Corruption in Procurement: Evidence from Financial Transactions Data*

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Abstract

This paper develops a novel approach to measuring illicit payments of firms to politicians based on objective financial data from Russia. Firms with public procurement revenue substantially increase tunneling around regional elections, whereas neither the tunneling activity of firms without procurement revenue, nor the legitimate financial activity of firms exhibits a pronounced political cycle. We show that the correlation between tunneling around elections and procurement contacts across firms is an indicator of corruption. We use the variation in the strength of this correlation to build a locality-level measure of corruption. Using this measure, we test and reject the "efficient grease" hypothesis by showing that in more corrupt localities procurement contracts are allocated to less productive firms.

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1 Introduction

Does corruption improve efficiency by allowing most productive firms to get around inefficient red tape or, on the contrary, corruption gives an advantage to less productive firms with political connections, increasing productive inefficiency? In theory, both answers are possible (see, for instance, the survey by Aidt, 2003). The empirical research on this question, however, is rather limited. The lack of evidence is not surprising: bribes are unobservable and corruption is very difficult to measure. In this paper we develop a novel approach to measuring illegal payments of firms to politicians and show that when the allocation of procurement contracts depends on whether firms make such illegal payments, less productive firms get procurement contracts.

The last two decades saw a sharp increase in the body of research focusing on measuring corruption. Most measures of corruption are based on perceptions, such as expert opinions or surveys, in which individuals and firm managers are questioned about their assessment of corruption. Due to the secretive nature of corruption, in most cases, surveys do not give information sufficient to test hypotheses about the welfare effects of corruption (for difficulties of survey designs attempting to measure corruption see Reinikka and Svensson, 2006). Recognizing the problems with subjective evidence, recently, the literature turned to evaluating corruption using policy experiments (e.g., Reinikka and Svensson, 2004; Olken, 2006), natural experiments (e.g., Caselli and Michaels, 2009), and field experiments (e.g., Bertrand, Djankov, Hanna and Mullainathan, 2007; Olken, 2007; Ferraz and Finan, 2008). However, experiments that allow evaluation of the scale of corruption are rare and often cover a very specific area of corrupt economic activities.

The goal of our paper is to provide a reliable measure of corruption in public procurement based on objective data without narrowing the scope, namely, for the near-population of Russia'a large firms, and assess the welfare implication of corruption. For this purpose, we measure the amount of cash tunneled illegally out of firms around the time of regional elections and relate it to the probability that these firms obtain procurement contracts from the government. We find this relationship to be positive and very strong, on average, and show that it is related to corruption rather than the change in political risk associated with elections. The strength of correlation between tunneling around elections and the allocation of procurement contracts across firms varies across localities. We use this variation to measure the extent of corruption in public procurement and test the "efficient grease" hypothesis (Leff, 1964; Huntington, 1968), namely, that bribery is welfare improving as it allows more efficient firms to bypass the inefficient administrative regulations. We reject this hypothesis by showing that corruption leads to an efficiency loss in the allocation of public procurement.

The data that made this research possible come from a list of banking transactions of the near-population of business entities in Russia over a 6-year period available on the Internet, previously used by Mironov (2013). We identify tunneling (Johnson et al., 2000), i.e., the amount of transfers to fly-by-night firms set up to take cash out of companies, at each point in time for each legitimate firm. We apply the intuitive criterion that legitimate firms are those that pay taxes, whereas fly-by-night firms are those that have revenue, but do not pay taxes, even though they should be doing so according to Russian legislation. Banking transaction data allow us to observe taxes payed by firms and public procurement revenue of firms, as both show up among a firm's banking transactions. Using difference-in-differences methodology on data of the weekly frequency for all legitimate large firms in Russia, we show that illicit outflow of cash out of firms that get public procurement contracts exhibits a strong political cycle (i.e., transfers to fly-by-night firms increase sharply around regional elections in these firms). In contrast, there is no pronounced political cycle in tunneling out of firms without public procurement revenue. There is also no political cycle in legitimate economic activity, measured as banking transactions between legitimate firms. The increase in illicit cash payments around elections suggests that the money is channeled to politicians as the evidence is inconsistent with the alternative explanation that tunneling around elections is driven by the change in political risk of firms.

We postulate that the strength of correlation between tunneling around elections and allocation of procurement contracts across firms can be used to measure corruption in public procurement. As we can calculate this correlation at any level of aggregation, we perform a reality check on this approach at the regional level. A standard perception-based Transparency International

Regional Corruption Perception Index (CPI) is available for 40 (out of 89) Russia's regions. Using this index, we show that, in regions deemed more corrupt by Transparency International, the correlation between firms' tunneling around elections, on the one hand, and the amount of their procurement revenue, on the other hand, is significantly higher. This result confirms that our approach to measuring corruption is valid. However, in contrast to the Transparency International regional CPI index, our measure of corruption is based on objective data and available almost for the entire Russian economy at both sub-regional and regional level.

As the next step, we move to sub-regional (locality) level of aggregation to study how the efficiency of the allocation of public procurement depends on corruption. As mentioned above, we measure the level of corruption in each locality as the strength of the correlation between tunneling around elections and the probability of winning public procurement contracts. Using the variation in this measure of corruption across different localities within a region, we show that in more corrupt environments, public procurement contracts are allocated to less productive firms, controlling for region, industry, and even locality fixed effects. We conclude that corruption has negative welfare implications and is not just an example of "efficient grease." More productive firms lose competition for public procurement contracts when their allocation depends on the illicit payments to politicians.

We estimate the amount of cash tunneled to politicians that is associated with corrupt distribution of public procurement to be around 2.5 million U.S. dollars for an average election in an average Russian region. A firm with public procurement contracts on average tunnels out about 30,000 U.S. dollars more in two months around regional election compared to the same-length period away from elections. The case of the Moscow-based company Inteko, owned by Yelena Baturina, the wife of the former mayor of Moscow, Yury Luzhkov, illustrates that the amount of cash channeled to politicians by an average recipient of public procurement contracts in an average region is substantially smaller than for the most notorious corruption cases. According to *Forbes*, in 2010, Yelena Baturina was the richest woman in Russia and the third richest woman in the world. She made her fortune through procurement contracts and concessions allocated to her company, Inteko, by Moscow city government at the time when Baturina's husband was the mayor of Moscow (between 1992 and 2010).[1] Figure 1 presents outlays from Inteko to fly-by-night firms from the banking transactions data during the period starting six months before the election of Moscow mayor in December 2003 and ending six months after the presidential election of March 2004. The data show that tunneling activity is concentrated around elections. In particular, the two biggest incidents of transfers to fly-by-night firms from Inteko, in the amounts of 2.8 million U.S. dollars and 4 million U.S. dollars, occurred one week before the Moscow mayoral election and one month before the presidential elections, respectively. Altogether, in five consecutive months around these two elections (from November 2003 to March 2004), Inteko tunneled 10.3 million U.S. dollars to fly-by-night firms. This is an order of magnitude larger than the total sum tunneled during the five months preceding November 2003 and the five months starting April 2004. (The exact sum tunneled in these ten months outside election period is 1.1 million U.S. dollars). An average region in Russia is much poorer and has substantially smaller rents than the capital city of Moscow.[2]

Our main contribution is to the literature on corruption and its implications for welfare (e.g., Shleifer and Vishny, 1993, 1994). In particular, we contribute to the recent strand of empirical literature that attempts to provide systematic evidence of corruption using objective rather than

[1] *The New York Times* and *Forbes* magazine published a series of articles on Yelena Baturina and the source of her fortune. See, for instance, the following links: http://topics.nytimes.com/top/reference/timestopics/people/b/yelena_baturina/index.html; http://www.forbes.com/profile/elena-baturina/ and http://en.rian.ru/russia/20100615/159431047.html.

[2] The magnitude of illicit payments to politicians by businessmen seems even higher during the national-level elections: According to the testimony of a Russian tycoon Roman Abramovich in the London High Court of Justice, he together with another Russian tycoon, Boris Berezovsky, spent 50 million U.S. dollars illegally supporting presidential election campaign of Mr. Putin in 2000 (see *the Wall Street Journal* article "Russian Tycoons Face Off in Court," November 7, 2011).

perception-based measures (see, for instance, Di Tella and Schargrodsky, 2003; Reinikka and Svensson, 2004; Bertrand, Djankov, Hanna and Mullainathan, 2007; Olken, 2007; Fisman and Miguel, 2007; Butler, Fauver and Mortal, 2009; Caselli and Michaels, 2009; Cheung, Rau and Stouraitis, 2011; Ferraz and Finan, 2011). We provide objective evidence of corruption in the allocation of public procurement contracts for a comprehensive list of Russian large firms and show that corruption exacerbates inefficiencies. Previous estimates of corruption were based on perceptions or covered a much smaller segment of economic activity (see, for instance, work surveyed by Bardhan, 1997; Rose-Ackerman, 1999; Svensson, 2005; Olken and Pande, 2012).

Our study is also related to the large body of work on corruption associated with political connections (e.g., Fisman, 2001; Johnson and Mitton, 2003; Bertrand, Kramarz, Schoar and Thesmar, 2007; Khwaja and Mian, 2005; Faccio, 2006; Faccio, Masulis and McConnell, 2006; Leuz and Oberholzer-Gee, 2006). As is illustrated by the case of Inteko, political connections is one of the mechanisms behind the evidence presented in this paper. Our study is particularly related to the literature showing that political connections in part determine allocation of government procurement contracts (e.g., Goldman, Rocholl and So, 2011; Amore and Bennedsen, 2010).[3]

We also contribute to the literature on opportunistic political cycles (see, for instance, a survey by Drazen, 2001). This work focuses primarily on the correspondence between election cycles and benefits directed to voters (in the form of transfers and social expenditure). We document a political cycle in illegal cash payments that firms make to politicians in order to obtain procurement contracts. Related to our findings, Burgess et al. (2012) show a political cycle in another illegal activity which brings cash to politicians, namely, forest extraction in the tropics. Our finding that firms provide benefits to politicians in the face of elections is also related to Bertrand, Kramarz, Schoar and Thesmar (2007), who document that political connections are associated with political cycle in employment granted for the political benefit of

[3]In addition, there is a related body of research which shows benefits of official campaign financing for firms (e.g., Claessens, Feijen and Laeven, 2008; Cooper, Gulen and Ovtchinnikov, 2010).

incumbent politicians.

Our work is also related to the papers documenting political budget cycles for Russian gubernatorial elections (Akhmedov and Zhuravskaya, 2004), state capture at the regional level in Russia (Slinko, Yakovlev and Zhuravskaya, 2005; Guriev, Yakovlev and Zhuravskaya, 2010), and tunneling by Russian firms (Desai, Dyck and Zingales, 2007; Mironov, 2013). Our work has some methodological parallels with other papers which use unconventional data sources to provide empirical evidence on the questions that cannot be studied using conventional data (e.g., Levitt and Venkatesh, 2000; Guriev and Rachinsky, 2006; Braguinsky and Mityakov, Forthcoming; Braguinsky, Mityakov and Liscovich, 2011; Mironov, 2013, Forthcoming). Much of this work focuses on Russia because of data availability.

The paper proceeds as follows. In section 2, we describe the data. Section 3 presents evidence of a political cycle in illegal cash tunneled from companies that receive public procurement revenue and estimates the size of illicit payments to politicians associated with obtaining procurement contracts. Section 4 develops the methodology of measuring corruption using the association between illicit payments and receiving procurement revenue across firms and presents a test of this approach. In section 5, we use our measures of corruption show that corruption leads to inefficiency in the allocation of public procurement. In section 6, we conclude.

2 Data

2.1 Legitimacy and Reliability of the Banking Transactions Data

Our main data source is the dataset used by Mironov (2013). It is the dataset of banking transactions among legal entities in Russia between 1999 and 2004 allegedly leaked to the public domain from the Russian Central Bank in 2005 and available freely on the Internet. These data are available both for free and also for a symbolic payment from several websites: *www.vivedata.com*, *www.rusbd.com*, *www.wmbase.com*, *www.mos-inform.com*, *www.specsoft.info*, etc. The Russian press discussed widely the incident of appearance of these data in the public domain.[4] The websites that demand the symbolic payment primarily charge for the service they provided by formatting the dataset to make the data more easily accessible rather than for the dataset itself, as it is also available for free. As the data appeared in the public domain presumably without an official permission of the Central Bank of Russia, it is important to note that the Russian Government and Russian Central Bank are aware of the usage of these data by journalists and researchers and publicly discuss policy-relevant conclusions of the analyses based on the data (see, for instance, transcript of the Conference on Tax Evasion at the Ministry of Economy that took place in October of 2006 in Moscow). In addition, the authors of this paper received a request from the First Deputy Chairman of the Central Bank of Russia, Andrei Kozlov, and a Deputy Chairman, Viktor Melnikov, to write a policy memo explaining the methodology of identifying fly-by-night firms using the banking transactions data as developed by Mironov (2013). In this request, the top Central Bank officials refer to "the data set from the Internet" as a legitimate source of information and acknowledge that the research department of the Central Bank uses the same data.[5] The fact that the government and the Central Bank officials take the results of research based on these data seriously is an indication of the reliability of these data.

As far as the legal issues associated with the use of these data are concerned, no lawsuits have been initiated against any party for using these data in spite a fairly large circulation of the data and publications by both journalists and researchers.[6] Lawyers within the Ministry of Interior of Russian Federation, when commenting in the press on the legitimacy of these data, explained that the Russian Central Bank never admitted that any data were leaked from the Bank and,

[4]See, for instance, publication in the main Russian business daily *Vedomosti* on March 30, 2005.

[5]A copy of the letter is available from the authors upon request.

[6]For an example of a journalistic investigation using these data, see *Vedomosti* on May 20, 2005; for popular descriptions of research based on these data, see *Vedomosti* on July 24, 2006 and October 25, 2011. For research on similar datasets, see, for instance, Guriev and Rachinsky (2006) and Braguinsky, Mityakov and Liscovich (2011).

therefore, from a legal standpoint, all data sets in the public domain are legal and no dataset is considered as illegitimate.[7]

A detailed description of the data and several important reality checks on them were done in Mironov (2013). These reality checks lead to the following conclusions. First, the Banking Transactions data match rather well with the registry of Russian firms published by the Russia's official statistical agency *Rosstat* for the group of firms that actually pay taxes (i.e., legitimate firms, as defined precisely in the next section, and used as a unit of observation in the analysis that follows) and do not match for firms, which do not pay taxes (i.e., fly-by-nights, also as defined in the next section). Second, for the firms that are present both in the Banking Transactions data and the registry, firm characteristics – available in both data sets – exactly coincide, which is another important sign of the reliability of the data.

2.2 Sample and Variables

The banking transactions data for 2003 and 2004 were used by Mironov (2013) and come from *www.vivedata.com.* The data for 1999-2002 come from *www.rusbd.com.* The data set contains $513,169,660$ transactions involving $1,721,914$ business and government legal entities and self-employed entrepreneurs without a legal enterprise status, with information on the date of each transaction, its payer, recipient, the amount of each transaction, and the self-reported purpose of it.

Our aim is to test for a relationship between transfers to fly-by-night firms from regular non-government firms around elections, and the public procurements contracts that these regular

[7]See, for instance, *Financial-economic news* published by *Interfax*on April 1, 2005. See also an article, published in a journal specializing on covering the banking sector, *Bankovskoye Obozreniye (Banking Review)*, No. 11, November 2005, in which an economist from the Central Bank explains the phenomenon of the leakage of these data by the excessive regulation of secrecy and the lack of financial transparency regulations, he argues for the need to make the data officially public, see *http://bankir.ru/publikacii/s/provodki-cb-rf-vorovat-nelzya-pokypat-1378429/.*

firms receive. Thus, the amounts of tunneling and public procurement revenue are the two main variables in our analysis. Both of these variables are constructed from the list of banking transactions. We describe how we construct these variables below. As for the sample of firms, we take the universe of all entities present in the banking transaction data and eliminate all government and municipal entities, all firms with 100% state or municipal ownership, all financial institutions, all foreign companies and all self-employed entrepreneurs without a legal enterprise status. This procedure eliminates little over 85% of all entities present in the Banking Transactions data. The reminder is comprised of a near-population of domestic, non-financial, non-government business legal entities, which are the focus of our analysis. As we describe below, we further narrow the sample by eliminating firms of a small size, as they are both unlikely to get government procurement contracts and unlikely to use services of fly-by-night firms, thus, they just add noise to our estimation.

First, we follow Mironov (2013) and use these banking transactions data to measure the amount of transfers to fly-by-night firms each week in each of the years between 1999 and 2004 for each regular firm in our sample. Mironov (2013) developed the methodology of identifying fly-by-night firms, i.e., firms that have profitable banking transactions but pay no taxes, in the banking transactions data set. Intuitively, fly-by-night firms are those that do not pay taxes despite having transactions that require the payment of taxes according to Russian law. To be precise, firms are defined as fly-by-night when they satisfy all of the following three criteria: (i) the ratio of taxes paid to the difference in cash inflows and outflows is negligible (i.e., below 0.1%); (ii) social security taxes are below the amount which corresponds to the social security tax for a firm with one employee on a minimum wage (i.e., $7.2); and (iii) cash inflows are higher than cash outflows. In contrast to fly-by-night firms, regular (or legitimate) firms are commercial entities that engage in commercial transactions and pay taxes. According to these criteria, we identified 99,925 fly-by-night firms and 166,381 regular firms among the private business entities in the banking transactions data. (Note that the vast majority of these regular firms are small businesses.) For the purposes of this paper, we deem all the transfers from regular firms to the fly-by-night firms as tunneling.

Second, we use the banking transactions data to identify revenue from public procurement contracts for each firm in our sample of regular – i.e., legitimate – firms (described below). We define revenue from public procurement contracts as the amount of all banking transactions from government-affiliated entities to regular firms that have the reported purpose of "payment for goods and services." In the baseline analysis, we exclude payments for utilities such as electricity and water from the list of revenues from public procurement contracts because the utilities contracts are not usually allocated on a competitive basis and are automatically allocated to local monopolists. The inclusion of utilities in the definition of public procurement does not affect our results.

We also collect data on the basic characteristics of regular legitimate firms, such as location, revenue, net income, debt, assets, and industry, which we use as control variables. Employment data are available for a subset of these firms. These data come from the registry of Russian firms published by the Russia's official statistical agency (*Rosstat*). This is the most recent registry that contains data on near-population of industrial firms in Russia in 2003. We merge regular firms from the banking transaction database with the registry data.

Since we are interested in estimating the electoral cycle in tunneling, we focus on the 87 (out of 89) Russian regions that held gubernatorial elections between 1999 and 2004. The two excluded regions are Dagestan, which has a parliamentary form of government, and Chechnya, which experienced a severe armed conflict in 1999-2000. In the 87 regions, over the period under study, 129 elections took place at 48 different points in time.

We construct our sample of regular firms by taking all firms that satisfy the following criteria from these regions in their election years:

1. A firm should be present both in *Rosstat's* 2003 registry and the banking transactions database.

2. A firm's revenue should be greater than $1M in 2003. We apply this criterion in order to obtain a data set of manageable size and because one can reasonably expect relatively large

firms to engage in bribing in exchange for obtaining government procurement contracts. In addition, the registry data can be considered as a near-population representative sample only for large firms.

3. A firm should be active, i.e., it should have at least 10 transactions in the banking transactions dataset over the entire period. As our measures of revenue from public procurement contracts and of the transfers to fly-by-night firms are based on the banking transactions data, we apply a minimum threshold for the number of transactions. We also require that a firm should perform some banking transactions during a period one year before and one year after the election.

These criteria yield $45,275$ regular firms. In order to assess the representativeness of the sample, we compare the revenue of these firms to the total revenue generated by all Russian firms (including the small ones, which are excluded from our sample). The total revenue of the firms in our sample constitutes 73.1% of the total revenue for all firms in the Russian economy.

In the appendix, we present summary statistics for the entire sample (Table A.1) and separately for each region (Table A.2). All nominal variables are expressed in thousands of constant 2003 U.S. dollars. A detailed description of variables can be found in the Data Appendix.

3 Political Cycle in Tunneling

3.1 Baseline estimation

Our first task is to estimate the electoral cycle in tunneling for firms with and without public procurement contracts. We regress the tunneling that each firm in our sample makes each week during the election year (between 1999 and 2004) normalized by the total amount of firm's revenue on a set of dummies indicating the time-distance to the election date, controlling for firm and week fixed effects. We allow the electoral cycle to vary between two groups of firms: those which do and do not receive substantial revenue from public procurement contracts, as we are interested in the difference in the magnitude of the electoral cycle between the two groups. As larger firms may have higher capacity to finance elections, we also allow for differential electoral cycles depending on the size of firm's revenue. The unit of analysis here is a firm in a particular week. Altogether there are 6,286,011 firm-week observations in the sample, i.e., firm-weeks in each region in the two years around each election among firms with non-zero transfers around elections (there are 45,275 such firms). To be precise, we estimate the following equation:

$$\frac{T_{ft}}{R_f} = \sum_{w=-30}^{30} \beta_w^1 D_w Gov_{fe} + \sum_{w=-30}^{30} \beta_w^2 D_w + \sum_{w=-30}^{30} \beta_w^3 D_w \log(R_f) + \sum_{l=0}^{2} \beta_l^4 \log(I_{f,t-l}) + \tau_t + \phi_f + \varepsilon_{ft}, \quad (1)$$

where f indexes firms; t indexes time in weeks (there are 313 weeks over the entire time period under study). The index w refers to the time-distance up to 30 weeks to the election date in the region where the firm f is located, so that $w = -1$ refers to the week before the election and $w = 1$ refers to the week after the election. As elections are always held on Sunday whereas banking transactions occur during work days, w varies from -30 to -1 and then from 1 to 30 and is never equal to zero. D_w is the dummy indicating the week that is w weeks away from the election date. T_{ft} is the transfer by firm f to fly-by-night firms at time t. (T stands for tunneling). R_f is the revenue of firm f in 2003. Subscript e indexes elections in a particular region. Thus, it is redundant for all regions where there was only one election, and meaningful for regions where there were two elections between 1999 and 2004. Gov_{fe} is a dummy which equals 1 if the revenue from public procurement contracts as a share of the firm's f total annualized revenue +/- one year from the election e is greater than a certain threshold. As a baseline, we consider the 5% threshold. To check the robustness of our results, we repeat the analysis redefining the Gov_{fe} dummy as having 1% of revenue coming from public procurement contracts. $\log(R_f)$ is a measure of firm size, namely, the logarithm of the firm's revenue in 2003.[8] In addition, we control for cash inflows into the firm bank account $\log(I_{ft})$ along with two lags of this variable.

[8]Due to data limitations, our sample size decreases dramatically if we control for revenue in the election year rather than in 2003. The results are robust to this alteration. As a baseline, we report results for the larger sample.

This control is needed to make sure that the timing of inflows is not driving our results on the dynamics of outflows to fly-by-night firms. τ_t and ϕ_f are the full sets of 313 time and $45,275$ firm fixed effects. Our results are robust to excluding controls for the differential political cycle depending on the size of the firm, i.e., $D_w \log(R_f)$, and to excluding controls for cash inflows, i.e., $\log(I_{f,t})$, $\log(I_{f,t-1})$, and $\log(I_{f,t-2})$. The main results (i.e., the coefficients β_w^1 and β_w^2) are also unaffected by the choice of the threshold of revenue coming from procurement. The error term ε_{ft} is clustered at the level of each of $45,275$ firms.

In Specification 1, the differences between coefficients on D_w between weeks close to and far away from election dates estimate the electoral cycle in tunneling for firms with procurement revenue below the specified threshold (β_w^2). Our main coefficients of interest are β_w^1, which estimate the difference in the electoral cycles in tunneling between firms with procurement revenue above and below the threshold.

In order to reduce idiosyncratic variation in the estimates of weekly frequency for presentation purposes, we also estimate the coefficients on dummies indicating the proximity to elections at monthly level. I.e., we re-estimate Equation 1 on the same sample, with the same controls, but replacing 60 dummies D_w indicating week-distance from elections by 16 monthly dummies D_m, where m indicates 4-week periods around elections. We estimate the following equation:

$$\frac{T_{ft}}{R_f} = \sum_{m=-8}^{8} \beta_m^1 D_m Gov_{fe} + \sum_{m=-8}^{8} \beta_m^2 D_m + \sum_{m=-8}^{8} \beta_m^3 D_m \log(R_f) + \sum_{l=0}^{2} \beta_l^4 \log(I_{f,t-l}) + \tau_t + \phi_f + \varepsilon_{ft}, \quad (2)$$

keeping the full set of 313 week fixed effects.

Figures 2 and 3 present the results of the estimations of Equations 1 and 2. The upper charts portray the sum of point estimates of β_w^1 and β_w^2 from Equation 1 by each week w around election time on Figure 2 and the the sum of point estimates of β_m^1 and β_m^2 from Equation 2 by each month m; these estimates show the dynamics of the tunneling activity by firms with procurement revenue above the 5% threshold at weekly and monthly frequency, respectively. Similarly, the middle charts on the two figures portray the tunneling for firms with procurement revenue below the 5% threshold, namely, β_w^2 and β_m^2 coefficients. The lower charts show the difference between the two, i.e., the estimates of β^1_w and β^1_m. Each chart also portrays 95% confidence interval around each estimated coefficient.

The two figures draw the same picture, but it is more visible on Figure 3 as the idiosyncratic week-level variation is smoothed out using monthly averages. The graphs show that starting approximately one half a year (24 weeks) before the election, firms start transferring more cash to fly-by-night firms compared to their usual average tunneling activity at times when election is far away (outside +/- 30 week period around elections). This increase in tunneling is present both in firms with and without a large share of revenue coming from public procurement (the upper and middle charts). However, it is particularly pronounced among firms with public procurement above 5% of revenue threshold (the upper charts). The tunneling activity remains significantly higher than usual for the entire 6 months prior to elections and grows steadily as elections approach (see, in particular, Figure 3). However, the largest spike in the transfers to fly-by-night firms occurs during the month right after the election. Starting from week +5 after the election on, the tunneling activity falls to the usual level and fluctuates around it. The lower charts demonstrate that the magnitude of the described political cycle is significantly higher among firms with the sizable procurement revenue compared to firms with procurement below the 5% threshold. Table A.3 in the Appendix presents the full regression output from estimating Equation (1) along with the F-tests for the joint significance of all β-coefficients as well as F-tests for the significance of the difference in the level of β-coefficients within the very short election window of [-4; +4] weeks around elections compared to β-coefficients outside this election window. All these F-tests yield statistical significance well above conventional levels.

In order to allow for the differential electoral cycle in tunneling, depending on the extent to which firms rely on public procurement contracts for their business, we also estimate the following two equations, first, with the political cycle estimated at the level of 60 weeks w around elections:

$$\frac{T_{ft}}{R_f} = \sum_{w=-30}^{30} \gamma^1_w D_w \frac{ProcR_{fe}}{R_f} + \sum_{w=-30}^{30} \gamma^2_w D_w + \sum_{w=-30}^{30} \gamma^3_w D_w \log(R_f) + \sum_{l=0}^{2} \beta^4_l \log(I_{f,t-l}) + \tau_t + \phi_f + \varepsilon_{ft}, \quad (3)$$

and, second, at the level of 16 months m:

$$\frac{T_{ft}}{R_f} = \sum_{m=-8}^{8} \gamma_m^1 D_m \frac{ProcR_{fe}}{R_f} + \sum_{m=-8}^{8} \gamma_m^2 D_m + \sum_{m=-8}^{8} \gamma_m^3 D_m \log(R_f) + \sum_{l=0}^{2} \beta_l^4 \log(I_{f,t-l}) + \tau_t + \phi_f + \varepsilon_{ft}. \quad (4)$$

The sample and the dependent variable are exactly as above. We just make one change to the set of covariates. $ProcR_{fe}$ stands for the size of the firm's procurement revenue +/- one year around the election date (in annualized terms, i.e., divided by 2); and therefore, $\frac{ProcR_{fe}}{R_f}$ is the share of annualized revenue from public procurement in the two years around elections as a fraction of the firm's total revenue as of 2003. The rest of the notation is as above. Again, to insure robustness, we estimate these equations with and without controlling for the differential electoral cycle in firms of different sizes, and with and without controls for cash inflows. The inclusion or exclusion of these controls does not affect the main results. As above, the error terms are clustered at the firm level. In Specifications 3 and 4, our main coefficients of interest are γ_w^1 and γ_m^1, respectively, which estimate the additional electoral cycle in tunneling for an incremental increase in the share of revenue coming from public procurement contracts.

Figure 4 presents the point estimates of γ_w^1 and γ_m^1 along with their confidence intervals in the upper and lower charts, respectively. It shows that the magnitude of the political cycle increases with an increase in the share of firm's revenue coming from procurement contracts. This is the case throughout the entire period of abnormal tunneling around elections, namely, from -6 to +1 month around elections. Table A.4 in the Appendix presents the full regression output from estimating Equation 3.

The magnitude of the incremental tunneling around elections is substantial. For example, during one month after the elections, firms that get more than 5% of their revenue from procurement contracts transfer to fly-by-night firms an additional sum equal to about 5.8% of their monthly revenue (on top of the usual tunneling activity). For comparison, the usual tunneling activity for an average (median) firm is about 4.75% (1.36%) of revenue. The increase in tunneling in half a year before elections is also sizable. In 6 months prior to the election, firms with procurement contracts above 5% of revenue increase their transfers to fly-by-night firms by the amount equal to 1% to 3% of monthly revenue each month. For each additional percentage point of annual revenue coming from the government procurement, the firms increase their tunneling by an additional amount equal to 0.16% of monthly revenue during one month right after the election, and by an amount equal to 0.06%-0.08% of monthly revenue during the election campaign.

Overall, we find a strong evidence of a political cycle in transfers to fly-by-night firms which is substantially and statistically significantly larger for firms with public procurement revenue.

3.2 Interpretation and the Effect of the Margin of Victory

Fly-by-night firms are used for tunneling, i.e., in order to transfer large sums into cash illegally out of firms for various purposes, such as tax evasion and diverting cash from shareholders to managers and from minority shareholders to majority shareholders (as in Johnson et al., 2000). Mironov (2013) provides evidence that fly-by-night firms are usually registered on stolen passports and do not provide any real services or produce any real goods. Instead, the legitimate firms sign (from their standpoint) a perfectly legal contract with fly-by-night firms for "consulting services" and pay them for these "services" via a banking transaction. Then, fly-by-night firms take the cash out of the bank and give it back to the management of the legitimate firm (for a fee).[9] All tax liabilities associated with such banking transactions rest with the fly-by-night firms, whereas the legitimate firms get the tunneled cash and is free to use it.

How one can explain the political cycle in tunneling? There are two potential explanations. One is that abnormal levels tunneling around elections, indicate that the cash is transferred to politicians. In that case, the fact that the tunneling increases during elections much more in firms that rely on contracts with the government for their business suggests that these transfers might be used as informal payments (i.e., bribes) for obtaining procurement contracts. The second potential explanation is that firms tunnel cash out in the proximity of elections because of a change in the political risk for firms associated with a possible change in the leadership.

[9] We cannot track what happens to the money after it was transferred to fly-by-night firms precisely because it is cashed out, as we only observe banking transitions between legal entities.

The change in political risk could vary across firms, which would explain the differential cycle between firms with and without procurement revenue. In this subsection, we argue that only the first explanation is consistent with the evidence.

If the political risk is behind the political cycle in tunneling, one should expect the tunneling around elections to be particularly high when elections yield the change in leadership, and therefore, the potential change in the formal regulatory environment or any informal implicit contracts between the governor and the regional business. In contrast, if incumbent wins with a very large margin of victory in the first round of elections, one should not expect any change in the rules of the game between the business and the regional government, and therefore, these elections are not associated with any additional political risk. Thus, in such elections, we should not observe political cycle in tunneling, if the political risk is the mechanism driving the political cycle.

We test these predictions by exploring how the margin of victory and political turnover affect the presence of the political cycle in tunneling during elections. In 27 out of 129 elections the incumbent ran and lost. In 74 elections the winner got more than 50% of the total vote in the first round of elections; and in 32 elections the incumbent got more than 70% of the total vote in the first round of elections. We re-estimated the political cycle in tunneling using Equations 1-4 separately on the sub-samples of elections in which the winner got above and below 50% of the vote in the first round, in which the incumbent lost and incumbent won, and finally in which the incumbent got above and below 70% of the vote in the first round of elections. (We also confirmed all of the results by estimating these equations on the full sample with additional interaction terms allowing the cycle to differ between these groups of elections.)

We found that the political cycle in tunneling decreases sharply with an increase in political competition, contrary to the prediction of the political risk mechanism. In particular, we do not observe a statistically significant political cycle for elections in which the winner got less that 50% in the first round of elections and in which the incumbent lost. For the purposes of a concise presentation of the results, we simplified the estimation further by replacing 60 D_w dummies indicating distance to election in Equations 1 and 3 with just a single dummy indicating the election window of [-4;+4] weeks around the election. We chose this window, as the deviation of tunneling activity from the usual level is the highest during this time (as is evident from the results of the estimation of the full cycle.) Table 1 summarizes these results, it reports coefficients on the election window dummy and on the interaction between the election window dummy and the dummy for procurement revenue above 5% of total revenue in upper panel, and on the interaction between the election window dummy and the share of procurement in total revenue in the lower panel. The results presented in the table confirm that there is no pronounced political cycle in tunneling, even among firms with procurement revenue above 5% threshold, for elections, in which the winner got less that 50% of the vote in the first round of elections and in which the incumbent lost (see columns 1 and 3 of the upper panel of Table 1). The coefficients in the second specification (lower panel) are more precisely estimated and, therefore, the coefficients on the interaction between the size of procurement revenue share and the election window dummy are statistically significant in this specification, even for the elections with a low margin of victory (as reported in the lower panel of Table 1). Yet, their magnitude of the estimated coefficients of interest is about 1/8th that for the subsample of elections with a larger margin of victory. The magnitude of the cycle is exactly the same (and large) for elections, in which the winner got more than 50% of the vote in the first round and those in which the incumbent won. Similar picture emerges from the estimation of the political cycle for elections, in which incumbent got more and less than 70% of the total vote in the first round of elections (see the last two columns of the table). The magnitude of the political cycle for the elections, where the incumbent won with at least 70% of the vote in the first round of election is substantially (2- to 4-times) larger than in the rest of the sample.

Therefore, we conclude that the change in the political risk in the face of election cannot be the driving force of the intensified tunneling around elections and that the reason for the political cycle in tunneling is that the money are directed to politicians. The precise timing of the cycle sheds some light on what these funds are used for. Out of the total amount of (abnormal) tunneling activity of firms with public procurement revenue in the window starting 6 months before elections and ending one month after elections, 2/3 of the cash is tunneled during the election campaign preceding the election and 1/3 during one month after the election.

Politicians on the campaign trail are the ones who need cash the most in the face of elections. Note that the law severely restricts the size of legal financing of election campaigns in Russia to the point that the funds raised legally account for a tiny fraction of the total financing.[10] Thus, it is reasonable to conclude that the additional funds tunneled out of firms during the election campaign of politically strong incumbents (for whom the political cycle in tunneling is at its largest) are channeled to finance their campaigns. The strong correlation between the size of procurement revenue and the tunneling during the election campaign suggests that such shadow campaign financing is rewarded with procurement contracts.

It is possible that some of the campaign spending is realized also right after the elections, as many campaign-related services (such as printing and distribution of advertisement leaflets, T-shirts, or posters) are provided up until the very end of campaign. However, much of the campaign spending (such as, for instance, vote-buying) is incurred on the spot, before the election. The question, therefore, is why tunneling becomes the most intensive in the month right after the election, when the election campaign is over. The answer was suggested to the authors in an informal interview with public officials in the Moscow-city administration.[11] Many of the public procurement contracts are allocated for the time of the election term and, therefore, the beginning of the electoral term is marked with new public procurement contracts being signed. Again, the fact that illegal tunneling of cash intensifies during the time of signing public procurement contracts suggests that the cash payments are used as bribes helping to get a procurement

[10]For example, according to expert estimates the pre-election budget of the United Russia party for parliamentary election in 2003 was $250 million, whereas the maximum limit permitted by the law was $8 million. For details, see the article in *Novaya Gazeta*, on September 18 2003 entitled "The biggest deal on the political market is the current parliamentary elections."

[11]Moscow city (along with one other metropolitan area of St. Petersburg) has a status of the Subject of the Federation equal to the rest of Russia's regions.

contract.[12]

In order to check the validity of our interpretation, we conduct two placebo experiments. First, we test for the political cycle in transactions among legitimate regular firms in manufacturing industries and find no evidence of such a cycle. This is an important test, as it rules out the possibility that our results are driven by an unobserved increase in legitimate economic activity around election time. Figure 5 illustrates the results. It portrays the dynamics of tunneling ("shadow transfers") and transfers to legitimate firms ("white transfers") in industries unrelated to publishing and media for our baseline sample of firms around election time, estimated using Equation (1). It is evident from the figure that only illegitimate ("shadow") transfers to fly-by-night firms exhibit a political cycle. Transfers to the legitimate firms are completely flat and do not depend on the proximity to elections. The table below the figure confirms that the test for the equality of coefficients inside and outside the election window of [-4;4] weeks around elections yields statistically significant difference only for transfers to fly-by-night firms and not for transfers to legitimate firms. Thus, we conclude that the political cycle in tunneling is not driven by a general increase in economic activity during the election time.

Furthermore, to make sure that our standard errors are not too small and our results are not driven by some differential trends in regions or firms, we re-estimate cycle in tunneling using Equations 1 and 3 for 200 randomly chosen combinations of placebo election dates in our regions. We draw placebo election dates randomly from the time interval that our data cover, at least 16 weeks away from the true election dates. Figure 6 presents the histograms of F-statistic from the test of equality of the means of coefficients of interest β^1 and γ^1) inside and outside the election

[12] We also explored whether the timing of the political cycle (namely, how much cash is tunneled before and how much after the election) depends on the margin of victory and found no relationship. In addition, we analyzed how various regional characteristics affect the magnitude of the cycle and found no robust correlations between the magnitude of the cycle with any of the observable characteristics of the regions, with the exception of a positive association between the cycle and perception-based measures of regional corruption, which we report below.

window (i.e., the tests for $\overline{\beta}^1_{w\in[-4;4]} = \overline{\beta}^1_{w\notin[-4;4]}$ in the upper panel and $\overline{\gamma}^1_{w\in[-4;4]} = \overline{\gamma}^1_{w\notin[-4;4]}$ in the lower panel of the graph). In each of the panels, the vertical line indicates the value of the F-statistic for the same test performed on the true data, which is substantially larger than vast majority of those generated by the placebo treatment. This experiment shows that the pattern in the data that we uncover is very unlikely to be generated by a random realization or differential trends between firms with and without government procurement revenue.

3.3 Magnitude

A simple unconditional difference-in-differences exercise can help illustrate the magnitude of the phenomenon. Table 2 summarizes the average amount of transfers to fly-by-night firms per firm in a two-by-two matrix. The rows display firms with and without any public procurement contracts, and the columns display two time periods (an 8-week-long election window and an average 8-week-long period outside the election window). As shown in the table, firms with public procurement had larger tunneling both inside and outside the election window. This could be explained by differences in firm size or corporate governance practices between the two groups of firms. In addition, for both groups, tunneling inside the election window were larger than those outside of it. This could be because politicians demand illicit cash contributions from all firms, for example, in exchange for getting around various regulatory barriers to doing business (Yakovlev and Zhuravskaya, 2013). The difference in tunneling inside and outside the election window, however, was substantially larger for firms with public procurement: an average firm with public procurement contracts tunneled $29,940$ USD more in a proximity to an average regional election.

An average region in Russia had 84 firms that received public procurement contracts. Thus, the amount of illegal cash channeled to politicians around elections that is associated with distribution of public procurement in Russia was about 2.5 million USD.[13] On average, firms that tunnel cash around elections (i.e., those firms whose tunneling exhibits a political cycle) get about

[13]Regional elections in Russia were abolished in 2005. Since then regional governors have been appointed by the Russia president rather than elected.

103,000 USD more revenue from public procurement contracts per year than firms that do not intensify their tunneling activity around elections. Therefore, a substantial part of these receipts are likely to be returned to politicians as a kickback in the form of shadow election financing or bribes right after the election.

4 Measuring the Extent of Corruption

So far, we documented that, on average, tunneling for firms that get public procurement contracts follows a political cycle. The next question is whether we can measure corruption using the correlation between tunneling around elections and allocation of government procurement. Our main hypothesis is that the stronger association between the allocation of government procurement contracts across firms with how much cash they tunneled during previous elections is an indication of higher level of corruption in government procurement. In order to test this hypothesis, we need a measure of corruption which provides variation within Russia and does not come from our data. The only available measure is the regional-level Corruption Perception Index of the perceived corruption measured by the Transparency International-Russia foundation for 40 (out of 89) regions in Russia.[14] This is a perception-based index compiled using enterprise-managers surveys; it was constructed only once, in 2002. For the purposes of simplicity of interpretation, we take the z-score of the index, so that the resulting measure has zero mean and unit variance with higher values indicating higher perceived regional corruption. With the help of this index, we can test whether tunneling is more closely associated with winning public procurement contracts in the regions named most corrupt by Transparency International.

For this purpose, and from now on, we consider a firm following a particular regional election episode as the unit of analysis. Thus, our cross-section sample consists of all legitimate firms in regions and years when elections took place.

First, we estimate the relationship between the probability of obtaining a procurement contract in a year following a particular regional election by a particular regional firm and tunneling

[14] The index is available at url: http://www.anti-corr.ru/rating_regions/index.htm.

activity of that firm during the preceding elections. Our main focus is on whether this relationship is stronger in regions that *a priori* are considered more corrupt. More precisely, we estimate the following linear probability model:

$$Prob[ProcR_{fe} > 0] = \alpha_1 L(T^{EL}_{fe}) + \alpha_2 L(T^{EL}_{fe}) \times CPI_f + \alpha'_3 X_f + \alpha_4 S_f + \alpha_5 M_{r_f} + \tau_e + \varepsilon_{fe}. \quad (5)$$

As a dependent variable we take the dummy indicating firms that received any revenue from public procurement contracts in the year following a particular election e, i.e., firms with $ProcR_{fe} > 0$. (As shown in Table A.1, this dummy equals one in 17.11% of observations.)[15] Our main explanatory variables of interest are the extent of tunneling actively of firm f during election e (T^{EL}_{fe}) and the TI Regional Corruption Perception Index in the region where firm f is located (CPI_f). T^{EL}_{fe} denotes the average weekly transfer by firm f to fly-by-night firms within the window of [-4; +4] weeks from the election date e in the region where firm f is located. T^{EL}_{fe} is measured in USD; and its distribution has a log-normal shape. To reduce the influence of extreme values on our estimates, one needs to take logs of all such variables. However, tunneling T can take the value of zero. Therefore, following MacKinnon and Magee (1990), instead of a log function, we use the inverse hyperbolic sine function $L(.)$, such that $L(T) = \log(T + (T^2 + 1)^{1/2})$. We use this transformation for all variables that can take the value of zero but should be logged.[16] The main focus of our analysis is the coefficient α_2 on the interaction between tunneling and the TI corruption index, which shows whether the effect of tunneling on wining public procurement contracts increases with the level of regional perceived corruption. Note that as the TI corruption

[15]The results are robust if we take procurement revenues +/- one year around elections, rather than just for the year after the elections. We also verify that the results are robust to using alternative thresholds of procurement revenue as a share of total revenue of 1% and 5% instead of zero.

[16]The results of regression analysis with $L(T)$ are easier interpreted than that with $\log(1 + T)$, as the estimated coefficients are approximately equal to percents, as if $\log(T)$ was used. All our results are robust to using $\log(1 + .)$ instead of $L(.)$ transformations.

index does not vary over time, region fixed-effects control for the direct effect of regional variation in perceived corruption.

S_f and M_{r_f} are the industry (sector) and region dummies, which control for variation across sectors and regions in public procurement contracts and in corruption. (r is the index for the regions) τ_e is the year fixed effect controlling for multiple elections in a particular year. X_f is a vector of additional control variables, namely, the logarithm of firm's revenue, net income as a share of revenue, and the ratio of debt to assets. All controls are measured in 2003.[17] The error term ε_{fe} is clustered at the level of firms.

The entire sample is comprised of $45,275$ firms (the same as in the previous section) and $63,021$ firm by election year observations. However, TI's Regional CPI is available only for a subset of regions. The inclusion of this variable decreases the sample size to $38,044$ firms and $54,115$ observations.

Further, in order to assess how perception index of corruption affects the association between tunneling around elections and the size of procurement revenue that firms receive, we estimate an additional specification, in which the dependent variable is the size of procurement revenue of firm f in a year following election e as a share of firm's revenue and the set of explanatory variables is exactly as in Equation 5. Precisely, the dependent variable in this augmented specification is $L(ProcR_{fe})$, which is the the inverse hyperbolic sine transformation of $ProcR_{fe}$. We verified that the results are similar when the procurement revenue as share of total revenue (instead of the absolute level) is taken as the dependent variable.

Table 3 presents the results. The first two columns report the results for the probability of securing non-zero procurement revenue as dependent variable (as in equation 5), and the last two columns - with the level of procurement revenue. In the first and the third column, we report the average association between tunneling and procurement in the entire sample (which is the

[17]We verified that our results are robust to using contemporary rather than 2003 controls. The sample, however, is substantially reduced when contemporary controls are included because of data limitations. None of our main results depend on inclusion of a particular set of controls.

x-sectional analogue of the relationship presented in the previous section), and in columns 2 and 3, we add the interaction term between tunneling and regional corruption.

In both regressions for the probability and the size of public procurement revenue, the coefficients on the interaction between corruption level and tunneling is positive and highly statistically significant in all specifications. We find that, in an average region, a 50 percent increase in the tunneling around election in an average firm leads to an increase in the probability of getting public procurement contract by 0.6 percentage points or 3.5%. It also leads to a 6.7% increase in firm's procurement revenue. However, in a region with TI corruption perception index, one standard deviation above the mean mean level, a 50 percent increase in the tunneling during elections leads to an increase in the probability of getting public procurement contract by 1 percentage point and it also leads to a 9.2% increase in firm's procurement revenue.

It is important to note that firms that do and that do not engage in tunneling may have very different characteristics in terms of size, profitability, industry and possibly location. Controlling for these characteristics in OLS setting, therefore, may not be enough to identify the association between tunneling around elections and obtaining government procurement as the two groups of firms may not overlap in terms of their observable characteristics. Thus, in addition to OLS, we use Propensity Score Matching (PSM) on all observables X_f in order to have similar comparison groups. As treatment, we consider dummy for having tunneling around elections greater than 10% of revenue and estimate the effect of treatment on the probability to get procurement contracts and on the size of procurement revenue using PSM for three different samples: all firms, firms in regions with TI corruption perception index above the median and below the median. Our results are robust to using Propensity Score Matching estimation method as reported in Table 4. Tunneling is associates with higher probability to get procurement contracts and higher procurement revenue on average and much more so in regions that TI deems more corrupt.

Overall, consistent with our hypothesis, higher corruption is associated with stronger link between tunneling around elections and obtaining public procurement. Therefore, we can use the correlation between tunneling and public procurement to measure the extent of corruption.

Our aim is to measure the degree of corruption in public procurement at the sub-regional level in order to study the effect of corruption using with-region variation. We define localities by the boundaries of sub-regional tax districts. We use this definition of localities because it is easily observable using the codes of firm identifiers. The number of tax districts varies from 2 in a few smallest regions to 35 in the city of Moscow. Considering the extent of corruption in procurement contracts at the level of locality is meaningful, as it is equivalent to small towns and boroughs of large cities. A lot of public procurement contracts are allocated at this level. We index localities with subscript l and estimate the specification analogous to Equation 5. However, instead of the interaction between TI Corruption Perception Index and tunneling, we include a set of interactions between dummies for each locality l (denoted by D_l) and tunneling around elections as the main variables of interest (controlling for the unobserved variation across localities with locality dummies):

$$Prob[ProcR_{fe} > 0] = \sum_{l} \alpha_{1l} D_l \times L(T_{fe}^{EL}) + \alpha_2' X_f + \alpha_3 S_f + \alpha_4 D_{l_f} + \tau_e + \varepsilon_{fe}. \quad (6)$$

In order to estimate α_{1l} precisely, we restrict the sample to localities with at least 40 firms, out of which at least one has government procurement contracts. Using the results of this estimation, we define two alternative measures of local corruption in allocation of public procurement: (1) a dummy variable Cor_l^d indicating that the estimate of α_{1l} for the locality l is positive and statistically significant at 10% level; and (2) a continuous measure Cor_l^c equal to the magnitude of the estimate of α_{1l} irrespective of its statistical significance. Both measures are defined for 62 regions and 257 localities.[18] Cor_l^c varies across all localities in each region. Cor_l^d equals zero in every locality in 41 regions and there is a within-region variation in Cor_l^d in 21 regions. Overall, the coefficients α_{1l} are positive and significant in 31% of localities.[19] Summary statistics for these variables are presented in Table A.5. The two measures of local corruption are complementary,

[18] For localities, where there are no private firms with procurement revenue (for instance, because government procurement contracts are allocated to state-owned or municipal firms), corruption in distribution of procurement revenue is undefined.

[19] In a few cases, estimates of α_{1l} are negative and significant at 5% level. However, this is well

as the first one has much larger variation and the second one is more precise. They are strongly correlated with a pairwise correlation coefficient of 0.57, both also correlate with the TI Regional Corruption Perception Index, with correlation coefficient of 0.74 for the dummy and 0.33 for the continuos measure. The advantages of our measures over the TI measure are that they are based on objective data; they are available at the sub-regional level; and for a much larger number of regions. In the next section, we use these measures to test the "efficiency grease" hypothesis.

5 Does Corruption Contribute to Inefficiency?

Does corruption lead to an inefficiency in allocation of procurement contracts? Does it help or hurt the chances of more efficient firms to gain public procurement? As the theoretical literature provides reasons in favor of and against both possibilities, these are empirical questions. Our measures of corruption can help to shed light on the answers. We use the variation in the level of corruption across localities to test whether more or less efficient firms (other things held equal) are more likely to obtain government procurement contracts in more corrupt localities. The challenge is to measure efficiency across firms. The best available to us measure is revenue per worker (which we consider to be an imperfect proxy for firm's labor productivity). It is (unfortunately) available only for a subset of the largest firms, so that the resulting data set consists of 19,113 firms in localities, where our corruption measures are defined. To test the "efficiency grease" hypothesis, we regress a firm-level dummy for having won government procurement contracts above 1% of total firm's revenue on the measure of firms' labor productivity, a measure of local corruption, and their interaction, controlling for all our standard firm-level controls, as well as industry, region, and year dummies:

$$Prob[\frac{ProcR_{fe}}{R_f} > 0.01] = \delta_1 \log(y_f) \times Cor_{l_f} + \delta_2 Cor_{l_f} + \delta_3 \log(y_f) + \delta_4' X_f + \delta_5 S_f + \delta_6 M_f + \tau_e + \varepsilon_{fe}. \tag{7}$$

y_f stands for the firm's f labor productivity and Cor_{l_f} is one of the two corruption measures of locality l where firm f is located. Our main coefficient of interest is δ_1; it estimates whether

within statistical error, as this occurs in 5.8% of the cases.

an increase in local corruption leads to a less or a more productive firm to get government procurement contract. As the interaction term between local corruption and labor productivity is identified even if we control for all unobserved heterogeneity among localities, we also estimate a similar regression adding locality fixed effects (i.e., dummies for each locality: D_{l_f}) to the list of controls and suppressing the direct effect of Cor_{l_f} as it is collinear to locality effects:

$$Prob[\frac{ProcR_{fe}}{R_f} > 0.01] = \delta_1 \log(y_f) \times Cor_{l_f} + \delta_3 \log(y_{fe}) + \delta_4' X_f + \delta_5 S_f + \delta_6 D_{l_f} + \tau_e + \varepsilon_{fe}. \quad (8)$$

Note that controlling for regional and industry fixed effects is crucial because a substantial variation in the amounts of procurement contracts and efficiency of firms are driven by unobserved regional and industry-level factors. The results are presented in Table 5. The first four columns present the estimation of Equation 7 and the last four columns – Equation 8. In every odd column, we suppress the interaction between the local corruption and labor productivity. Columns 1, 2, 5, and 6 use the continuous measure of corruption (i.e., α_1 from Equation 6); columns 3, 4, 7, and 8 use the dummy for the significant α_1 as the corruption measure.

First, we find that government procurement contracts are, on average, directed to firms with lower revenue per worker (as the coefficient on labor productivity is negative and statistically significant irrespective of specification). This result has two alternative interpretations. One possibility is that the distribution of government procurement contracts is simply inefficient. The alternative story, however, is that government procurement is distributed in order to support higher employment for patronage reasons. The latter interpretation does not necessarily imply lower efficiency as one can imagine two different technologies: one - more labor intensive and and the other - less labor intensive. A paternalistic government with an objective of high employment could chose firms with more labor intensive technology without an efficiency loss. The second finding is our main focus: higher corruption is associated with less productive firms obtaining public procurement contracts. The sign of the coefficients on the interaction term between labor productivity and both of our corruption measures is negative in all specifications and statistically significant in all but one specification.[20] Importantly, in contrast to the interpretation of the direct effect of y_f, the interpretation of the effect of the interaction between y_f and Cor_{l_f} has an unambiguous interpretation of an increase in the inefficiency in distribution of government procurement contracts. This is because in more corrupt localities, by construction of our corruption proxies, governments are less paternalistic on average as they distribute procurement contracts in exchange for tunneling of illegal cash rather than in exchange for supporting higher levels of employment. The magnitude of the effects is as follows: we find that in non-corrupt localities government procurement contracts are allocated to firms which have 1.5% lower labor productivity compared to firms which do not win public procurement contracts in the same locality and same industry. In contrast, in corrupt localities, firms with procurement revenue are 2.6% less productive compared to non-recipients of public procurement contracts in the same locality and same industry. Therefore, corruption leads to substantial efficiency losses in the allocation of government procurement contracts. A plausible explanation of this results is that the managerial qualities needed to bribe politicians and needed to run firms efficiently are substitutes rather than compliments.

Overall, we reject the "efficient grease" hypothesis, as corruption leads to an increase in inefficiency of distribution of public procurement contracts.

6 Conclusions

We use objective data for a near-population of Russian firms to develop a new methodology for measuring corruption. Bribes follow a political cycle. Politicians collect bribes around elections as an illicit payment for allocation of government procurement contracts. An average firm that receives public procurement contracts pays about 30,000 U.S. dollars in bribes around a regional election and gets procurement contracts that bring 100,000 U.S. dollars in additional revenue per year. Using the correlation between tunneling around elections and the allocation of procurement

[20] The results are robust to using 0.1% rather than 1% threshold for the revenue coming from public procurement contracts.

as a measure of corruption, we test and reject the "efficiency grease" hypothesis by showing that less productive firms are more likely to win public procurement contracts in more corrupt localities and, therefore, the allocation of public procurement is less efficient under corruption. Our findings suggest that the managerial skills needed to run a firm efficiently do not help winning procurement contracts in corrupt environments; and vice versa political capital that helps winning procurement contracts does not help firm's productivity.

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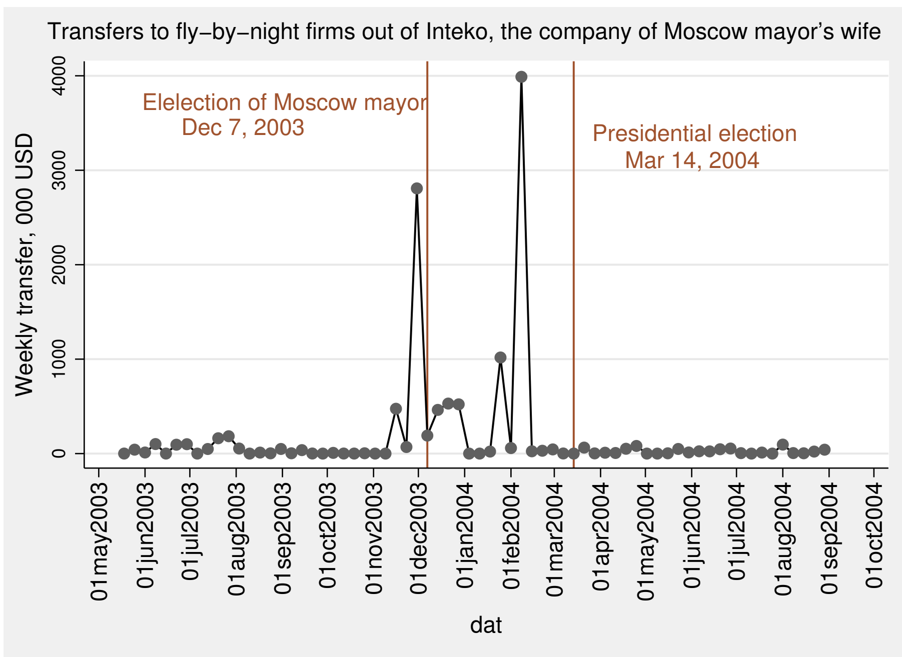
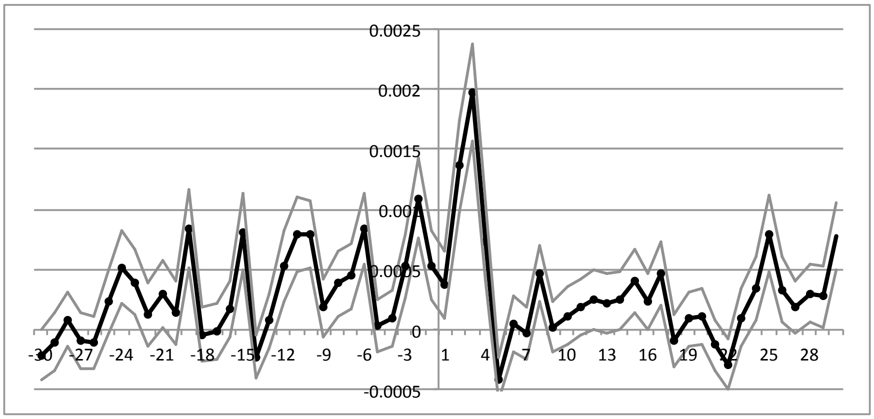
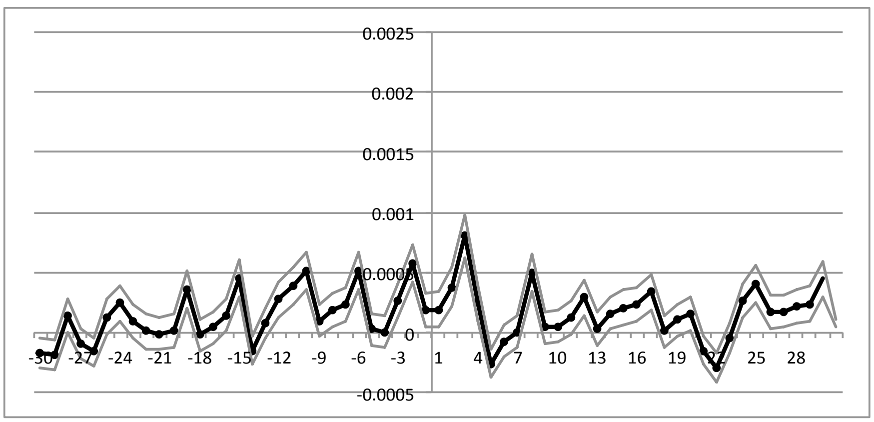


Figure 1: Transfers to fly-by-night firms by Inteko, the company of the wife of Moscow mayor
Note: The figure portrays the amount of cash tunneled from the company Inteko.

Proximity to elections (in weeks) and tunneling of firms with procurement above 5% of revenue, $\beta_w^1 + \beta_w^2$:



Proximity to elections (in weeks) and tunneling of firms with procurement below 5% of revenue, β_w^2:



The difference in tunneling between firms with procurement above and below the threshold, β_w^1:

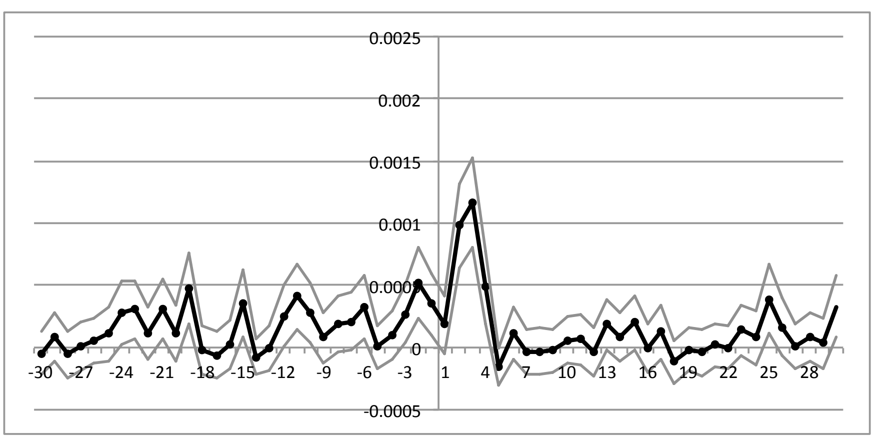
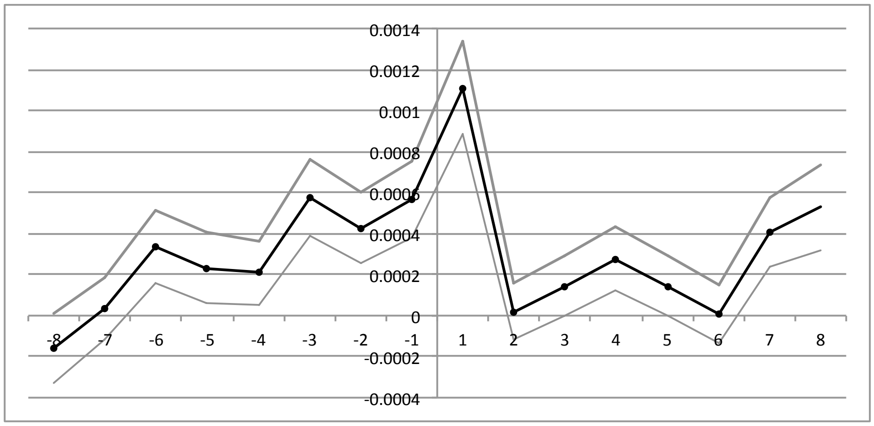
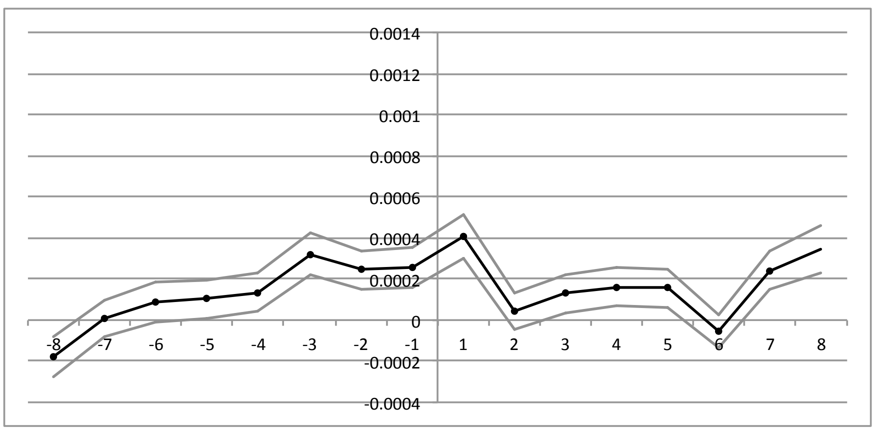


Figure 2: Political cycle in tunneling by firms with and without procurement contracts (weekly)
Note: Units of the y-axis: weekly outlays to fly-by-night firms in percentage of annual revenue. The figure portrays coefficient estimates of β_w^1, β_w^2 and their sum from the estimation of Equation 1 along with their significance levels. X-axes measure the number of weeks w away from the election. The full regression output is presented in Table A.3 in the Appendix.

Proximity to elections (in months) and tunneling of firms with procurement above the 5% threshold, $\beta_m^1 + \beta_m^2$:



Proximity to elections (in months) and tunneling of firms with procurement below the 5% threshold, β_m^2:



The difference in tunneling between firms above and below the threshold, β_m^1:

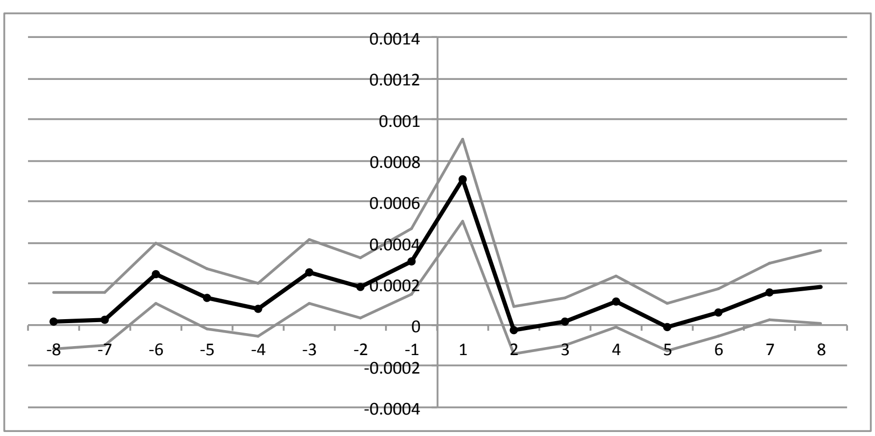
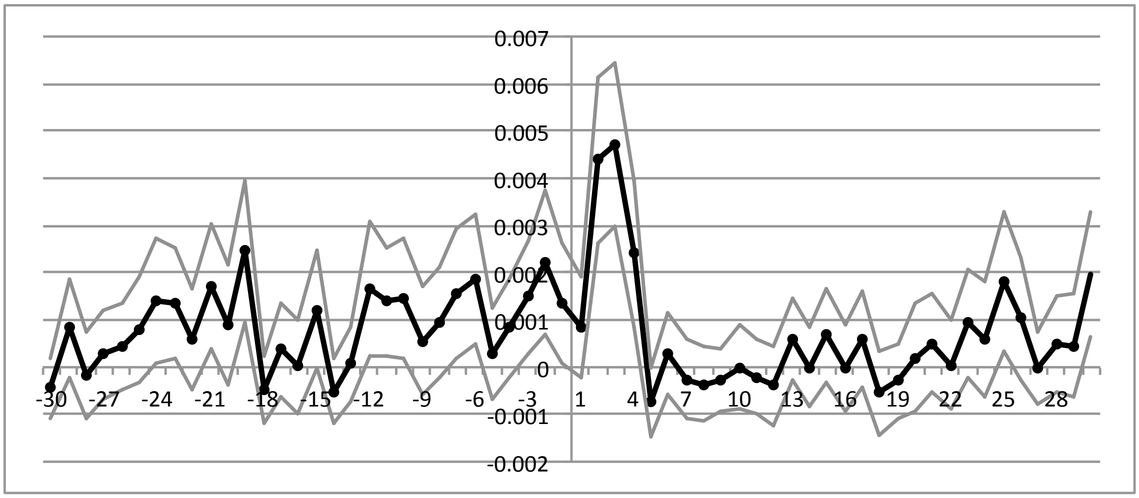


Figure 3: Political cycle in tunneling by firms with and without procurement contracts (monthly)
Note: Units of the y-axis: weekly outlays to fly-by-night firms in percentage of annual revenue. The figure portrays coefficient estimates of β_m^1, β_m^2 and their sum from the estimation of Equation 2 along with their significance levels. X-axes measure the number of months m away from the election.

Proximity to elections in weeks and the additional tunneling per additional percentage point of revenue coming from procurement contracts, γ_w^1:



Proximity to elections in months and the additional tunneling per additional percentage point of revenue coming from procurement contracts, γ_m^1:

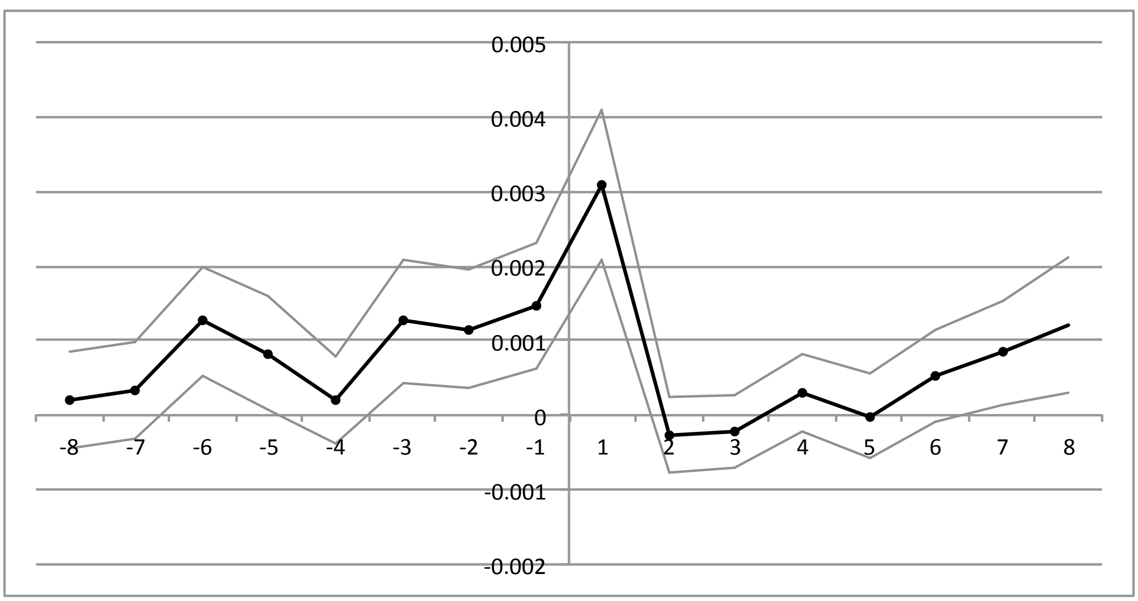
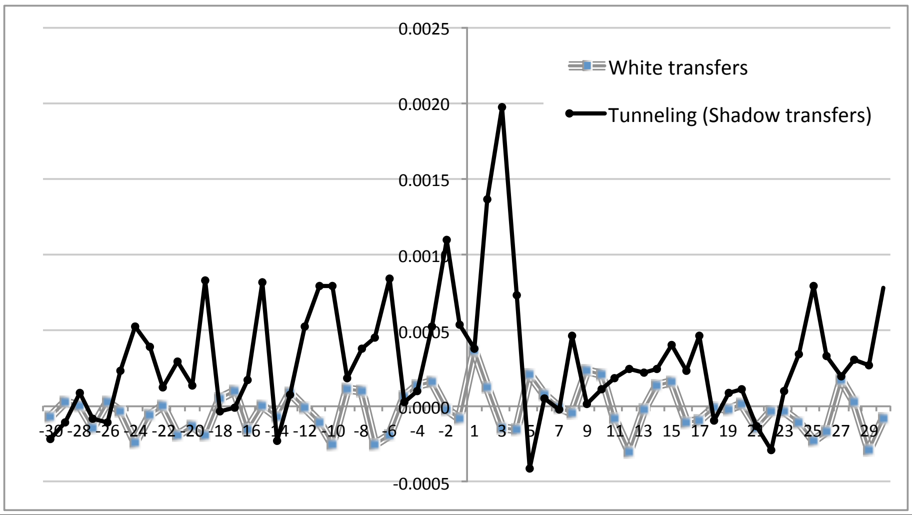


Figure 4: Political cycle in tunneling as a function of the size of procurement revenue
Note: The figure portrays coefficient estimates of γ^1 from Equations 3 and 4 along with their significance levels. X-axes measure the number of weeks w away from the election. The full regression output is presented in Table A.4 in the Appendix.

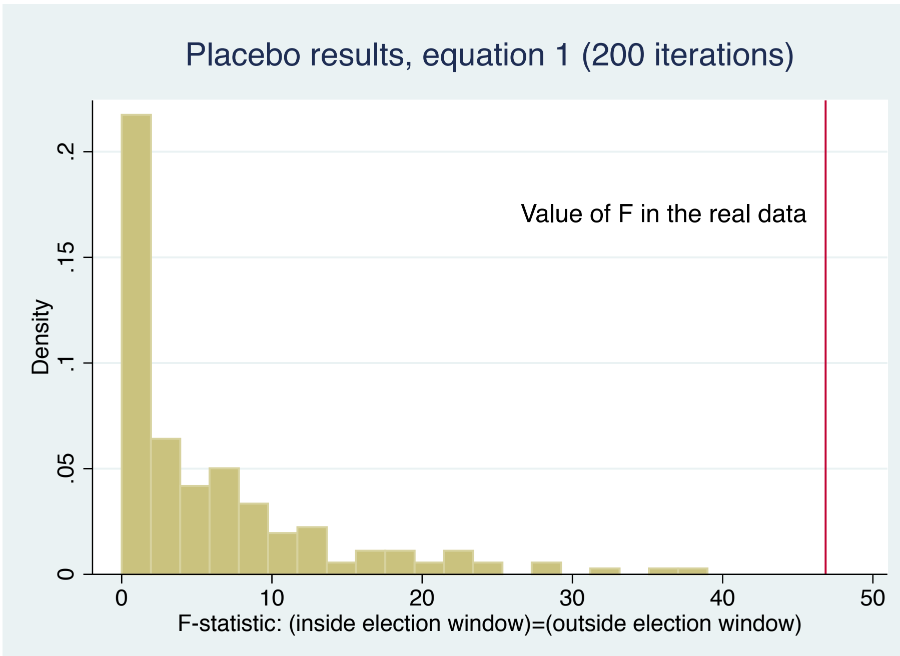


Cycle in "White" transfers and "Shadow" transfers

F-test for:	White	Shadow
$\beta^1_{in[-4;4]} = \beta^1_{out[-4;4]}$	F = 1.98	F = 37.28
	p = 0.16	p = 0.00
$\beta^2_{in[-4;4]} = \beta^2_{out[-4;4]}$	F = 1.09	F = 32.13
	p = 0.2963	p = 0.00

Figure 5: Placebo: transfers to fly-by-night firms vs. transfers to legitimate firms

Note: The figure portrays the dynamics of total transfers, i.e., $\beta^1_w + \beta^2_w$ from the estimation of Equation 1, taking overtime distribution of transfers to fly-by-night firms ("shadow" transfers) and transfers to legitimate firms ("white" transfers) as dependent variables. The table presents F-tests testing for the presence of political cycle in respective transfers among firms with public procurement revenue above (upper row) and below (lower row) the 5% of total revenue threshold.



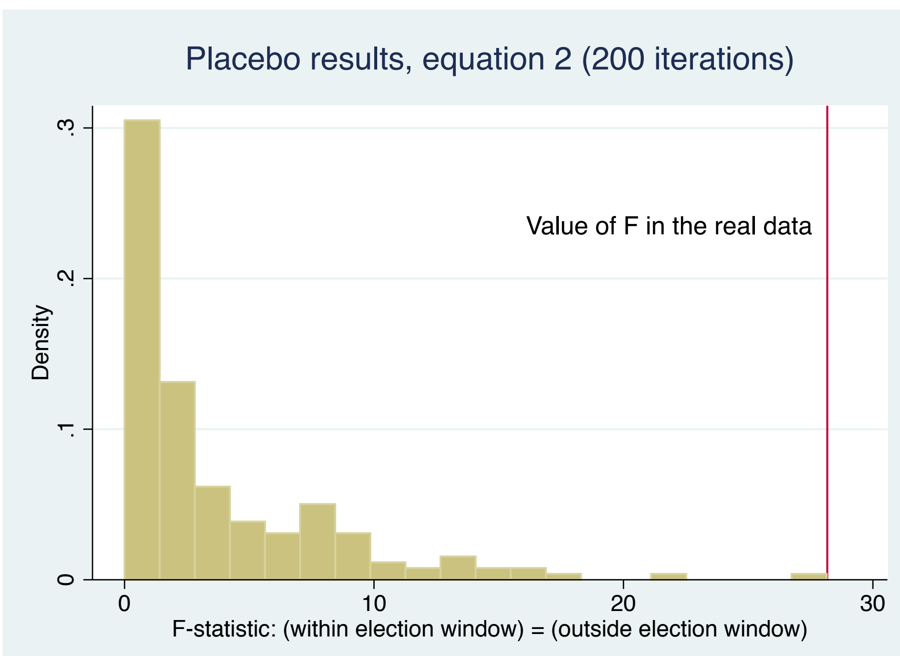


Figure 6: Placebo election dates

Table 1: Political cycle in tunneling and the margin of victory

	Winner got:		Incumbent:			
	<50%	>50%	lost	won	<70%	>70%
			Specification simplifying equations 1-2			
(Proc. rev. share > 5%) x Election window	-0.00003	0.00050	0.00005	0.00049	0.00027	0.00045
	(0.00006)	(0.00008)***	(0.00011)	(0.00008)***	(0.00009)***	(0.0001)***
Election window	0.00009	0.00031	0.00000	0.00030	0.00011	0.00042
	(0.00005)*	(0.00005)***	(0.00007)	(0.00005)***	(0.00004)***	(0.00007)***
Number of obs	1833618	4452393	744847	4864401	2917418	2691830
Number of firms	16980	33817	7460	38665	26521	25833
			Specification simplifying equations 3-4			
Procurement rev. share x Election window	0.00020	0.00151	0.00026	0.00153	0.00069	0.00120
	(0.00011)*	(0.00043)***	(0.00008)***	(0.00042)***	(0.00037)*	(0.00042)***
Election window	0.00009	0.00031	0.00000	0.00030	0.00010	0.00043
	(0.00005)*	(0.00005)***	(0.00007)	(0.00005)***	(0.00004)***	(0.00007)***
Number of obs	1833618	4452393	744847	4864401	2917418	2691830
Number of firms	16980	33817	7460	38665	26521	25833

Note: Standard errors corrected for clusters at the level of firms are in parentheses. Election window is a dummy indicating 4 weeks away from elections on both sides. "Proc. rev. share > 5%" is a dummy indicating that procurement revenue is above 5% of firm's revenue. "Procurement Rev share" is the share of firms revenue that comes from procurement contracts.

Table 2: Magnitude

Difference-in-differences estimate of the tunneling associated with procurement per firm with non-zero public procurement revenue			
	Window:		
	+/−4 weeks around election	average 8 weeks outside election window	Dif: (inside) - (outside)
Tunneling per firm | Proc.rev>0	$ 109 613	$ 74 195	$ 35 418
Tunneling per firm | Proc.rev=0	$ 33 858	$ 28 381	$ 5 477
Dif: (T | Proc.rev>0) - (T | Proc.rev=0)	$ 75 755	$ 45 815	$ 29 941
Tunneling around elections per firm			$ 29 941
Average # of firms with Proc.rev>0 per region			84
Average size of tunneling per election			$ 2 515 000

Table 3: Procurement contracts and tunneling in more and less corrupt regions

	Dummy: Procurement revenue > 0		L(Procurement revenue)	
	(1)	(2)	(3)	(4)
L(Tunneling / week), election window	0.035	0.032	0.159	0.142
	(0.001)***	(0.001)***	(0.007)***	(0.007)***
TI CPI corruption x L(Tunneling / week), election window		0.010		0.058
		(0.001)***		(0.008)***
Log(Revenue)	0.027	0.026	0.177	0.183
	(0.002)***	(0.002)***	(0.008)***	(0.009)***
Net Income/Revenue	-0.019	-0.017	-0.241	-0.235
	(0.016)	(0.019)	(0.071)***	(0.083)***
Debt/Assets	-0.039	-0.039	-0.219	-0.219
	(0.009)***	(0.011)***	(0.042)***	(0.048)***
Industry dummy	Y	Y	Y	Y
Region dummy	Y	Y	Y	Y
Election year dummy	Y	Y	Y	Y
R-sq	0.190	0.185	0.160	0.159
Number of obs	63021	54115	63021	54115
Number of firms	45275	38044	45275	38044

Note: Standard errors corrected for clusters at the level of firms are in parentheses. "TI CPI corruption" is the Transparency International regional corruption perception index.

Table 4: Propensity score estimates of the relationship between tunneling and procurement

	Dummy: Procurement revenue >0			L(Procurement revenue)		
	(1)	(2)	(3)	(4)	(5)	(6)
SAMPLE:	All	CPI≤Median	CPI>Median	All	CPI≤Median	CPI>Median
(Tunneling, election window/Revenue) > 0.1	0.054	0.022	0.068	0.234	0.061	0.304
	(0.008)***	(0.009)**	(0.011)***	(0.035)***	(0.039)	(0.046)***
Log(Revenue)	Y	Y	Y	Y	Y	Y
Net Income/Revenue	Y	Y	Y	Y	Y	Y
Debt/Assets	Y	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y	Y
Region dummy	Y	Y	Y	Y	Y	Y
Election year dummy	Y	Y	Y	Y	Y	Y
R-sq	0.008	0.000	0.001	0.005	0.000	0.002
Number of obs	62874	26161	27838	62874	26161	27838
Number of firms	45128	19746	18206	45128	19746	18206

Note: Standard errors corrected for clusters at the level of firms are in parentheses. "CPI" is the Transparency International regional corruption perception index.

Table 5: Efficiency loss from corruption

	Dummy: government procurement revenue > 1 % of revenue							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Local corruption measure:	α_1		dummy: t-stat> 10%		α_1		dummy: t-stat> 10%	
Log labor productivity	-0.015	-0.013	-0.015	-0.011	-0.015	-0.013	-0.015	-0.010
	(0.003)***	(0.003)***	(0.003)***	(0.003)***	(0.003)***	(0.003)***	(0.003)***	(0.003)***
Log labor productivity x Corruption		-0.067		-0.009		-0.087		-0.010
		(0.044)		(0.003)***		(0.046)*		(0.003)***
Corruption	0.084	0.278	0.002	0.028				
	(0.062)	(0.15)*	(0.006)	(0.012)**				
Log(Revenue)	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Net Income/Revenue	-0.050	-0.050	-0.050	-0.052	-0.049	-0.049	-0.049	-0.052
	(0.017)***	(0.017)***	(0.017)***	(0.017)***	(0.017)***	(0.017)***	(0.017)***	(0.017)***
Debt/Assets	-0.036	-0.036	-0.036	-0.036	-0.036	-0.036	-0.036	-0.036
	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***
Industry dummy	Y	Y	Y	Y	Y	Y	Y	Y
Locality dummy	N	N	N	N	Y	Y	Y	Y
Election year dummy	Y	Y	Y	Y	Y	Y	Y	Y
R-sq	0.063	0.063	0.063	0.063	0.071	0.071	0.071	0.072
Number of obs	29302	29302	29302	29302	29302	29302	29302	29302
Number of firms	19113	19113	19113	19113	19113	19113	19113	19113

Note: Standard errors corrected for clusters at the level of firms are in parentheses. Election year fixed effects and industry fixed effects are included as controls in all specifications. "Corruption" stands for one of the two measures of corruption constructed from the association between tunneling around elections and the distribution of public procurement.

A Online Appendix

Table A.1: Summary statistics

Sample: firms x elections					
	Mean	Median	St. dev.	N of obs	N of firms
	(1)	(2)	(3)	(4)	(5)
Revenue 2003, \$000's	\$14,246	\$ 2,852	\$ 105,660	63021	45275
Assets 2003, \$000's	\$13,113	\$ 1,317	\$ 173,933	63008	45264
Net Income 2003, \$000's	\$ 784	\$ 26	\$ 21,760	62804	45102
Net Income / Revenue 2003, %	1.95	0.81	9.38	63021	45275
Debt / Assets 2003, %	4.37	0.00	14.83	63021	45275
Annualized transfers to fly-by-night firms 1999-2004, \$000's	\$ 272	\$ 36	\$ 5,909	63021	45275
Annualized transfers to fly-by-night firms 1999-2004 / Revenue 2003, %	4.75	1.36	8.38	63021	45275
Annualized revenue from procurement 1999-2004, \$000's	\$ 58	\$ -	\$ 1,548	63021	45275
Annualized revenue from procurement 1999-2004 / Revenue 2003, %	0.37	0.00	1.99	63021	45275
Log(1+procurement revenue)	0.572	0.000	1.602	63021	45275
Proc. Rev >0, %	17.11	0.00	37.66	63021	45275
Proc. Rev >1% of revenue, %	5.02	0.00	21.84	63021	45275
Proc. Rev >5% of revenue, %	2.24	0.00	14.78	63021	45275
L(Tunneling / week, election window), 1999-2004	0.758	0.000	1.313	63021	45275
L(Tunneling / week, outside election window), 1999-2004	0.828	0.125	1.232	63021	45275
TI CPI Corruption	0.000	0.457	1.000	54115	38044
TI CPI Political Corruption	0.032	0.031	0.030	44787	30842
Labor productivity (revenue per employee)	32.551	15.008	58.625	44532	31101
Log labor productivity	2.873	2.709	0.966	44532	31101
Sample: firms x weeks					
	Mean	Median	St. dev.	N of obs	N of firms
	(1)	(2)	(3)	(4)	(5)
Tunneling per week / Revenue	0.001	0.000	0.003	6286011	45275
Procurement revenue / Revenue, %	0.530	0.000	3.386	6286011	45275
Proc. Rev >1% of revenue, %	5.747	0.000	23.274	6286011	45275
Proc. Rev >5% of revenue, %	2.387	0.000	15.265	6286011	45275

Table A.2: Summary statistics by region

Region (1)	Election Date 1 (1)	Election Date 2 (2)	N of obs (3)	N of firms (4)	Revenue, $000's (5)	Paym. to sp. / Revenue, % (6)	Gov orders / Revenue, % (7)	Gov01, % (8)	Gov05, % (9)
Adygeya republic	2002-01-13		38	38	4,099	0.83	0.00	0.00	0.00
Bashkortostan republic	2003-12-07		932	932	15,678	2.10	0.09	1.29	0.54
Buryat republic	2002-06-23		125	125	8,717	2.02	0.09	0.80	0.80
Altai republic	2001-12-16		201	201	23,178	6.04	0.31	3.48	1.99
Ingush republic	2002-04-07		11	11	47,930	2.97	0.00	0.00	0.00
Kabardino-Balkar republic	2002-01-13		44	44	4,984	2.07	0.00	0.00	0.00
Kalmyk republic	2002-10-20		48	48	20,906	9.59	0.45	4.17	2.08
Karachaevo-Cherkess republic	1999-04-25	2003-08-17	76	53	7,224	2.87	0.05	1.32	0.00
Karelia republic	2002-04-28		209	209	6,544	0.93	0.04	0.96	0.48
Komi republic	2001-12-16		205	205	17,385	2.88	0.00	0.00	0.00
Mari-El republic	2000-12-03	2004-12-19	236	148	4,430	1.93	0.11	1.27	0.42
Mordovia republic	2003-02-16		173	173	8,005	1.48	0.13	2.31	0.58
Sakha (Yakutia) republic	2001-12-23		202	202	18,535	2.81	0.16	1.49	0.99
North Osetiya republic	2002-01-20		60	60	6,876	5.23	0.00	0.00	0.00
Tatarstan republic	2001-03-25		578	578	20,799	2.71	0.23	2.25	1.21
Tuva republic	2002-03-17		15	15	3,473	1.19	0.00	0.00	0.00
Udmurtia Republic	2000-10-15	2004-03-14	622	429	10,478	1.49	0.20	2.25	1.29
Khakasia republic	2000-12-24	2004-12-26	133	88	9,736	1.14	0.00	0.00	0.00
Chuvash republic	2001-12-16		215	215	6,603	1.86	0.15	1.40	1.40
Altai krai	2000-03-26	2004-03-14	603	483	6,771	1.62	0.25	2.32	1.66
Krasnodar krai	2000-12-03	2004-03-14	2,440	1,589	8,523	3.00	0.13	1.52	0.90
Krasnoyarsk krai	2002-09-08		564	564	8,813	2.57	0.10	1.06	0.53
Primorskii krai	1999-12-19	2001-05-27	697	435	9,700	1.52	0.13	1.15	0.72
Stavropol krai	2000-12-03		379	379	7,685	2.37	0.19	2.37	1.06
Khabarovsk krai	2000-12-10	2004-12-19	827	532	9,009	2.09	0.14	1.57	0.85
Amur oblast	2001-03-25		117	117	9,200	3.23	0.01	0.00	0.00
Arkhangelsk oblast	2000-12-03	2004-03-14	431	288	8,350	2.19	0.11	0.70	0.70
Astrakhan oblast	2000-12-03	2004-12-05	253	147	9,142	2.08	0.09	1.58	0.79
Belgorod oblast	1999-05-30	2003-05-25	577	439	12,281	2.65	0.12	1.39	0.69
Bryansk oblast	2000-12-10	2004-12-05	442	262	6,978	3.25	0.32	2.94	2.04
Vladimir oblast	2000-12-10		295	295	8,596	2.30	0.52	5.42	3.73
Volgograd oblast	2000-12-24	2004-12-05	823	513	12,001	2.52	0.05	0.73	0.24
Vologda oblast	1999-12-19	2003-12-07	591	403	18,131	1.87	0.06	0.85	0.34
Voronezh oblast	2000-12-24	2004-03-14	900	685	6,306	2.20	0.16	1.33	0.89
Ivanovo oblast	2000-12-03		147	147	6,317	1.67	0.98	8.16	6.12
Irkutsk oblast	2001-07-29		552	552	9,928	2.31	0.08	0.91	0.54
Kaliningrad oblast	2000-11-05		129	129	13,540	1.79	0.15	3.88	0.78
Kaluga oblast	2000-11-12	2004-03-14	584	324	7,670	4.07	0.52	5.31	3.08
Kamchatka oblast	2000-12-03	2004-12-05	207	125	7,706	1.47	0.17	1.93	1.45
Kemerovo oblast	2001-04-22		395	395	18,723	1.86	0.05	0.51	0.25
Kirov oblast	2000-03-26	2003-12-07	506	334	6,636	1.61	0.14	2.17	0.99
Kostroma oblast	2000-12-10		99	99	7,315	2.23	0.47	4.04	4.04
Kurgan oblast	2000-11-26	2004-11-28	146	102	9,790	1.37	0.35	2.05	2.05
Kursk oblast	2000-10-22		147	147	10,561	1.97	0.26	3.40	2.04
Leningrad oblast	1999-09-19	2003-09-21	760	546	13,045	1.13	0.03	0.79	0.00
Lipetsk oblast	2002-04-12		288	288	18,278	2.18	0.09	1.39	0.35
Magadan oblast	2000-11-05	2003-02-02	167	108	6,402	2.21	0.19	2.40	1.20
Moscow oblast	1999-12-19	2003-12-07	5,271	3,176	11,006	6.76	0.64	10.09	3.76
Murmansk oblast	2000-03-26	2004-03-14	381	277	14,717	1.70	0.15	1.57	0.79
Nizhny Novgorod oblast	2001-07-15		855	855	14,124	2.65	0.28	3.16	1.64
Novgorod oblast	1999-09-05	2003-09-07	266	164	9,120	1.53	0.13	0.75	0.75
Novosibirsk oblast	1999-12-19	2003-12-07	1,215	881	11,071	2.36	0.16	1.89	0.99
Omsk oblast	1999-09-05	2003-09-07	605	428	21,003	2.26	0.10	0.83	0.50
Orenburg oblast	1999-12-19	2003-12-07	446	311	16,233	1.76	0.04	0.45	0.45
Oryol oblast	2001-10-28		199	199	14,016	2.26	0.24	5.53	1.51
Penza oblast	2002-04-12		243	243	5,002	2.32	0.20	3.70	1.65
Perm oblast	2000-12-03		343	343	18,899	1.80	0.14	2.33	0.58
Pskov oblast	2000-11-12	2004-11-14	237	155	6,844	2.66	0.37	3.38	2.11
Rostov oblast	2001-09-23		957	957	8,156	2.91	0.19	2.30	1.78
Ryazan oblast	2000-12-03	2004-03-14	494	284	9,575	2.51	0.28	2.23	2.02
Samara oblast	2000-07-02		508	508	25,800	1.65	0.14	1.38	0.79
Saratov oblast	2000-03-26		253	253	14,651	2.62	0.25	2.77	1.58
Sakhalin oblast	2000-10-22	2003-12-07	404	252	5,866	1.78	0.02	0.50	0.00
Sverdlovsk oblast	1999-08-29	2003-09-07	1,993	1,387	14,089	1.78	0.09	1.25	0.50
Smolensk oblast	2002-05-19		234	234	8,932	4.00	0.25	2.99	1.28
Tambov oblast	1999-12-19	2003-12-07	238	172	6,081	1.43	0.51	5.04	3.36
Tver oblast	1999-12-19	2003-12-07	482	331	7,244	3.46	0.29	3.11	1.87
Tomsk oblast	1999-09-19	2003-09-21	371	319	13,391	2.40	0.00	0.00	0.00
Tula oblast	2001-04-08		337	337	9,795	3.06	0.36	4.75	2.08
Tyumen oblast	2001-01-14		259	259	24,286	2.46	0.07	1.93	0.39
Ulyanovsk oblast	2000-12-24	2004-12-05	445	291	18,284	2.57	0.11	1.35	0.90
Chelyabinsk oblast	2000-12-24		496	496	20,278	1.94	0.22	2.02	1.41
Chita oblast	2000-10-29	2004-03-14	169	109	7,750	2.23	0.10	1.78	1.18
Yaroslavl oblast	1999-12-19	2003-12-07	807	560	8,957	2.06	0.23	3.35	1.24
Moscow city	1999-12-19	2003-12-07	21,321	13,783	17,592	8.38	0.62	8.86	3.75
St. Petersburg city	2000-05-14	2003-09-21	4,362	2,890	11,810	2.42	0.30	3.26	1.90
Evrei autonomous oblast	2000-03-26		10	10	4,127	1.29	0.18	10.00	0.00
o/w Aginsk Buryat autonomous	2000-10-29		11	11	27,739	4.59	0.23	18.18	0.00
o/w Komi-Permyak autonomous	2000-12-03		6	6	3,683	0.73	0.00	0.00	0.00
o/w Koryak autonomous okrug	2000-12-03	2004-03-14	16	10	20,500	1.86	0.09	0.00	0.00
o/w Nenets autonomous okrug	2001-01-14		13	13	15,570	4.35	0.00	0.00	0.00
Taimyr autonomous okrug	2001-01-28	2003-01-26	31	17	294,062	5.43	0.15	3.23	0.00
o/w Ust-Ordyn Buryat autonom	2000-11-19	2004-11-14	6	5	1,684	0.56	0.00	0.00	0.00
Khanty-Mansi autonomous okru	2000-03-26		389	389	70,841	3.14	0.06	0.77	0.26
Chukotka autonomous okrug	2000-12-24		22	22	12,309	3.55	1.04	9.09	9.09
Evenki autonomous okrug	2001-04-08		5	5	6,423	5.34	0.01	0.00	0.00
Yamalo-Nenets autonomous okr	2000-03-26		132	132	61,224	2.48	0.10	1.52	0.76

Table A.3: Regression results, Specification 1

Election week w	Coef. β_w^1	Std. Err.	t	Coef. β_w^2	Std. Err.	t	Coef. β_w^3	Std. Err.	t
-30	-0.00005	0.00009	-0.55	-0.00016	0.00006	-2.67	0.00002	0.00001	2.59
-29	0.00009	0.00010	0.86	-0.00019	0.00006	-2.94	0.00002	0.00001	2.65
-28	-0.00005	0.00010	-0.56	0.00014	0.00007	2.01	-0.00001	0.00001	-1.57
-27	0.00001	0.00010	0.09	-0.00010	0.00006	-1.52	0.00001	0.00001	1.75
-26	0.00006	0.00010	0.59	-0.00016	0.00006	-2.56	0.00001	0.00001	2.15
-25	0.00011	0.00011	0.99	0.00013	0.00008	1.74	-0.00001	0.00001	-1.02
-24	0.00028	0.00013	2.11	0.00025	0.00008	3.25	-0.00002	0.00001	-2.51
-23	0.00030	0.00012	2.51	0.00009	0.00007	1.32	-0.00001	0.00001	-1.02
-22	0.00011	0.00011	1.05	0.00001	0.00007	0.19	0.00000	0.00001	0.24
-21	0.00031	0.00012	2.52	-0.00001	0.00007	-0.10	0.00000	0.00001	0.60
-20	0.00012	0.00011	1.05	0.00002	0.00007	0.26	0.00000	0.00001	0.21
-19	0.00048	0.00015	3.26	0.00036	0.00008	4.56	-0.00003	0.00001	-3.59
-18	-0.00002	0.00010	-0.22	-0.00002	0.00007	-0.24	0.00000	0.00001	0.47
-17	-0.00006	0.00010	-0.62	0.00004	0.00007	0.65	-0.00001	0.00001	-0.76
-16	0.00002	0.00010	0.26	0.00015	0.00007	2.11	-0.00002	0.00001	-2.12
-15	0.00036	0.00014	2.55	0.00046	0.00008	5.73	-0.00005	0.00001	-5.22
-14	-0.00008	0.00007	-1.09	-0.00015	0.00006	-2.49	0.00001	0.00001	1.67
-13	0.00000	0.00009	-0.02	0.00008	0.00007	1.23	-0.00001	0.00001	-1.76
-12	0.00026	0.00013	2.03	0.00028	0.00007	3.72	-0.00003	0.00001	-3.91
-11	0.00041	0.00013	3.06	0.00039	0.00008	5.04	-0.00004	0.00001	-4.82
-10	0.00028	0.00012	2.36	0.00051	0.00008	6.44	-0.00006	0.00001	-6.15
-9	0.00008	0.00010	0.81	0.00010	0.00007	1.44	-0.00001	0.00001	-1.41
-8	0.00019	0.00012	1.62	0.00019	0.00007	2.68	-0.00002	0.00001	-2.83
-7	0.00021	0.00012	1.78	0.00024	0.00007	3.39	-0.00003	0.00001	-3.26
-6	0.00032	0.00013	2.49	0.00051	0.00008	6.44	-0.00006	0.00001	-6.02
-5	0.00000	0.00009	0.04	0.00003	0.00007	0.43	0.00000	0.00001	-0.64
-4	0.00009	0.00010	0.95	0.00001	0.00007	0.10	-0.00001	0.00001	-0.71
-3	0.00027	0.00012	2.30	0.00026	0.00007	3.63	-0.00003	0.00001	-3.67
-2	0.00052	0.00015	3.53	0.00058	0.00008	7.11	-0.00006	0.00001	-6.81
-1	0.00035	0.00013	2.77	0.00019	0.00007	2.69	-0.00002	0.00001	-3.03
1	0.00018	0.00012	1.54	0.00019	0.00007	2.57	-0.00002	0.00001	-2.61
2	0.00098	0.00017	5.71	0.00038	0.00008	4.62	-0.00004	0.00001	-4.49
3	0.00117	0.00018	6.40	0.00080	0.00009	8.73	-0.00009	0.00001	-8.01
4	0.00049	0.00015	3.28	0.00024	0.00008	3.21	-0.00003	0.00001	-3.47
5	-0.00016	0.00007	-2.10	-0.00026	0.00006	-4.29	0.00002	0.00001	3.50
6	0.00012	0.00011	1.12	-0.00007	0.00007	-1.02	0.00000	0.00001	0.49
7	-0.00003	0.00009	-0.35	0.00001	0.00007	0.07	0.00000	0.00001	-0.30
8	-0.00003	0.00010	-0.29	0.00050	0.00008	6.21	-0.00006	0.00001	-6.05
9	-0.00002	0.00009	-0.28	0.00005	0.00007	0.69	-0.00001	0.00001	-1.24
10	0.00006	0.00010	0.62	0.00006	0.00007	0.82	-0.00001	0.00001	-1.36
11	0.00006	0.00010	0.63	0.00013	0.00007	1.83	-0.00002	0.00001	-2.54
12	-0.00004	0.00010	-0.41	0.00029	0.00008	3.82	-0.00003	0.00001	-3.86
13	0.00018	0.00011	1.75	0.00004	0.00007	0.51	-0.00001	0.00001	-1.06
14	0.00008	0.00010	0.85	0.00016	0.00007	2.41	-0.00002	0.00001	-2.98
15	0.00020	0.00011	1.78	0.00021	0.00007	2.93	-0.00003	0.00001	-3.10
16	-0.00001	0.00010	-0.08	0.00024	0.00007	3.41	-0.00003	0.00001	-3.52
17	0.00013	0.00011	1.15	0.00034	0.00008	4.47	-0.00004	0.00001	-4.25
18	-0.00011	0.00009	-1.30	0.00002	0.00007	0.26	0.00000	0.00001	-0.48
19	-0.00002	0.00009	-0.17	0.00011	0.00007	1.58	-0.00001	0.00001	-1.78
20	-0.00004	0.00010	-0.42	0.00015	0.00007	2.12	-0.00002	0.00001	-2.24
21	0.00002	0.00009	0.23	-0.00015	0.00006	-2.59	0.00001	0.00001	1.41
22	0.00000	0.00009	0.02	-0.00029	0.00006	-4.87	0.00003	0.00001	4.24
23	0.00014	0.00010	1.38	-0.00004	0.00006	-0.69	0.00000	0.00001	-0.05
24	0.00008	0.00011	0.72	0.00026	0.00007	3.63	-0.00003	0.00001	-3.65
25	0.00039	0.00014	2.82	0.00041	0.00008	5.23	-0.00005	0.00001	-5.24
26	0.00017	0.00012	1.41	0.00017	0.00007	2.34	-0.00002	0.00001	-2.64
27	0.00001	0.00009	0.13	0.00018	0.00007	2.55	-0.00002	0.00001	-2.94
28	0.00008	0.00010	0.80	0.00022	0.00007	3.16	-0.00003	0.00001	-3.72
29	0.00003	0.00010	0.32	0.00024	0.00007	3.31	-0.00003	0.00001	-3.49
30	0.00033	0.00013	2.64	0.00045	0.00007	6.09	-0.00005	0.00001	-6.18
F-test for joint significance of β	F = 2.14 p = 0.000			F = 6.05 p = 0.000			F = 5.15 p = 0.000		
F-test for cycle $\overline{\beta}_{\in[-4;4]} = \overline{\beta}_{\notin[-4;4]}$	F = 37.28 p = 0.000			F =32.13 p = 0.000			F =30.18 p = 0.000		

Note: Number of obs.: 6,286,011. Number of firms, i.e., clusters: 45,275. R-sq, within: 2.09%. R-sq, between: 9.26%. Coefficients at cash inflows are suppressed from the table for brevity, they are statistically significant.

Table A.4: Regression results, Specification 3

Election week w	Coef. γ_w^1	Std. Err.	t	Coef. γ_w^2	Std. Err.	t	Coef. γ_w^3	Std. Err.	t
-30	-0.00045	0.00032	-1.41	-0.00016	0.00006	-2.64	0.00002	0.00001	2.58
-29	0.00084	0.00052	1.61	-0.00019	0.00006	-3.00	0.00002	0.00001	2.68
-28	-0.00017	0.00046	-0.37	0.00014	0.00007	2.00	-0.00001	0.00001	-1.57
-27	0.00027	0.00047	0.57	-0.00010	0.00006	-1.55	0.00001	0.00001	1.77
-26	0.00044	0.00045	0.97	-0.00016	0.00006	-2.59	0.00002	0.00001	2.16
-25	0.00080	0.00056	1.44	0.00013	0.00008	1.70	-0.00001	0.00001	-0.99
-24	0.00140	0.00066	2.11	0.00024	0.00008	3.22	-0.00002	0.00001	-2.48
-23	0.00135	0.00058	2.33	0.00009	0.00007	1.31	-0.00001	0.00001	-1.00
-22	0.00059	0.00054	1.10	0.00001	0.00007	0.17	0.00000	0.00001	0.25
-21	0.00171	0.00066	2.57	-0.00001	0.00007	-0.16	0.00001	0.00001	0.64
-20	0.00091	0.00064	1.42	0.00002	0.00007	0.22	0.00000	0.00001	0.23
-19	0.00246	0.00074	3.31	0.00035	0.00008	4.50	-0.00003	0.00001	-3.55
-18	-0.00046	0.00036	-1.28	-0.00001	0.00007	-0.19	0.00000	0.00001	0.44
-17	0.00038	0.00050	0.76	0.00004	0.00007	0.58	-0.00001	0.00001	-0.73
-16	0.00003	0.00050	0.07	0.00015	0.00007	2.12	-0.00002	0.00001	-2.12
-15	0.00122	0.00063	1.94	0.00046	0.00008	5.75	-0.00005	0.00001	-5.22
-14	-0.00051	0.00034	-1.50	-0.00014	0.00006	-2.46	0.00001	0.00001	1.65
-13	0.00007	0.00040	0.17	0.00008	0.00007	1.22	-0.00001	0.00001	-1.75
-12	0.00167	0.00071	2.36	0.00027	0.00007	3.65	-0.00003	0.00001	-3.87
-11	0.00140	0.00057	2.46	0.00039	0.00008	5.06	-0.00004	0.00001	-4.82
-10	0.00144	0.00063	2.27	0.00051	0.00008	6.42	-0.00006	0.00001	-6.13
-9	0.00057	0.00057	1.00	0.00010	0.00007	1.41	-0.00001	0.00001	-1.39
-8	0.00094	0.00059	1.59	0.00019	0.00007	2.67	-0.00002	0.00001	-2.82
-7	0.00154	0.00069	2.25	0.00023	0.00007	3.31	-0.00003	0.00001	-3.21
-6	0.00186	0.00069	2.70	0.00051	0.00008	6.38	-0.00006	0.00001	-5.98
-5	0.00027	0.00048	0.55	0.00003	0.00007	0.39	0.00000	0.00001	-0.62
-4	0.00084	0.00052	1.62	0.00000	0.00007	0.04	-0.00001	0.00001	-0.68
-3	0.00149	0.00060	2.49	0.00026	0.00007	3.58	-0.00003	0.00001	-3.64
-2	0.00221	0.00076	2.93	0.00057	0.00008	7.09	-0.00006	0.00001	-6.79
-1	0.00137	0.00063	2.16	0.00019	0.00007	2.69	-0.00002	0.00001	-3.02
1	0.00084	0.00054	1.56	0.00019	0.00007	2.56	-0.00002	0.00001	-2.60
2	0.00439	0.00087	5.04	0.00038	0.00008	4.58	-0.00004	0.00001	-4.45
3	0.00470	0.00086	5.45	0.00080	0.00009	8.72	-0.00008	0.00001	-7.98
4	0.00240	0.00077	3.13	0.00024	0.00008	3.17	-0.00003	0.00001	-3.44
5	-0.00074	0.00036	-2.03	-0.00026	0.00006	-4.28	0.00002	0.00001	3.49
6	0.00028	0.00043	0.64	-0.00007	0.00007	-1.00	0.00000	0.00001	0.48
7	-0.00025	0.00041	-0.62	0.00001	0.00007	0.09	0.00000	0.00001	-0.31
8	-0.00035	0.00041	-0.87	0.00050	0.00008	6.23	-0.00006	0.00001	-6.06
9	-0.00029	0.00033	-0.88	0.00005	0.00007	0.71	-0.00001	0.00001	-1.26
10	-0.00001	0.00044	-0.02	0.00006	0.00007	0.84	-0.00001	0.00001	-1.37
11	-0.00020	0.00039	-0.51	0.00013	0.00007	1.88	-0.00002	0.00001	-2.56
12	-0.00039	0.00042	-0.93	0.00029	0.00008	3.84	-0.00003	0.00001	-3.87
13	0.00058	0.00043	1.35	0.00004	0.00007	0.53	-0.00001	0.00001	-1.06
14	0.00000	0.00042	0.00	0.00016	0.00007	2.45	-0.00002	0.00001	-3.00
15	0.00067	0.00049	1.38	0.00021	0.00007	2.95	-0.00003	0.00001	-3.10
16	-0.00002	0.00046	-0.04	0.00024	0.00007	3.41	-0.00003	0.00001	-3.51
17	0.00059	0.00051	1.16	0.00034	0.00008	4.47	-0.00004	0.00001	-4.24
18	-0.00054	0.00044	-1.24	0.00002	0.00007	0.27	0.00000	0.00001	-0.49
19	-0.00030	0.00039	-0.75	0.00011	0.00007	1.60	-0.00001	0.00001	-1.80
20	0.00021	0.00058	0.37	0.00015	0.00007	2.08	-0.00002	0.00001	-2.22
21	0.00050	0.00053	0.96	-0.00015	0.00006	-2.66	0.00001	0.00001	1.44
22	0.00006	0.00047	0.12	-0.00029	0.00006	-4.88	0.00003	0.00001	4.24
23	0.00094	0.00057	1.65	-0.00005	0.00006	-0.74	0.00000	0.00001	-0.02
24	0.00059	0.00060	0.99	0.00026	0.00007	3.60	-0.00003	0.00001	-3.64
25	0.00183	0.00073	2.49	0.00040	0.00008	5.21	-0.00005	0.00001	-5.22
26	0.00105	0.00065	1.61	0.00017	0.00007	2.30	-0.00002	0.00001	-2.62
27	-0.00001	0.00038	-0.03	0.00018	0.00007	2.56	-0.00002	0.00001	-2.95
28	0.00050	0.00051	0.97	0.00022	0.00007	3.14	-0.00003	0.00001	-3.71
29	0.00046	0.00054	0.85	0.00024	0.00007	3.27	-0.00003	0.00001	-3.47
30	0.00197	0.00066	2.99	0.00044	0.00007	6.01	-0.00005	0.00001	-6.14
F-test for joint significance of γ	F =2.16 p = 0.000			F = 6.03 p = 0.000			F = 5.13 p = 0.000		
F-test for cycle $\overline{\gamma}_{\in[-4;4]} = \overline{\gamma}_{\notin[-4;4]}$	F = 28.17 p = 0.000			F =31.69 p = 0.000			F =29.72 p = 0.000		

Note: Number of obs.: 6,286,011. Number of firms, i.e., clusters: 45,275. R-sq, within: 2.09%. R-sq, between: 9.26%. Coefficients at cash inflows are suppressed from the table for brevity, they are statistically significant.

Table A.5: Summary statistics for local corruption measures

	Obs	Mean	Std. Dev.	Min	Max
	Locality level				
Coefficient α_{1l}	257	0.027	0.045	-0.09	0.20
Dummy (α_{1l} is signif)	257	0.237	0.427	0	1
	Firm level (observations)				
Coefficient α_{1l}	44118	0.032	0.030	-0.09	0.24
Dummy (α_{1l} is signif)	44118	0.574	0.494	0	1

B Data Appendix

B.1 Data Sources Used in Addition to Banking Transactions Data

In addition to the list of banking transactions, we use two other data sources. The first source is the Rosstat (Russia's official statistical agency) database of Russian companies provided by *Spark* (http://www.ispark.ru/en-US/default.aspx). This database contains a firm's INN, name, region, date of registration, industry, directors, owners, and other identifying information about the firm. In addition, it contains basic accounting data, such as revenue, profit, net income, assets, and debt. According to Russian law, all firms (even small ones) must report their balance sheets and income statements to Rosstat on a quarterly basis. Although this law does not set any explicit penalty for firms that do not report, the majority of Russian firms report their data to Rosstat to maintain good relations with the tax authorities. Rosstat contains accounting data for about 1.5 million Russian firms.

The second dataset includes the personal income of Moscow residents. It contains more than 7 million records for 2002, and more than 9 million records for 2003 and 2004. Each entry contains unique identification data (name, address, identification number) for both employer and employee. There can be multiple records per person if a person receives income from several sources. Guriev and Rachinsky (2006) use these data to measure income inequality in the presence of super-rich individuals. We use this dataset to get the number of tax agency employees.

B.2 Description of Variables Used in the Analysis

B.2.1 Sample: firms x elections

- Revenue, 2003 - Company's book revenue in 2003 taken from Rosstat
- Assets, 2003 - Company's book assets in 2003 taken from Rosstat
- Net Income, 2003 - Company's net income in 2003 taken from Rosstat
- Debt, 2003 - A sum of company's short term debt in 2003 and long term debt in 2003, which are taken from Rosstat
- Annualized transfers to fly-by-night firms 1999-2004 - Total transfers to fly-by-night firms by a firm in 1999-2004 divided by six. The transfers to fly-by-night firms are calculated using the banking transaction database. See Mironov (2013) for a detailed description of the identification procedure of fly-by-night firms. These firms are referred to as "spacemen" in Mironov (2013).
- Annualized revenue from procurement, 1 year after election - Total transfers from government-affiliated entities to a firm, which have the reported purpose of payment for goods and services during one year after the election. These transfers are calculated using the banking transaction database. In the baseline analysis, we exclude payments for utilities, e.g., electricity and water, from the list of revenues from public procurement contracts because these contracts are not usually allocated on a competitive basis and are automatically allocated to local monopolists. (None of the results changes if we keep utilities in definition

of public procurement.) If the election date happened to be in 2004, then we divide the total transfers by the number of days left until the end of 2004 and multiply by 365 (to get annualized revenue from procurement).

- Tunneling per week, election window - We calculate total transfers to fly-by-night firms by a firm from 4 weeks before until 4 weeks after the election and divide by 8. If the election period overlapped with our sample period and is shorter than 8 weeks, then we divide the transfers to fly-by-night firms by the actual number of weeks presented in our sample period (1999-2004). For example, if the date of the election is 2004-12-19, then we divide the transfers to fly-by-night firms by 5.7.

- Tunneling per week, outside election window - We calculate total transfers to fly-by-night firms by a firm starting one year before the election date and ending 4 weeks before the election. Then, we divide this number by the actual number of weeks presented in our sample period.

- Perceived corruption - see section 4.2 of the paper for description

- Tax-agency-level corruption - see section 5 of the paper for description

- Number of employees - number of firm's employees in 2003 taken from Rosstat

B.2.2 Sample: Firms x Weeks

- Tunneling per week - Transfers to fly-by-night firms during a specific week.

- Tunneling per year - Annualized transfer to fly-by-night firms from one year before until one year after the election. For example, if the election date is 2004-03-14 then we take total transfers to fly-by-night firms from 2003-03-14 to 2004-12-31. After that we divide this number by the number of days in the period from 2003-03-14 to 2004-12-31 and multiply by 365. If the election date is 2003-12-07 then we take total transfers to fly-by-night firms from 2002-12-07 to 2004-12-07 and divide them by 2.

- Revenue - Company's book revenue in 2003 taken from Rosstat

- Procurement revenue - Annualized transfers from government-affiliated entities from one year before until one year after the election. We include only transactions that have the reported purpose of payment for goods and services. We exclude payments for utilities, e.g., electricity and water, from the list of revenues from public procurement contracts.