exporting firms. Larger firms are relatively safe from the effects of corruption, but small- and medium-sized firms tend to suffer more productivity loss due to corruption. Quantile regressions show that more productive firms suffer more productivity loss from corruptions, whereas lesser productive firms suffer relatively less.

More importantly, in the era of free trade, taking advantage of imported intermediate goods and services in production has become an important way for firms to improve productivity and cope with increasingly fierce competition in both domestic and international markets. However, the extent to which firms can benefit from import liberalization depends not only on their own efforts but also on the domestic institutional environment and factors such as the corruption level of the government, in which firms are involved or related. This paper found that the higher the degree of provincial corruption, the lower the productivity gains from import liberalization. Both evidences from industry-level and firm-level measures show that input import liberalization improves firm productivity, but the productivity gains will be significantly reduced by domestic corruption. Micro evidence from firm-level imports in different categories confirms that importing results in productivity gains, especially the import of intermediate goods, but those gains will be diminished by corruption.

Our finding implies that China can gain more productivity improvement from import liberalization if more anti-corruption measures are taken. The control of regional corruption and import liberalization policies are all in the hands of the government but still far from firms' expectations. More public policy support needs to be provided especially to private and small-sized firms since they are the most vulnerable to corruption in China. More generally speaking, developing countries may make better use of import liberalization to improve productivity by making their domestic institutions healthier by reducing domestic corruption, especially in such turbulent international environment as now, given the recent emergence of populist and protectionist movements.

Additionally, various fixed effects concerning province, year, and industrial sector are used in all regressions with standard errors clustered at the firm level. To further deal with the potential endogeneity problems such as measurement error and reverse causality, instrumental variable regressions were applied. The government audits and personal characteristics of key anti-corruption institution leaders are highly relevant with respect to local corruption but have no direct influence on firm productivity. Accordingly, three instrumental variables for corruption indexes were generated, such as the amount of violations identified in government audits, provincial anti-corruption bureau leaders' previous experience in anti-corruption institution, and position in provincial government. Two-stage least square regressions were applied. The first-stage results and F-test values upheld the validity of the instrumental variables, whereas the second-stage results showed the findings to be robust.

Finally, the impact of the recent anti-corruption campaign that Chinese government launched in late 2012 was not investigated in the paper. This is mainly because 1) the empirical results in most existing literature concerning China's firm-level productivity measures and corruption-related issues can be compared with ours as they are based on the same ASIP data with the same period (1998–2007) such as Brandt et al. (2012, 2017) and 2) some key variables essential for calculating firm productivity, such as IVA and industrial intermediate input, are missing in the ASIP data after 2007. However, the most recent literature that investigates the impact of the anti-corruption campaign indirectly supports some conclusions obtained in this paper. For example, Li et al. (2018) find that SOEs, large firms, or politically connected firms earn lower returns than private, small, or non-politically connected firms as a response to the announcement of strong anti-corruption actions; existing local institutions play a crucial role in determining the announcement returns across firms. Ding et al. (2017) show that the recent anti-corruption investigations in China are associated with credit reallocation from less productive SOEs to more productive non-SOEs. It should be noted, both papers mentioned above are based on a relatively small sample size collected from the China Stock Market (covering 2,258 and 1,560 firms respectively), which is very different from our nationwide approach covering more than 200,000 firms (more than 90% of Chinese manufacturing output, exports, and fixed assets). Moreover, concerning the information for corruption, Li et al. (2018) uses an event study approach and the announcement of anti-corruption inspection to be conducted by the Central Commission for Discipline Inspection as the event date, rather than direct information from corruption itself; Ding et al. (2018) restrict corruption sample to only 78 senior government officials who hold positions at or above deputy minister level at the central government and deputy governor level at the provincial government. Meanwhile, this study covers all the filed corruption cases in which the amount of embezzlement and bribery investigated is above 5,000 Chinese yuan. In this sense, our paper provided more robust results with universal significance.

Tables

Table 1: Variable definition

Variable	Definition	Variable level
TFP	TFP measured by ACF method using CD production function	Firm level
CRPTR	Corruption cases per hundred government officers	Provincial level
Ln CRPT	Natural log of corruption cases	Provincial level
Ln Audits	Natural log of audit money of violation	Provincial level
Ln IVA	Natural log of industrial value added	Firm level
Ln KLR	Natural log of capital labor ratio	Firm Level
Ln New	Natural log of new products	Firm level
Ln ITariff	Natural log of input tariff	CIC4 Industry level
Ln YTariff	Natural log of output tariff	CIC4 Industry level
Ln TM	Natural log of total imports	Firm level
Ln InteM	Natural log of imports of intermediate goods	Firm level
Ln CapiM	Natural log of imports of capital goods	Firm level
Ln MateM	Natural log of imports of materials	Firm level
Ln ConsM	Natural log of imports of consumption goods	Firm level

Table 2: Descriptive statistics

stats	N	Mean	Min	Max	Median
TFP	1823872	1.076	-0.798	4.964	1.059
CRPTR	1880602	0.534	0.038	3.080	0.381
Ln CRPT	1880602	7.262	3.664	8.311	7.360
Ln Audits	1880602	11.154	6.677	14.793	11.007
Ln IVA	1636731	8.563	0.000	17.467	8.483
Ln KLR	1856793	3.447	-6.986	14.123	3.509
Ln New	1636733	2.397	0.000	18.516	0.000
Ln ITariff	1880602	2.142	1.072	3.344	2.098
Ln YTariff	1880602	2.455	0.000	4.190	2.462
Ln TM	206996	13.018	0.693	24.528	13.427
Ln InteM	206996	10.928	0.000	23.789	12.395
Ln CapiM	206996	5.580	0.000	23.726	0.000
Ln MateM	206996	1.054	0.000	22.048	0.000
Ln ConsM	206996	4.710	0.000	21.260	0.000

Note: For import-related variables such as Ln TM, Ln InteM etc., only observations for importers are reported.

Table 3: Baseline regression, OLS

	(1)	(2)	(3)
CRPTR	-0.024***	-0.022***	-0.021***
	(0.001)	(0.001)	(0.001)
Ln IVA		0.012***	0.013***
		(0.000)	(0.000)
Ln KLR			0.004***
			(0.000)
Ln New	0.001***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
FE	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y
adj. R^2	0.971	0.972	0.973
N	1484420	1484417	1466917

Note: Standard errors clustered at firm level are reported in parentheses. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. F represents firm FE, P represents province FE, and I2#Y represents two-digit CIC industry by year FE.

Table 4: Regression by firm type, OLS

	(1) SOE	(2) POE	(3) FIE
CRPTR	-0.004	-0.033***	-0.013***
	(0.003)	(0.002)	(0.002)
Ln IVA	-0.017***	0.024***	0.015***
	(0.001)	(0.000)	(0.000)
Ln KLR	0.015***	0.000	0.002***
	(0.001)	(0.000)	(0.000)
Ln New	0.000	0.000***	0.001***
	(0.000)	(0.000)	(0.000)
FE	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y
adj. R^2	0.961	0.978	0.975
N	153359	497876	317305

Note: See the notes for Table 3.

Table 5: IV (Audits) result for baseline and for different firm types, first stage

	(1) CRPTR Whole	(2) CRPTR SOE	(3) CRPTR POE	(4) CRPTR FIE
Ln Audit	-0.018***	-0.005***	-0.013***	-0.022***
	(0.000)	(0.000)	(0.000)	(0.000)
Ln IVA	-0.006***	-0.017***	-0.009***	-0.003***
	(0.000)	(0.001)	(0.000)	(0.000)
Ln KLR	-0.003***	0.000	-0.002	-0.004***
	(0.000)	(0.001)	(0.000)	(0.000)
Ln New	0.001***	-0.000	0.002***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
FE	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y
F statistic	2906..04	32.21	843.14	589.64
adj. R^2	0.968	0.969	0.977	0.965
N	1466917	153359	497876	317305

Note: See the notes for Table 3.

Table 6: IV (Audits) result for baseline and for different firm types, second stage

	(1) Whole	(2) SOE	(3) POE	(4) FIE
CRPTR	-0.126***	-0.093	-0.145***	-0.090***
	(0.007)	(0.101)	(0.015)	(0.012)
Ln IVA	0.012***	-0.017***	0.023***	0.015***
	(0.000)	(0.001)	(0.000)	(0.000)
Ln KLR	0.003***	0.015***	0.000	0.001***
	(0.000)	(0.001)	(0.000)	(0.000)
Ln New	0.001***	0.000	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
FE	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y
adj. R^2	0.979	0.970	0.985	0.981
N	1466917	153359	497876	317305

Note: See the notes for Table 3.

Table 7: Results by exporting status, IV (Audits)

	(1) Exporting	(2) Non-Exporting
CRPTR	-0.129***	-0.121***
	(0.010)	(0.011)
Ln IVA	0.015***	0.011***
	(0.000)	(0.000)
Ln KLR	0.002***	0.004***
	(0.000)	(0.000)
Ln New	0.001***	0.000***
	(0.000)	(0.000)
FE	F,P,I2#Y	F,P,I2#Y
adj. R^2	0.982	0.980
N	397420	1018922

Note: See the notes for Table 3.

Table 8: Results by firm size, IV (Audits)

	(1) Large	(2) Medium	(3) Small
CRPTR	-0.125	-0.191***	-0.101***
	(0.088)	(0.023)	(0.008)
Ln IVA	0.022***	0.015***	0.012***
	(0.002)	(0.001)	(0.000)
Ln KLR	0.008***	-0.000	0.003***
	(0.002)	(0.001)	(0.000)
Ln New	0.001***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
FE	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y
adj. R^2	0.989	0.988	0.981
N	30918	123898	1177379

Note: See the notes for Table 3. Firms are classified into large, medium and small based on the standards of ASIP.

Table 9: Quantile regressions, IV (Audits)

	(1)	(2)	(3)	(4)
	Q4	Q3	Q2	Q1
CRPTR	-0.190***	-0.158***	-0.051***	-0.072***
	(0.020)	(0.015)	(0.009)	(0.012)
Ln IVA	0.030***	0.012***	0.005***	-0.000
	(0.001)	(0.000)	(0.000)	(0.000)
Ln KLR	0.013***	0.001***	0.001***	-0.005***
	(0.001)	(0.000)	(0.000)	(0.000)
Ln New	0.001***	0.001***	0.000***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
FE	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y
adj. R^2	0.911	0.831	0.841	0.983
N	334340	306679	336201	346456

Note: See the notes for Table 3. Q4 represents the highest 25% observations according to TFP level, and Q1 represents the lowest 25%.

Table 10: Industry-level input and output tariff, IV (Audits)

	(1) Whole	(2) SOE	(3) POE	(4) FIE
CRPTR	-0.648***	1.989	-0.477***	-3.850***
	(0.046)	(7.460)	(0.059)	(1.078)
CRPTR*Ln ITariff	0.189***	-0.389	0.127***	1.079***
	(0.014)	(1.596)	(0.020)	(0.309)
CRPTR*Ln YTariff	-0.014***	-0.045	0.001	0.014
	(0.004)	(0.028)	(0.008)	(0.012)
Ln ITariff	-0.060***	0.297	-0.023	-0.500***
	(0.009)	(0.937)	(0.015)	(0.152)
Ln YTariff	0.005**	0.017	-0.005	-0.014**
	(0.002)	(0.011)	(0.005)	(0.006)
Ln IVA	0.012***	-0.016***	0.024***	0.014***
	(0.000)	(0.002)	(0.000)	(0.001)
Ln KLR	0.004***	0.016***	0.001*	0.002***
	(0.000)	(0.002)	(0.000)	(0.001)
Ln New	0.001***	0.000	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
FE	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y
adj. R^2	0.968	0.884	0.977	0.893
N	1439546	146552	490474	310450

Note: See the notes for Table 3.

Table 11: Firm-level imports in different types, IV (Audits)

	(1) Importing	(2) Non-Importing	(3) Importing	(4) Importing
CRPTR	-0.058***	-0.116***	-0.012	-0.040***
	(0.011)	(0.008)	(0.012)	(0.013)
CRPTR*Ln TM			-0.003***	
			(0.001)	
CRPTR*Ln InteM				-0.001**
				(0.001)
CRPTR*Ln CapiM				-0.000
				(0.000)
CRPTR*Ln MateM				0.001
				(0.001)
CRPTR*Ln ConsM				-0.000
				(0.000)
Ln TM			0.002***	
			(0.000)	
Ln InteM				0.001***
				(0.000)
Ln CapiM				0.000***
				(0.000)
Ln MateM				0.000
				(0.000)
Ln ConsM				0.000***
				(0.000)
Ln IVA	0.015***	0.012***	0.014***	0.014***
	(0.001)	(0.000)	(0.001)	(0.001)
Ln KLR	0.002**	0.004***	0.002**	0.002**
	(0.001)	(0.000)	(0.001)	(0.001)
Ln New	0.001***	0.000***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
FE	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y
adj. R^2	0.979	0.972	0.979	0.979
N	140088	1268928	140088	140088

Note: See the notes for Table 3.

Appendix Table 1: Baseline regression re-estimated with Ln CRPT, OLS

	(1)	(2)	(3)
Ln CRPT	-0.020***	-0.018***	-0.018***
	(0.001)	(0.001)	(0.001)
Ln IVA		0.012***	0.013***
		(0.000)	(0.000)
Ln KLR			0.004***
			(0.000)
Ln New	0.001***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
FE	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y
adj. R^2	0.971	0.972	0.973
N	1484420	1484417	1466917

See the notes for Table 3.

Appendix Table 2: Regression by firm type re-estimated with Ln CRPT, OLS

	(1)	(2)	(3)
	SOE	POE	FIE
Ln CRPT	-0.001	-0.033***	-0.018***
	(0.003)	(0.002)	(0.002)
Ln IVA	-0.017***	0.025***	0.015***
	(0.001)	(0.000)	(0.000)
Ln KLR	0.015***	0.000	0.002***
	(0.001)	(0.000)	(0.000)
Ln New	0.000	0.000***	0.001***
	(0.000)	(0.000)	(0.000)
FE	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y
adj. R^2	0.961	0.978	0.975
N	153359	497876	317305

Note: See the notes for Table 3.

Appendix Table 3: IV (Audits) result for baseline and for different firm types re-estimated using Ln CRPT, first stage

	(1) Ln CRPT Whole	(2) Ln CRPT SOE	(3) Ln CRPT POE	(4) Ln CRPT FIE
Ln Audit	-0.030***	-0.010***	-0.034***	-0.032***
	(0.000)	(0.001)	(0.000)	(0.000)
Ln IVA	-0.002***	-0.002***	-0.004***	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Ln KLR	-0.001***	0.002***	-0.001***	-0.001***
	(0.000)	(0.001)	(0.000)	(0.000)
Ln New	0.001***	-0.000	0.001***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
FE	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y
F statistic	8280.79	84.86	5024.48	1970.86
adj. R^2	0.983	0.982	0.984	0.984
N	1466917	153359	497876	317305

Note: See the notes for Table 3.

Appendix Table 4: IV (Audits) result for baseline and for different firm types re-estimated using Ln CRPT, second stage

	(1) Whole	(2) SOE	(3) POE	(4) FIE
Ln CRPT	-0.076***	-0.047	-0.055***	-0.061***
	(0.004)	(0.051)	(0.006)	(0.008)
Ln IVA	0.013***	-0.017***	0.024***	0.015***
	(0.000)	(0.001)	(0.000)	(0.000)
Ln KLR	0.004***	0.015***	0.000	0.002***
	(0.000)	(0.001)	(0.000)	(0.000)
Ln New	0.000***	0.000	0.000***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
FE	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y
adj. R^2	0.980	0.970	0.985	0.981
N	1466917	153359	497876	317305

Note: See the notes for Table 3.

Appendix Table 5: Using R&D instead of new products

	(1) Whole	(2) SOE	(3) POE	(4) FIE
CRPTR	-0.134***	0.107**	-0.509***	-0.052***
	(0.009)	(0.052)	(0.055)	(0.011)
Ln IVA	0.017***	-0.009***	0.020***	0.015***
	(0.000)	(0.002)	(0.001)	(0.001)
Ln KLR	-0.000	0.014***	-0.001***	0.000
	(0.000)	(0.002)	(0.000)	(0.001)
Ln R&D	0.001***	0.002***	0.001***	0.001***
	(0.000)	(0.001)	(0.000)	(0.000)
FE	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y
adj. R^2	0.986	0.976	0.984	0.986
N	778235	27907	359575	177462

See the notes for Table 3.

Appendix Table 6: Deputy Secretary of the Provincial Party Committee used as IV

	(1) Whole	(2) SOE	(3) POE	(4) FIE
CRPTR	-0.019**	0.137***	-0.052***	0.035*
	(0.008)	(0.040)	(0.014)	(0.020)
Ln IVA	0.013***	-0.017***	0.024***	0.016***
	(0.000)	(0.001)	(0.000)	(0.000)
Ln KLR	0.004***	0.015***	0.000	0.002***
	(0.000)	(0.001)	(0.000)	(0.000)
Ln New	0.000***	0.000	0.000***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
FE	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y
adj. R^2	0.980	0.970	0.985	0.981
N	1466917	153359	497876	317305

See the notes for Table 3.

Appendix Table 7: Previous working experiences used as IV

	(1) Whole	(2) SOE	(3) POE	(4) FIE
CRPTR	-0.035***	0.004	-0.072***	-0.018*
	(0.004)	(0.016)	(0.004)	(0.010)
Ln IVA	0.013***	-0.017***	0.024***	0.015***
	(0.000)	(0.001)	(0.000)	(0.000)
Ln KLR	0.004***	0.015***	0.000	0.002***
	(0.000)	(0.001)	(0.000)	(0.000)
Ln New	0.000***	0.000	0.000***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
FE	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y	F,P,I2#Y
adj. R^2	0.980	0.970	0.985	0.981
N	1466917	153359	497876	317305

See the notes for Table 3.

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