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Author
Szucs, Ferenc

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Essays on Corruption and Political Favoritism

by

Ferenc Szucs

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Committee in charge:

Professor Frederico Finan, Chair
Professor Ernesto Dal Bo
Professor Stefano DellaVigna

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Abstract

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Corruption and political favoritism are considered major impediments to economic development. Although there is a growing consensus about the adverse efficiency consequences of corruption we still have a limited understanding of how corruption is shaped by political and economic institutions and how it affects our democracies. An increasing literature documents political favoritism and its welfare consequences relative to a no misallocation benchmark. In my dissertation, I complement this line of research by quantifying the effects of favoritism relative to relevant policy counterfactuals. My work highlights the importance of transparency and limiting regulatory discretion in improving the efficiency of public spending.

In the first chapter, I investigate the determinants and consequences of increasing a buyer's discretion in public procurement. I study the role of discretion in the context of a Hungarian policy reform which removed the obligation of using an open auction for contracts under a certain anticipated value. Below this threshold, buyers can use an alternative "high-discretion" procedure to purchase goods and services. At the threshold, I document large discontinuities in procurement outcomes, but I also find a discontinuity in the density of anticipated contract value, indicating that public agencies set contract values strategically to avoid auctions. To distinguish the causal effects of increased discretion from the self-selection of agencies into high-discretion procedures, I exploit the time variation of the policy reform. I find that discretion increases the price of contracts and decreases the productivity of contractors. To dig deeper into the motivations of public agencies, I use a structural model to identify discretion's impact on rents from corruption. I also use the same structural approach to simulate the effect of alternative value thresholds. I find that the actual threshold redistributes about 2 percent of the total contract value from taxpayers to firms and decreases the average productivity of contractors by approximately 1.6 percent. My simulations suggest that the optimal threshold would be about a third of the actual.

Moreover, case studies suggest that in addition to rent extraction corruption provides opportunities to buy political support in weakly institutionalized democracies (e.g. McMillan and Zoido (2004)). Consequently, detrimental effects of political favoritism may not be limited to misallocation of public resources but also constrain governmental accountability. In

the second chapter, my coauthor Adam Szeidl and I confirm this conclusion by investigating political favoritism in the Hungarian media market. We scrutinize three different markets, printed media, billboards, and online newspapers. We establish three main results about favoritism in the Hungarian media. First, we document distortive two-way favors between politicians and the media, in the form of government advertising and media coverage. For both directions of favors, our empirical strategy is to compare the allocations of actors with changing versus unchanging connection status. More specifically we compare advertising behavior of state-owned and private companies and media content of outlets with more and less political connections. Since friendly news coverage systematically moves together with advertising favors we interpret our findings as media capture. Second, we document an organizational change in favoritism: a first phase when favored media was controlled by a single connected investor; a second phase when this relationship broke down and two-way favors were terminated; and a third phase when control of newly favored media was divided between multiple connected investors. Our preferred interpretation is that governments with more de-jure power shift the organization of favors towards a divide-and-rule style arrangement. Third, we develop and implement a portable structural approach to measure the economic cost of misallocative favoritism.

To Klara

Contents

List of Figures

List of Tables

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Chapter 1

Discretion and Corruption in Public Procurement

1.1   Introduction

Corruption and lack of competition are widely considered as major impediments to efficient public spending. To overcome these challenges most developed countries have introduced formalized procedures, such as open auctions, to award contracts to providers of goods and services. In addition to creating strong incentives for bidders to reveal their true costs, auction is widely considered the most transparent procedure for limiting procurers' ability to engage in corruption or political favoritism (Chong, Staropoli, and Yvrande-Billon (2011), Tran (2010)). The role of transparency is not exhausted in limiting rent extraction, it may also decrease misallocation of resources associated with corruption. However, auctions usually take more time and have higher administrative cost than simpler and less formalized modes of procurement, such as direct negotiations. Moreover, a growing theoretical literature emphasizes that, due to information asymmetries and non-contractible dimensions of quality, providing more discretionary power to buyers can improve procurement outcomes (Manelli and Vincent (1995), Bajari and Tadelis (2001), Kang and Miller (2015)).

Despite its importance, due to data limitations, empirical evidence on the efficiency effects of different procurement procedures is still scarce. Indeed, to my knowledge, all existing work investigates the effect of discretion on tender level characteristics and fails to provide firm level evidence on the selection of contractors. Identification problems also constrain the supply of reliable evidence. Since procurement procedures are endogenously determined, simple correlations between procurement procedures and outcomes fail to address their causal relationships. For example, it is reasonable to assume that corrupt buyers value discretion in the selection of contractors more than their honest counterparts, which would confuse the effect of discretion with the effect of corruption.

This paper fills this gap by addressing both data and identification limitations. To directly address quality of selected contractors, I link a large database of public procurement

in Hungary to two additional firm level datasets. First, I match procurement contracts with the balance sheets of bidding firms, which enables me to study several firm level outcomes, such as the productivity of the winning firm. Second, I link procurement contracts to the political connections of bidding firms (created by Koren, Szeidl, Szucs, and Vedres (2015)), which is measured by identifying politicians among firm representatives. Measuring political connections allows me to investigate the effect of political favoritism on the choice of procurement procedure. To deal with the endogeneity of procedure selection, I combine the exogenous variation of a policy reform with a model of procuring agencies' procedural decisions. I structurally estimate the model to identify discretion induced gains in private rents captured by public officials and to evaluate the welfare consequences of alternative policies.

I analyze the impact of buyer discretion in the context of a Hungarian policy reform enacted in 2011, which relaxed the obligation of using an open auction when the anticipated contract value is less than 25 million Hungarian Forint (HUF, about 90,000 USD). Below the 25-million threshold, buyers could choose an invitational procedure, which provides them discretionary power to exclude bidders from participating in the tender.

I start my analysis by providing three important reduced form findings to illustrate public agencies' reaction to the policy reform. First, I compare the distribution of anticipated contract values before and after the policy reform was introduced. I find a large spike right below the value threshold in the post-reform period which was absent prior to the reform. This excess mass of procurement tenders seems to originate from above the threshold where there is a missing mass relative to the pre-reform period. This change in the distribution suggests that some public agencies set the contract value strategically to gain access to the high-discretion procedure. Second, I show that procuring agencies choose high-discretion procedures more often if at least one of the bidders is politically connected to the governing party. This result suggests that the demand for discretion is at least partially driven by procurers' desire to favor politically connected firms. Third, following Coviello, Guglielmo, and Spagnolo (2017), I use regression discontinuity design to document that procurement outcomes are different on the two sides of the value threshold. I find that the normalized price of the contract, measured by the ratio of the winning bid and the anticipated contract value, is 9 percent larger below than above the threshold. Also, for contracts below the threshold, buyers choose smaller, younger, and about 32 percent less productive firms than for contracts on the other side of the threshold. Selected firms below the threshold are more likely to be domestic, local, and politically connected than contractors above the threshold.

The RD estimates show interesting differences in procurement outcomes between the two sides of the threshold, but these differences cannot be interpreted as the causal effects of high discretion. The ideal experiment to estimate the causal effects would require a random assignment of procurement procedures to tenders which the RDD fails to deliver. As a result of the strategic determination of the contract values mentioned above, the comparability of units on the two sides of the threshold brakes down.

For example, there are good reasons to think that corrupt agencies have a larger demand for discretion, so we may find more of them below than above the threshold. Similarly, less competent agencies may feel the obligation of using open auctions more burdensome

than their more competent counterparts, creating a difference in the average competence of agencies on the two sides of the threshold. Consequently, discontinuities in outcomes reflect the sum of the causal effect of discretion and the sorting of tenders around the threshold.

In order to disentangle the causal effects from the effects of sorting, I exploit time variation in procurement rules created by the policy reform. Since the reform introduced high-discretion procedure only below the threshold, one can use a difference-in-differences design to measure the impacts of discretion. In this approach, the treatment group consists of tenders below the threshold where the new policy made the high-discretion procedure available, while the control group is made of tenders above the threshold where there was no change in regulations. However, even the upper tail of the value distribution is effected by the policy change through the outgoing selection of tenders, contaminating our control group. To deal with this problem, I combine the difference-in-differences design with a Roy (1951) model which describes the joint decision of contract value and procurement procedure.

I estimate the model in two steps. In the first step, I estimate the extent of sorting into high discretion non-parametrically by incorporating information on the changes of contract value distributions. In the second step, I use a control function approach to disentangle the causal effects of discretion from the effects of sorting. The logic of the identification is somewhat similar to Diamond and Persson (2016) who estimate the effect of teacher grade manipulation on student outcomes by comparing both the outcomes and the grade distributions to manipulation free counterfactuals. However, unlike Diamond and Persson, I have the pre-reform period to generate these counterfactuals. If we compare open auctions across time periods, we find a large compositional change below the threshold where discretion becomes easily available and generates large sorting into the high-discretion procedure. Conversely, above the threshold, as we move further from it, discretion requires more distortion of the contract value, making sorting less popular. The comparison of outcomes of open auctions across time at different points of the contract value distribution, exposed to a varying degree of compositional change, identifies the effects of sorting.

The results of the semi-parametric selection correction model are smaller than the discontinuities at the threshold. My estimates suggest that discretion increases the price of contracts by 8 percent and decreases the productivity of contractors by 12 percent. I detect a substantial sorting of low-productivity tenders into the high-discretion procedure, meaning that procurers of tenders where the winning firm would have been less productive even if open auction had been used choose high discretion more often. This finding is consistent with the practices of corrupt procuring agencies for two reasons. First, less productive contractors could be a consequence of corruption since not even auctions are perfectly immune to manipulations resulting in the selection of less efficient but politically favored firms. Second, corrupt agencies might prefer discretion to avoid costly manipulation of auctions. Moreover, this sorting contradicts with any complementarity between the procurers' competence and their preference for discretion since agencies with a high demand for discretion have a tendency to select less productive contractors.

Manipulation of contract values is a challenge in estimating the effect of discretion, but it is an opportunity to understand why procurers choose high discretion even at the expense

of buying a smaller amount of goods or services.[1] Since the high-discretion procedure is not available above the threshold, the size of the excess mass below the threshold provides information on the trade-off between choosing high discretion and obtaining more contract value. To obtain a meaningful measure of this trade-off, I structurally estimate my Roy model describing procurement decisions. Unlike in the semi-parametric approach mentioned above, I estimate the demand for discretion parametrically, which requires more functional form assumptions, but allows for more economic interpretations. The two main goals of the parametric approach are the following. First, it identifies the effect of discretion on private rents captured by procurers. These rents are identified by comparing spikes below the threshold for tenders with and without politically connected bidders. More specifically, this variation allows me to estimate the extra contract value that agencies are willing to sacrifice to gain high discretion if a politically connected firm participates in the tender. Second, the identification of the trade-off between discretion and contract value enables me to simulate the effect of alternative procurement thresholds and find its optimal value.

The structural estimates of the model confirm the semi-parametric results. I find that discretion increases prices by 6 percent and decreases the average productivity of contractors by 10 percent. Moreover, my model estimates directly confirm that corruption increases the demand for discretion. I find that when a politically connected firm participates, procurers are willing to sacrifice 25 percentage points more value to increase discretion than in tenders with only unconnected bidders.

I use my parametric model to conduct a few policy simulations. The model highlights that the introduction of a value threshold affects average prices and productivities through two main channels. First, it affects agencies' procedure choices by making the high-discretion procedure available, which directly increases the price of contracts and decreases the productivity of contractors. Second, in addition to procurement procedures it also changes the distribution of contract values which has an opposite effect on the productivity of contractors. Due to the specific nature of sorting, it disproportionately decreases contract values of low productivity (and probably more corrupt) tenders. This means that although discretion makes inefficient contracts even less efficient, it also makes them smaller and reduces their weight in total procurement spending.

I find that for low thresholds (below 15 million HUF) the second effect dominates and the introduction of the threshold increases average productivity. However, for larger thresholds, the opposite effect dominates. The policy simulations suggest that the optimal threshold would be around 6 million HUF (about 21,000 USD). The policy reform introduced in 2011 decreased average productivity of public spending, hence increased aggregate production cost by 1.6 percent. Also, it increased the price of every dollar of anticipated public spending by 2 cents.

This paper speaks most directly to a small but growing literature investigating the effects of discretion in public procurement (see Chever and Moore (2012), Chever, Saussier, and

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[1]Similarly in spirit to Saez (2010), which estimates tax elasticity using the bunching at kinks of the income tax schedule.

Yvrande-Billon (2017), Lalive and Schmutzler (2011), Coviello et al. (2017)). I contribute to this literature in two dimensions. First, having access to the balance sheets of bidding firms, I study direct measures of contractor quality which allow a more reliable assessment of efficiency consequences. Second, using exogenous variation of the policy reform and a model of selection correction, I improve the identification of the causal effects of discretion.

My study also contributes to a line of research investigating the determinants of the demand for discretion. For example, Palguta and Pertold (2014) document manipulation of contract values to avoid auctions in the Czech Republic and finds a higher fraction of anonymously owned firms among the winners of manipulated contracts. Tóth and Hajdú (2017) document similar anomalies in contract values in Hungary and link them to an increased risk of corruption. Chong et al. (2011) study public procurement contracts undertaken by French municipalities and finds a positive correlation between political competition and the use of auctions. Gerardino, Litschig, and Pomeranz (2017) find that rigorous audits increase procurers demand for high-discretion procedures. I complement these studies by establishing a direct link between high-discretion procedures and corruption.

I also build on the literature of political favoritism in procurement (Brogaard, Denes, and Duchin (2015), Goldman, Rocholl, and So (2013b), Muraközy and Telegdy (2016), Baltrunaite (2016)). My main contribution to this line of research is showing the importance of buyer's discretion in promoting favoritism. I also contribute to works quantifying the welfare consequences of favoritism (Mironov and Zhuravskaya (2015), Schoenherr (2016), Szeidl and Szucs (2017), Bandiera, Prat, and Valletti (2009)) by providing a structural framework to simulate the effects of alternative policies.

Finally, this paper is closely related to a literature investigating the effects of specific policies on corruption, such as Di Tella and Schargrodsky (2003), Olken (2007), Ferraz and Finan (2008), Avis, Ferraz, and Finan (2016) which measure the effect of government audits on local public spending. I complement this body of research by documenting the importance of transparent procurement procedures in fighting corruption.

The rest of the paper is organized as follows. Section 1.2 describes the institutional context and my data. Section 1.3 presents my reduced-form evidence. Section 1.4 presents the model of procuring decisions. In section 1.5, I describe my semi-parametric approach to estimate the model and I report the results. Section 1.6 presents the structural estimation of the model. In Section 1.7, I quantify the welfare consequences of alternative procurement policies. Section 1.8 concludes.

1.2 Context and data

Public Procurement in Hungary

Hungary is one of the new member states of the European Union. Before Hungary's 2004 accession to the EU, its national procurement legislation has been gradually harmonized with the European directives. An explicit goal of the EU directives was to improve the

transparency and competitiveness of the procurement process. In line with these efforts, the Procurement Act of 2003 named open auction as the most desired procurement procedure, which could be avoided only under very specific circumstances. Indeed, during the 2003-2011 period more than two thirds of public procurement contracts were awarded through open auctions.

During my study period, Hungary had two consecutive administrations. Between 2002 and 2010 a Socialist-Liberal coalition was governing Hungary. After series of scandals involving the prime minister, the Socialist government suffered a large decline in popularity. In 2010, the Conservative opposition won a landslide victory, capturing two thirds of parliamentary seats. Relying on its unprecedented political power, the new conservative administration enacted a long list of new laws, including a reform of public procurement regulations.

Although open auctions are widely considered the most transparent form of public procurement, they are typically slower and more costly to organize than simplified procedures providing more discretion. Since the temptation to engage in corruption increases in the contract value, many countries, including the United States and most EU countries, use procurement thresholds providing simplified procedures for small value contracts. Following these examples, in 2011 the Hungarian parliament accepted a new Public Procurement Act enabling government agencies to choose an invitational procedure as long as the anticipated contract value was below 25 million HUF (about 90,000 USD).[2] The anticipated value of a contract is set by the procuring agency before the procedure is selected by way of matching the approximate cost of the purchase. The simplified procedure mentioned above provides the buyer more discretion to pre-select potential applicants,[3] which clearly makes the procurement procedure simpler and faster, but comes at the cost of less transparency and higher risk of corruption.

Data and descriptive stats

The primary source of data is the cleaned public records of all Hungarian procurement contracts for the 2009-2014 period. This dataset contains the anticipated and actual procured value of the contracts and the identity of all bidders. Since the 25-million threshold applies only to non-construction tenders, I restrict my attention to them. From the total 51,000 contracts, I exclude 276 observations where the number of bidders exceeds 30, because the high number of bidders suggests a framework agreement instead of an individual project.

Figure 1.1 shows the number (1.1a) and aggregate value (1.1b) of contracts awarded using either an invitational (which provides high discretion) or any other procedures. Other procedures mostly consist of open auctions, but negotiation with announcement and a few other special procedures also belong to this category. Negotiation with announcement is

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[2]In the 2011-13 period the invitational procedure took the form of a direct negotiation without an announcement. From November 2013 procurers could also choose a simplified version of auction where only invited firms can bid.

[3]To maintain a minimum level of competition, public agencies using invitational procedures have to invite at least three firms.

also considered a highly competitive procedure, since it is open to all applicants meeting the requirements listed in the announcement. Figure 1.1a shows that the total number of contracts is about 18,000 in the pre-reform and 33,000 in the post-reform period. High-discretion tenders give only a negligible share before (about 3.5 percent) but more than half of total contracts after the reform. Similarly, the share of value procured using a high-discretion procedure goes up from 6 percent of 1.6 billion dollars spent in the pre-reform period to more than a third of 2.6 billion spent in the post period.

To evaluate the selection of contractors, I use the names of awarded firms to link them to their balance sheet data. I was able to match almost 80% of my sample of contracts to the corresponding balance sheet of the winning firm. Although the imperfect match of contracts to balance sheets may raise concerns of sample selection bias, the procedure type does not seem to correlate with the success of matching. Indeed, Figure 1.2 shows no discontinuity in the fraction of contracts matched at the 25-million threshold, which means that from the perspective of procedural choice, the matching was as good as random.

Throughout my analysis, I look at two main groups of procurement outcomes. The first group is tender level characteristics measuring the competitiveness and the price of public purchases. I operationalize competition by the number of firms participating in the procurement tender. This could be the number of bidders in case of an auction or the number of firms involved in the negotiation. The other important tender level characteristic is the normalized price of the contract, calculated by the log-ratio of actual and anticipated contract values (similar to the winning rebate used by Coviello et al. (2017)). This captures the percentage deviation of the winning bid from the anticipated price (which should be an expert estimate of the market price of the product or service purchased).[4]

Access to balance sheets of winning firms allows me to analyze different measures of contractor quality. As proxies of firm quality, I use the size and the age of the awarded firm. Each of these variables are widely used proxies for productivity, since more productive firms grow larger and live longer (Syverson (2011)). As a more direct measure of productivity, I calculate the total factor productivity of contractors. Following a very standard approach, similar to Hsieh and Klenow (2009b), I assume that firms have a Cobb-Douglas production function, which gives a simple expression for the logarithmic total factor productivity,

$$\log TFP = \log \frac{Y}{L} - \bar{\alpha} \log \frac{K}{L},$$

where Y is the added value of the firm, L is employment, K is equity of the firm, and $\bar{\alpha}$ is the one digit industry average of capital income share, measured by $\alpha = 1 - \frac{wage\,bill}{Y}$. Calculating the TFP of a firm from its balance sheet raises a possible concern.

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[4]In about 7 percent of all tenders the winning bid was less then a third of the anticipated contract value. Checking a few announcements manually suggested that sometimes the winning bid records the unit price while the anticipated value approximates total costs resulting in extreme low normalized prices. To correct these mistakes, for tenders with normalized prices below -1 (meaning that winning bid is less than third of the anticipated value), I imputed the average normalized price of their period-procedure-contract value cell.

Connected firms could win overpriced procurement contracts or get access to preferential loans that could artificially inflate their productivity. This could create a spurious correlation with discretion if connected firms win high-discretion tenders more often. To avoid this problem, I compute the average lagged TFP of each winning firm in the 2006-2009 period. As the timeline of events in Figure 1.3 shows, I calculate average productivity for the last legislative period before the conservative government which enacted the reform, came to power. Since the conservative party was not in the position of favoring firms before 2010, the right-connected firms' lagged TFP is free of the effect of political favors.

Using the Hungarian Company Register, I create indicators for domestic and local firms. A firm is classified as domestic if the majority of its owners are domestic entities. A bidder is local in a given tender if its HQ is located in the same city as the procuring agency.

An important part of the research design relies on identifying political connections of bidding firms. To document political connections, I use a measure created by Koren, Szeidl, Szucs, and Vedres (2015). In this paper, we create a measure of political connections for the 500 firms with the largest procurement revenue during the 2006-2014 period.[5]

Research assistants manually checked the connections between the firm and any of the parliamentary parties in a few different datasets. First, they looked for matches in the full names of firm representatives and political candidates. We obtained the names of firm representatives from the Hungarian Company Register. Firm representatives include three main groups. (1) Representatives who can sign legal documents in the name of the firms, typically top managers. (2) Owners. (3) Board members. To get the names of political candidates, we used digitized public records of all national and local elections during the 1990-2014 period. In the case of matching names, we relied on our assistants personal judgment in determining whether the name was rare enough to classify the firm as politically connected. Second, assistants made manual Google searches on the names of each company to find any mention of personal connections between the firm and political parties in national or local news.

We classified a firm as politically connected if any of the previous two steps produced evidence on the political connections of the company. For more details of the connection measure see Koren et al. (2015). In this paper, I focus on the connections to the conservative party because it was in power during the whole post-reform period. This classification divides procurement tenders into three groups. (1) Tenders with no checked bidder. (2) Tenders with at least one checked but no connected bidder. (3) Tenders with at least one checked and connected bidder.

Table 1 reports the averages of all variables described above for high-discretion and other tenders separately. Panel A of Table 1 displays tender level characteristics. The value of high-discretion tenders are somewhat smaller than the average value of other tenders, which is a direct consequence of the compliance with the value threshold. Table 1 documents a lower level of competition and a higher average price, when a high-discretion procedure is used.

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[5]During the 2009-14 period 406 of the 500 top procurement winners have won a non-construction tender.

It also shows that checked firms (top 500 procurement winners) are more likely to participate in other tenders, hence the fraction of tenders with connected participants is also higher for other tenders. This is not surprising, since high-discretion procedures are limited to relatively small contracts, and checked firms are more attracted by bigger contracts. On the other hand, conditional on having at least one large competitor, the fraction of tenders with at least one connected firm is larger for the high-discretion tenders. This means that connected firms are over-represented among checked firms in high-discretion tenders, which can be the sign of an increased level of political favoritism.

Panel B of Table 1.1 reports the averages of winner level characteristics. It shows that contractors awarded in a high-discretion procedure tend to be smaller, younger, and less productive than contractors of other tenders. These numbers suggest an unfavorable selection of contractors when a high-discretion procedure is used. The ownership of winning firms also differs across different procedures. High discretion is associated with a higher chance of a domestic, local, and connected winners. These results suggest that discretion gives rise to political motives in the selection of contractors.

1.3   Reduced form evidence

Distribution of contract values

Figure 1.4 illustrates the distribution of anticipated contract values. The dashed line shows the pre-reform distribution, the solid line depicts the post-reform distribution.

The left tails of the pre- and post-reform distributions are very similar, but in the post-reform period there is a large spike below the threshold, which was absent before the reform. The excess mass of the spike seems to originate from above the threshold where there is a missing mass relative to the pre-reform period. The main finding in the figure is that some buyers strategically anticipated contract value right below the threshold in order to avoid the open auction requirement.

A possible way of manipulating the size of a contract is cutting a larger project into multiple smaller pieces. Although plausible, this does not seem to be the dominant form of manipulation in this context. Figure 1.5 plots the distribution of project values, aggregated to agency-contractor-year cells, and shows a very similar picture to Figure 1.4. This suggests that agencies are willing to make real distortions to the size of their projects to simplify the procedure or to obtain more discretion over the selection of contractors.

Procuring public officials may prefer to avoid open auctions for multiple reasons. On one hand, the invitational procedure is faster and associated with lower administrative costs than an open auction, which requires a public announcement and the review of potentially more applications. On the other hand, high discretion provides more opportunities to extract private rents through corruption. Figure 1.6 provides suggestive evidence that the demand for high discretion is at least partially driven by agencies desire to favor politically connected firms. It plots the distribution of anticipated contract values for tenders with at least one

"checked" participant because I only have data on the political connections of the hand-checked firms. The dashed line depicts the value distribution for the pre-reform period. The post reform distribution is displayed separately for tenders with at least one connected bidder (solid line) and tenders with only unconnected bidders (dashed-dotted line). The figure shows that the excess mass below the threshold is larger for tenders with connected participants, suggesting that political favoritism is an important factor in the choice of high discretion.

Since firms' participation decisions are made after the procedure is selected Figure 1.6 is consistent with an alternative interpretation. It is possible that the causal link between connected participation and high-discretion procedure goes the other direction and connected firms are attracted more to high-discretion tenders. To rule out this interpretation, in Figure 1.7, I plot the contract value distribution (in the post-reform period) for product categories with more (where connected firms participate in more than 20 percent of tenders) and less connected firms separatelly. Figure 1.7 shows a very similar pattern to Figure 1.6. Since the product category of a firm's output is more exogenous than participation choice the similarity of the two graphs supports the original favoritism interpretation.

Impact of high discretion

The procurement reform of 2011 has introduced a discontinuity in the procurement regulations at 25 million HUF. Before I present my empirical strategy investigating the causal effects of high discretion, I study how this discontinuity affected the overall behavior. First, I look at compliance of procuring agencies with the new law. Figure 1.8 shows the first stage relationship plotting the share of high-discretion procedures as a function of anticipated value. The large discontinuity in Figure 1.8 is a direct consequence of the post-reform legislation, which relaxes the strict requirements of invitational procedures below, but not above, the threshold.

Next, I check whether the discontinuity in procurement regulations induces discontinuities in important tender and winning firm level characteristics.

Tender level characteristics. I start presenting my results with tender level characteristics. Figure 1.9 provides graphical evidence on the discontinuity of tender level outcomes at the 25 million threshold. Figure 1.9a plots the number of firms participating in the tender. It shows a very small discontinuity, which suggests that discretion has a limited effect on firm entry. On the other hand, Figure 1.9b reports a clear discontinuity in normalized prices and shows that the price of a dollar of anticipated contract value is substantially higher below than above the threshold. The large drop of average normalized price at the threshold is especially interesting given that we see no discontinuity in entry. The difference in prices on the two sides of the threshold is not simply the consequence of different levels of competition, but is driven by other factors such as a change in the level of corruption or in the composition of the applicant pool.

To quantify the size of discontinuities in procurement outcomes, I run the following local

linear regressions,

$$Y_i = \alpha + \beta \cdot 1\left(\log\frac{V_i}{T} > 0\right) + \gamma \cdot \log\frac{V_i}{T} + \zeta \cdot \log\frac{V_i}{T} \cdot 1\left(\log\frac{V_i}{T} > 0\right) + \varepsilon_i. \qquad (1.1)$$

My left hand side variables are the tender level characteristics introduced above. The running variable is the logarithmic anticipated value normalized to zero at the threshold. I estimate Equation 1.1 using triangular kernel and the optimal bandwidth selection rule proposed by Calonico, Cattaneo, and Titiunik (2012).

Results are reported in Panel A of Table 1.2. Column 1 shows that tenders above the threshold have slightly more bidders, though the difference is not significant. Column 2, on the other hand, documents that prices of tenders above the threshold are 6.4 percent larger than below.

I determine the implied correlations of procurement outcomes and discretion by estimating the following fuzzy RD specifications:

$$Y_i = \eta + \mu \cdot D_i + \rho \cdot \log\frac{V_i}{T} + \xi \cdot \log\frac{V_i}{T} \cdot 1\left(\log\frac{V_i}{T} > 0\right) + \nu_i, \qquad (1.2)$$

where the excluded instrument is an indicator for the contract value being above the threshold. The first stage equation is similar to Equation 1.1, with discretion being on the left-hand side.

Fuzzy RD results are shown in Panel B of Table 1.2. Column 1 confirms the graphical evidence by documenting a weak and marginally significant negative relationship between discretion and firm entry. Column 2 shows that high-discretion procedures are associated with 9 percent higher prices.

Winning firm level characteristics. Since procurement contracts are linked to the balance sheets of winning firms, I can study relationships between procurement procedures and some key observables of the selected contractors. Similarly to the graphs above, Figure 1.10 plots winning firm characteristics as a function of anticipated contract value. Figure 1.10a shows the logarithmic total factor productivity of the winning firm and documents a vast difference in the average productivity of contractors on the two sides of the threshold. Similarly, Figure 1.10b-c reports large discontinuities in log-employment and firm age, which are also widely used proxies of firm productivity. Figure 1.10d documents a slight drop in the concentration of local firms at the threshold, while Figure 1.10e shows a large discontinuity in the fraction of domestic winners. These results are consistent with corruption being stronger below the threshold, since local and domestic firms are more likely to have political connections providing them superior bribing technology. I can confirm this claim more directly by using my measure of political connections. Figure 1.10f plots the fraction of politically connected winners conditional on having at least one connected applicant. It shows that below the threshold, where the high-discretion procedure is available, connected bidders have a better chance of being awarded a contract.

For winner characteristics, I also run regressions specified by Equation 1.1, but now Y_i denotes variables plotted in Figure 1.10. Results are reported in columns 1-6 of Table 1.3.

Column 1 estimates a 20-percent gap in the average productivity of winning firms between the two sides of the threshold. Columns 2-6 show that winners below the threshold are almost 50 percent smaller, 2.8 years younger, more likely to be local by 4, domestic by 12, and politically connected by 19 percentage points.

Similarly to tender level characteristics, I use the fuzzy RDD described by Equation 1.2 to estimate the implied correlations of winner characteristics and discretion. Panel B of Table 1.3 presents the results. Column 1 shows that contractors selected in high-discretion procedures are less productive by 32 percent than contractors selected in open auctions. Results in columns 2-6 imply substantial differences in other variables too. Estimates suggest that winning firms have about 64 percent less employees, and are 4.6 years younger if they are awarded in high-discretion procedures. Contractors selected in high-discretion procedures are more likely to be local by 7 and domestic by 18 percentage points. Moreover, connected firms have a 28-percentage point higher chance to win in a high-discretion procedure.

Discussion. Although we see strong discontinuities at the 25-million threshold, it is still unclear whether discretion has a causal effect on procurement outcomes. The ideal experiment would randomly allocate the procurement procedure to tenders and observe the difference in prices and selection of winning firms. However, since we see a clear manipulation of contract values around the threshold, the regression discontinuity design can easily fail to provide a random assignment of tenders and agencies to the two sides of the threshold. If a specific group of public agencies has a higher demand for discretion and sorts below the threshold, then comparability of tenders on the two sides of the threshold brakes down. In this case, the discontinuities above do not reflect the true causal effects of discretion, but they are at least partially driven by the compositional differences between the two sides of the threshold.

Composition of tenders on the two sides of the threshold can differ for multiple reasons. Since discretion helps to handpick the winner of a tender, it is very likely that corrupt procurers have a stronger preference for discretion and are more willing to manipulate contract values to obtain them. At the same time, corrupt agencies would select less productive contractors even if they used open auctions since they optimize for bribing instead of production technology. Similarly, it is reasonable to assume that incompetent agencies find open auctions excessively burdensome, hence sort below the threshold. This also results in a selection bias, since incompetent agencies are less efficient at finding suitable contractors anyway. Both stories would clearly introduce an upward bias (in absolute terms) into the RD estimates.

On the other hand, if procurement contracts are exposed to serious contracting difficulties, then discretion and competence of the buying agency are complements. This complementarity would imply the sorting of the most competent agencies into discretion, since they benefit the most from the flexibility of high-discretion procedures. This reasoning would imply that RDD underestimates the effects of discretion.

1.4 Model of procurement

To deal with the endogeneity of the agencies' procurement decisions and to shed some light on the determinants of the demand for high discretion, I propose a simple model describing the joint decision of contract value and procurement procedure. The model is built around the idea that public agencies potentially trade lower prices of open auctions to lower administrative costs and higher rents provided by high-discretion procedures. The model formalizes the intuition that procurers with large demands for goods and services may choose suboptimal quantities in order to avoid the obligation to use open auctions. The model investigates how corruption affects this trade-off between choosing a high-discretion procedure and signing a larger value contract.

The procuring agency simultaneously determines the anticipated contract value V and the type of procurement procedure D. She potentially interacts with two types of firms, politically connected and unconnected. As a result of the two firm types, the applicant pool of a tender could consist of (1) only unconnected firms ($C = 0$) or (2) at least one connected firm ($C = 1$).

The selected firm pays a given percentage of the price P to the agency in bribes. Since the agency's bargaining power depends on her discretion, the kickback scheme is a function of procedure type, $Bribe = \beta(D) \cdot P$. I assume that politically connected firms have a superior bribing technology, so they pay a larger kickback at all procedures, $\beta^c(D) > \beta^{uc}(D)$.

The utility of the agency is additively separable in public and private benefits and the cost of the procedure,

$$U(V, D) = \lambda \log(V - P) + (1 - \lambda) E[\log(Bribe)] - c(D), \qquad (1.3)$$

where λ is the weight on public benefit. The public benefit is given by the log difference between the contract value and the price paid. The private benefit is the expected value of log bribes. Since the contract can be awarded to two types of firms, the agency's expected utility from bribes is given by

$$E[\log(Bribe)] = q(D, C) \log(\beta^c(D) P) + [1 - q(D, C)] \log(\beta^{uc}(D) P), \qquad (1.4)$$

where $q(D, C)$ is the probability of a connected winner as a function of the procurement procedure and the type of the applicant pool. This probability is positive only if there is at least one connected firm among the bidders ($C = 1$), so $0 = q(D, 0) < q(D, 1)$.

Since this model focuses on the procuring agency's behavior, I abstract away from the bidding behavior of potential contractors and assume that the winning bid is linear in the value with a procedure specific coefficient,

$$P = \alpha(D) V. \qquad (1.5)$$

By substituting Equation 1.4 and 1.5 into Equation 1.3 we get

$$U(V, D) = \log V + \lambda \log(1 - \alpha(D)) + (1 - \lambda) \log \alpha(D) + (1 - \lambda) \log \beta^u(D)$$

$$+ (1 - \lambda) \, q \, (D, C) \log \frac{\beta^c \, (D)}{\beta^{uc} \, (D)}.$$

Unfortunately, my data and empirical design will be insufficient to separately identify all parameters of the utility function. However, some interesting and meaningful functions of parameters can be identified even without recovering the primitives of the model. The following equation rewrites the utility as a function of variables I can directly estimate from the data.

$$U \, (V, \, D) = \log V + b \cdot D + \pi \cdot D \cdot C + const, \tag{1.6}$$

where $b \equiv c \, (0) - c \, (1) + \lambda \log \frac{1 - \alpha(1)}{1 - \alpha(0)} + (1 - \lambda) \log \frac{\alpha(1)}{\alpha(0)} + (1 - \lambda) \log \frac{\beta^u(1)}{\beta^u(0)}$ is the net benefit of high discretion relative to open auction, picking up all factors affecting the relative desirability of different procurement procedures in tenders with politically unconnected bidders. b summarizes discretion's impact on the agency's utility through its effect on prices, administrative costs, and bribes collected from unconnected firms. $const \equiv \lambda \log (1 - \alpha \, (0)) + (1 - \lambda) \log \alpha \, (0) + (1 - \lambda) \log \beta^{uc} \, (0) - c \, (0) + (1 - \lambda) \, q \, (0, C) \log \frac{\beta^c(0)}{\beta^{uc}(0)}$ is a constant unaffected by the optimal choice of procurement procedure and contract value. $\log V + const$ captures the agency's utility from choosing contract value V and using an open auction.

The parameter of primary interest is

$$\pi \equiv (1 - \lambda) \left(q \, (1, 1) \log \frac{\beta^c \, (1)}{\beta^{uc} \, (1)} - q \, (0, 1) \log \frac{\beta^c \, (0)}{\beta^{uc} \, (0)} \right),$$

which measures discretion's effect on the expected value of extra private rents collected from connected firms. An alternative interpretation of π is that it measures the extra contract value agencies are willing to sacrifice to gain high discretion if a politically connected firm participates in the tender. Discretion potentially affects extra expected rents from connected firms through two margins. First it can influence the probability that a connected firm wins, $q \, (1, 1) \neq q \, (0, 1)$. Second, it can influence the premium paid by connected firms, $\frac{\beta^c(1)}{\beta^{uc}(1)} \neq \frac{\beta^c(0)}{\beta^{uc}(0)}$. Discretion yields the extra rent, π, only if there is at least one connected bidder, since $q \, (D, 0) = 0$ for all D. π gives a lower bound on the effects of discretion on private rents, since having more discretion might also increase the bribes collected from unconnected bidders, which is loaded to the parameter b.

The procuring agency has a budget B and makes her decision under two alternative regimes. Under the first regime, which was in effect before the policy reform, high-discretion procedures are not available, meaning that $D = 0$. The second regime, similar to the legislation in the post-reform period, allows the procuring agency to choose high-discretion procedures ($D = 1$) if the value is below a given threshold, T, but above the threshold open auction is still compulsory. As a result, the optimization problem of the agency in the post-reform period is the following:

$$\max_{V, D} \{\log V + b \cdot D + \pi \cdot D \cdot C + const\}$$

$$st. : V \leq \begin{cases} B & if \ D = 0 \\ \min\{B, \ T\} & if \ D = 1 \end{cases}$$

The solutions to the agency's problem under the two regimes are summarized by Proposition 1.

Proposition 1. *Regime 1:* $V^* = B$ *and* $D^* = 0$
Regime 2: $V^* = B^{1-D^* \cdot 1(B>T)} \cdot T^{D^* \cdot 1(B>T)}$ *and* $D^* = 1\left(b + \pi \cdot C \geq 1(B > T) \cdot \log \frac{B}{T}\right)$

Proof. As it is pointed out in Section 1.4, the solution of the model under Regime 1 is very straightforward. The agency has to use an open auction and she only chooses the optimal contract value, which she sets equal to the budget, since her utility function is increasing in the contract value.

Under Regime 2, she also chooses as large contract value as she could. This is equal to the budget for open auctions and equal to the minimum of the budget and the procurement threshold for high-discretion procedures. Consequently, the optimal contract value is given by

$$V^* = B^{1-D^* \cdot 1(B>T)} \cdot T^{D^* \cdot 1(B>T)}.$$

She chooses a high-discretion procedure if it yields a higher utility than using an open auctions:

$$U\left(\min\{B, T\}, \ 1\right) \geq U\left(B, \ 0\right)$$

$$\log B + 1\left(B > T\right) \log \frac{T}{B} + b + \pi C \geq \log B.$$

As a result the solution on optimal procedure is given by:

$$D^* = 1\left(b + \pi \cdot C \geq 1\left(B > T\right) \log \frac{B}{T}\right).$$

□

The solution for the pre-period is very straightforward and directly follows from the fact that the utility in Equation 1.6 is strictly increasing in the contract value. In this case, the budget constraint is always binding and the contract value is equal to B. It is easier to highlight the intuition behind the solution in the post-period by considering the decision on the two choice variables sequentially. Assume that the agency has already chosen the procurement procedure and now considering contract value. Her optimal choice is plotted in Figure 1.11a. The dashed line represents optimal contract value conditional on using an open auction as a function of the budget. Just like in the pre-period, the full budget is utilized. On the other hand, if the agency has chosen a high-discretion procedure, the value cannot grow without bounds and caps at T even for large values of B. The agency utilizes the whole budget as long as it is small, but for larger budgets it chooses a contract value equal to the threshold.

The choice of the procedure depends on two parameters, the net benefit of discretion b and the budget B. As long as the budget constraint is binding, the agency chooses high discretion if the net benefit of discretion is positive (or bigger than $-\pi$ for tenders with connected participants). When the procedure constraint is binding the agency needs to consider, in addition to the net benefit of discretion, the opportunity cost of forgone contract value. Consequently, as the budget gets large, the critical value of b, above which she chooses high discretion, is increasing in B. This is illustrated by Figure 1.11b where the public agency chooses high discretion in the region above the curve.

1.5   Semi-parametric selection correction

This section combines exogenous variation of the procurement reform with the model outlined in the previous section to disentangle the causal impacts of discretion from the sorting of tenders. Since the focus of this section is to correct for possible selection of tenders into the high-discretion procedure, I will estimate demand for discretion non-parametrically. The non-parametric approach relaxes functional form assumptions made in the previous section but provides less insights into the demand for discretion. In the next section, I propose a fully parametric approach to estimate the model which requires the functional form assumptions of Section 1.4 but allows for richer economic interpretation of the demand function.

Since we are interested in the effects of discretion on procurement outcomes, we want to estimate the following set of equations

$$Y_i^s = \delta_s \cdot D_i + f_s\left(B_i\right) + \tau_s \cdot Post_i + u_i^s, \tag{1.7}$$

where Y_i^s is either the normalized price $(s = 1)$ or the log-productivity of the winning firm $(s = 2)$. D_i is an indicator for the high-discretion procedure, $f_s\left(B_i\right)$ is some function of the procurement budget, and $Post_i$ is a dummy for the post-reform period. An important assumption of Equation 1.7 is that $f_s\left(B_i\right)$ is time invariant, hence time effect is constant for all budgets. This assumption is supported by Figure 1.12, which show evidence on the stability of the functional form prior to the introduction of the procurement threshold.

As we have seen in Section 1.3, the main empirical challenge lies in the endogeneity of the procurement decisions. Since public agencies control procurement procedures and contract values, the observed V_i does not necessarily equal the budget and D_i might be correlated with the error term. These problems make the OLS estimate of δ_s inconsistent.

I address the problem of self-selection into the high-discretion procedure by estimating Equation 1.7 together with selection equations implied by the solutions of the procurement model. The selection equation on contract values is given by

$$\log V_i = \log T \cdot D_i \cdot 1\left(B_i > T\right) + \log B_i\left[1 - D_i \cdot 1\left(B_i > T\right)\right]. \tag{1.8}$$

Equation 1.8 says that the agency utilizes the whole budget unless she chooses high discretion and the budget exceeds the procurement threshold, in which case she sets the value equal to

the threshold. Since I estimate the demand for discretion non-parametrically, the selection equation for the procurement procedure can be written in a more general form:

$$D_i = 1\,(d_i > h\,(B_i)) \cdot Post_i, \tag{1.9}$$

where the solution of the model in the previous section is a special case with

$$d_i = \frac{b_i - E\,[b_i]}{Sd\,[b_i]}$$

$$h\,(B_i) = \frac{1}{Sd\,[b_i]}\left(-E\,[b_i] - \pi C_i + 1\,(B_i > T)\log\frac{B_i}{T}\right).$$

Equation 1.9 says that the procuring agency chooses a high-discretion procedure in the post-reform period if her latent utility from discretion denoted by d_i exceeds a budget specific critical value. I assume that the budget has a discrete support, $B_i \in \{B_1, \ldots, B_N\}$, and I discretize the observations of contract values using the same bins. B_i is independent from the residuals of the outcome equations, and the latent utility d_i. This does not introduce a new restriction into the data generating process, since $h\,(\cdot)$ is an arbitrary function which picks up any correlation between B_i and D_i. I assume that d_i and u_i^s are jointly normally distributed with the variance-covariance matrix $Var\,(u, d) = \begin{bmatrix} \sigma_u^2 & \rho_{u,d}\sigma_u \\ \rho_{u,d}\sigma_u & 1 \end{bmatrix}$.

An important implication of Equation 1.8 is that all manipulators choose $D_i = 1$ and are clustered in the bin right below the threshold. So if we exclude observations with $V_i = T$ and $D_i = 1$, we are left with observations where the contract value is equal to the exogenous budget ($V_i = B_i$). As a result of this, conditional expected outcome of open auctions with $V_i = v$ is given by

$$E\,[Y_i^s \mid D_i = 0,\, B_i = v,\, Post_i] = f_s\,(v) + \tau^s \cdot Post_i + E\,[u_i^s \mid D_i = 0,\, B_i = v]$$

$$= f_s\,(v) + \tau^s \cdot Post_i + E\,[u_i^s \mid d_i < h\,(v)] \cdot Post_i$$

$$= f_s\,(v) + \tau^s \cdot Post_i - \rho_{u,d}\sigma_u\lambda^+\left[\Phi^{-1}\,(P\,(v))\right] \cdot Post_i, \tag{1.10}$$

where $P\,(v) \equiv \Pr\,(D_i = 0 \mid B_i = v,\, Post_i = 1) = \Phi\,(h\,(v))$, $\lambda^+\,(z) \equiv \frac{\phi(z)}{\Phi(z)}$. Similarly the expected outcome conditional on choosing high discretion (which we only have in the post reform period) for $V_i = v < T$ is given by

$$E\,[Y_i^s \mid D_i = 1,\, B_i = v,\, Post_i = 1] = \delta_s + f\,(v) + \tau^s + E\,[u_i^s \mid D_i = 1,\, B_i = v]$$

$$= \delta_s + f_s\,(v) + \tau^s + E\,[u_i^s \mid v_i > h\,(v)]$$

$$= \delta_s + f_s\,(v) + \tau^s + \rho_{u,d}\sigma_d\lambda^-\left[\Phi^{-1}\,(P\,(v))\right], \tag{1.11}$$

where $\lambda^-\,(z) \equiv \frac{\phi(z)}{1-\Phi(z)}$. If we have an estimate on $P\,(v)$ we can construct the following control function:

$$CF\,(B_i = v,\, Post_i) = D_i \cdot \lambda^-\left[\Phi^{-1}\,(P\,(v))\right] - (1 - D_i) \cdot \lambda^+\left[\Phi^{-1}\,(P\,(v))\right] \cdot Post_i. \tag{1.12}$$

It follows from Equation 1.10 and 1.11 that if we include the control function into Equation 1.7 then the OLS estimate of δ_s identifies the true causal effect,

$$\hat{\delta}_s \equiv E\left[Y_i^s \mid D_i = 1,\, B_i = v,\, Post_i = 1,\, CF\left(v,\, 1\right)\right]$$

$$-E\left[Y_i^s \mid D_i = 0,\, B_i = v,\, Post_i = 1,\, CF\left(v,\, 1\right)\right]$$

$$= \delta_s + f_s\left(v\right) + \tau^s \cdot Post_i + \rho_{u,d}\sigma_u CF\left(v,\, 1\right) - f_s\left(v\right)\tau^s \cdot Post_i - \rho_{u,d}\sigma_u CF\left(v,\, 1\right) = \delta_s$$

Obtaining an estimate of $P\left(v\right)$ is straightforward as long as $v < T$, since neither open nor high-discretion procedures manipulate contract value. Probability of an open auction is simply given by

$$P\left(v\right) \equiv \frac{\Pr\left(B_i = v,\, D_i = 0 \mid Post_i = 1\right)}{\Pr\left(B_i = v \mid Post_i = 1\right)} = \frac{\Pr\left(V_i = v,\, D_i = 0 \mid Post_i = 1\right)}{\Pr\left(V_i = v \mid Post_i = 1\right)}. \tag{1.13}$$

On the other hand, for $v > T$, we cannot estimate $P\left(v\right)$ the same way. In this region $\Pr\left(B_i = v \mid Post_i = 1\right)$ is not equal to $\Pr\left(V_i = v \mid Post_i = 1\right)$, because high-discretion tenders bunch below the threshold. In order to obtain an estimate of $P\left(v\right)$, I assume that the pre-reform contract value distribution is a good benchmark for the post-reform budget distribution, formally $\Pr\left(B_i = v \mid Post_i = 1\right) = \Pr\left(V_i = v \mid Post_i = 0\right).$ This assumption means that all changes in value distributions across the two periods were driven by the policy reform. Consequently, for $v > T$ the fraction of open auctions is given by

$$P\left(v\right) \equiv \frac{\Pr\left(B_i = v,\, D_i = 0 \mid Post_i = 1\right)}{\Pr\left(B_i = v \mid Post_i = 1\right)} = \frac{\Pr\left(V_i = v \mid Post_i = 1\right)}{\Pr\left(V_i = v \mid Post_i = 0\right)}. \tag{1.14}$$

Following Heckman (1979), I estimate the model in two steps. First, I discretize the contract value space and estimate $P\left(v\right)$ non-parametrically for each grid of V_i using Equations 1.13 and 1.14. Second, I exclude observations with $D_i = 1$ and $V_i = T$ and estimate Equation 1.7 including the control function by OLS. Note that the excluded instrument is the interaction of budget and time, since I estimate a saturated model of budget and time in the first stage but their effects are additively separable in the second stage. The exclusion restriction relies on the assumption that $f_s\left(\cdot\right)$ function in Equation 1.7 is stable across the two time periods. I approximate $f_s\left(\cdot\right)$ with a linear function of log-value for prices and a quadratic function for productivities.

Identification. Figure 1.13 illustrates the logic of the identification. Figure 1.13a shows logarithmic productivity of open auction winners as a function of contract value for the pre- and post-period, separately. The difference between the outcomes of the two periods are driven by the time effect and the change in the composition of tenders across time periods. The assumption that function $f_s\left(\cdot\right)$ in Equation 1.7 is time invariant implies that in the absence of sorting the two curves might differ, but need to be parallel to each other. However, sorting can create differences in the shapes of the two curves, since different points of the value distribution are exposed to varying degrees of sorting.

Indeed, below the threshold, where the high-discretion procedure is easily available, composition of tenders have changed markedly between the pre- and the post-period. On the other hand, above the threshold, the further the budget of the tender is from the threshold, the more contract value needs to be sacrificed to gain high discretion over the selection of contractors. As a result, as we move further from the threshold, the change in the composition of tenders between time periods becomes smaller, which explains the closing gap between the two curves.

Once we have the effect of sorting, we can compare outcomes across different procedures to identify the treatment effect of discretion. This comparison is illustrated by Figure **??**, which plots log-productivity of open auctions and high-discretion procedures in the post-period. The difference between the outcomes of open auctions and high-discretion procedures is explained by the sum of the sorting and the treatment effect. Consequently, by knowing the effect of sorting, we can partial out the effect of discretion.

Results of the semi-parametric model

Results of the semi-parametric selection correction model are reported in Table 1.4. Column 1 shows the simple OLS estimate on normalized price. Column 2 modifies the specification of column 1 to correct for the sorting of tenders by including the control function. Columns 3-4 show similar specifications on the productivity of the winning firm.

The 5 percent increase in the normalized price reported by column 1 is smaller than the discontinuity at the threshold reported in the previous section. This difference can be explained by the fact that the specification in column 1 identifies an average treatment effect instead of a LATE at the threshold. Column 2 finds that discretion increases price by 8 percent. This is a larger effect than the one reported in column 1, suggesting that low-price tenders sort into high discretion. This finding suggests that open auction is avoided because of the increased price competition it brings. It is in line with the corruption interpretation of sorting, since a stronger price competition results in less rents shared, hence it creates more incentives to reach out for discretion. Column 3 shows a 30 percent loss in productivity if a high-discretion procedure is used which is consistent with the RD estimate. Column 4 finds a much smaller 12 percent decrease in the productivity of contractors. This reduction of the treatment effect relative to column 3 is explained by a clear selection of low-productivity tenders into high-discretion procedures.

This means that discretion attracts tenders where productivity of winners would have been low even if open auctions were used. This finding is consistent with corruption being an important driver of sorting. Although open auctions strenghten economic efficiency they do not fully rule out political motivations in the selection of contractors. Indeed, there is an abundance of anecdotal evidence suggesting that by tayloring requirements corrupt agencies can favor politically connected firms even if they are less productive. Corrupt agencies' ability to manipulate auctions and their preference for discretion (to avoid the costs of manipulating auctions) together can generate the sorting I find. Moreover, the nature of the sorting is inconsistent with the existence of any complementarity between discretion and

competence of agencies, since agencies with high demands for discretion seem to be less efficient in selecting productive contractors.

   Model predictions. To provide a sense of the fit of each model, I report the predicted log-probability for open auctions under each specification. Figure 1.14a plots log-productivity of contractors using the specification of column 3 for the pre- and post-period, respectively. The model without selection has a hard time replicating the differences in the gaps between the two curves below and above the threshold. However, the specification of column 4 plotted by Figure 1.14b provides a good fit for all contract values.

1.6   Structural estimation

The semi-parametric selection correction results of the previous section suggest that discretion increases the prices of contracts and decreases the productivity of selected contractors. If discretion has such a detrimental effect on public interests, why would any procurer choose a high-discretion procedure? To dig deeper into the determinants of the demand for discretion, I estimate the model of Section 1.4 parametrically. This parametric approach enables me to identify the trade-off between obtaining more discretion and choosing more contract value. There are two main goals of this excercise. First, by estimating the effect of political favoritism on this trade-off, I can express discretion's effect on private rents in terms of forgone contract value. Second, I can use this trade-off to simulate the effects of alternative procurement thresholds.

   The selection equation on contract values is the same as Equation 1.8 of the previous section,

$$\log V_i = \log T \cdot D_i \cdot 1\left(B_i > T\right) + \log B_i \left[1 - D_i \cdot 1\left(B_i > T\right)\right].$$

However, the the selection equation on the procurement procedure uses the functional form assumptions of Section 1.4:

$$D_i = 1\left(b_i + \pi C_i + \phi L_i \geq 1\left(B_i > T\right)\log\frac{B_i}{T}\right) \cdot Post_i, \tag{1.15}$$

where L_i is an indicator for having at least one checked bidder, and C_i is a dummy for at least one connected firm bidding. The two residuals are the net benefit from high discretion b_i and the maximum value of the project B_i.

   I estimate the two-outcome equations described by Equation 1.7 together with the selection equations given by Equation 1.8 and 1.15 under the following distributional assumptions. Just like in the semi-parametric model, I assume that B_i has a discrete support, with probability weights of $\Pr\left(B_j\right) \equiv q_j$. B_i is independent from b_i and u_i, whose joint distribution is given by

$$\left(b_i,\; u_i\right)' \sim N\left(\left(\mu, 0, 0\right)', \Omega\right),$$

where μ is the mean of b_i and Ω is an arbitrary variance-covariance matrix. Similarly to the semi-parametric approach, the correlation structure between b_i and u_i captures the selection of tenders into high-discretion procedures.

The vector of parameters θ consists of: (i) the average net benefit from high discretion μ, a benefit shifter for tenders with checked bidders ϕ, and the extra private rent from tenders with connected bidders π; (ii) the vector of the effects of discretion $\delta = (\delta_1, \delta_2)'$, the vector of time effects $\tau = (\tau_1, \tau_2)'$; (iii) the variance-covariance matrix of the (b_i, u_i) residual vector Ω; (iv) probability weights $q'_j s$. I estimate the parameter vector θ with maximum likelihood method.

The likelihood of the observations from the pre-reform period is given by,

$$L[Y_i, V_i = B_j \mid \theta, Post_i = 0] = g(\hat{u}_i) q_j,$$

were $\hat{u}_i \equiv Y_i - \delta D_i - f(V_i) - \tau \cdot Post_i$ is the predicted residual of Equation 1.7. If the contract was awarded after 2011, the likelihood takes the following form,

$$L[Y_i, D_i, V_i = B_j \mid \theta, Post_i = 1]$$

$$= \left\{ (1 - D_i) G \left[1 (B_j > T) \log \frac{B_j}{T} - \pi C_i - \phi L_i \right] + D_i \left[1 - G (-rC_i - \phi L_i) \right] \right\} g(\hat{u}_i) q_j$$

$$+ D_i \cdot 1 (k_j = T) \left\{ \sum_{k_l > T} \left[1 - G \left(\log \frac{B_l}{T} - \pi C_i - \phi L_i \right) \right] g(\hat{u}_i) q_l \right\},$$

where $g(\cdot)$ is the pdf of u_i and $G(\cdot)$ is the cdf of $b_i \mid u_i$. I estimate the parameter vector θ which maximizes the likelihood function,

$$\mathcal{L} = \prod_{i=1}^{n} L[Y_i, V_i = B_j \mid \theta, Post_i = 0]^{1-Post_i} L[Y_i, D_i, V_i = B_j \mid \theta, Post_i = 1]^{Post_i}.$$

Identification. The separate identification of the causal effects of discretion, the time effects and the effects of sorting are based on the same variations used in the identification of the semi-parametric selection correction model.

The added value of the parametric approach is the identification of the trade-off between discretion and contract value and the effect of political favoritism on this trade-off. We can get a sense of the importance of obtaining high discretion in terms of forgone contract value if we analyze the gap between the right tales of the pre and the post-period contract value distributions. If the gap closes fast as we move away from the threshold, then firms are not willing to sacrifice a lot of contract value to obtain discretion. Conversely, if the gap closes slowly, then firms are willing to sacrifice a lot of contract value to get discretion.

The π parameter, measuring the effect of discretion on the rents from corruption, is identified from the comparison of the size of spikes below the threshold across tenders with and without politically connected participants. From the excess bunching of tenders with connected firms, the model quantifies the amount of extra contract value agencies are willing to sacrifice to help connected firms win.

Structural results

Table 1.5 reports the estimates of the structural parameters.

Impact of discretion. The structural results confirm the findings of the semi-parametric selection correction model by estimating very similar effects on procurement outcomes. I find that discretion increases normalized price by 6 percent. Similarly to the semi-parametric results, the effect on winner productivity is also much smaller than the discontinuity at the threshold. I find that discretion decreases the average productivity of contractors by 10 percent. These results support the importance of transparency in public procurement.

Sorting into discretion. My model estimates detect a weak sorting of low-price tenders into the high-discretion procedure. The correlation coefficient is less precisely estimated but consistent with the parameter of the control function in the semi-structural estimation. The model estimates a substantial sorting of low-productivity tenders into high-discretion procedures. The size of the negative correlation between the net benefit of high discretion and the productivity residual is consistent with the selection coefficient detected in column 4 of Table 1.4.

Favoritism and the demand for discretion. The main goal of the parametric estimation was to establish a direct link between discretion and corruption and measure the effect of high-discretion procedures on rent extraction. Parameter π provides a lower bound on the gain in private rents by measuring the effect of discretion on the extra rents collected from connected firms. The estimate of π indicates that public agencies are willing to sacrifice 25 percentage points more contract value to choose high discretion if there is a connected bidder, meaning that the demand for discretion is substantially inflated by the participation of connected firms.

Model predictions. To provide a sense of the fit of the model, I report model simulations on important moments of the data. Figure 1.15 illustrates the performance of the model in predicting the distributions of the two decision variables. Figure 1.15a shows the simulated and empirical distribution of logarithmic contract values for the pre- and post-reform periods separately. We see that the model fits the data very well, replicating the spike and the missing mass very precisely. Figure 1.15b plots the fraction of high-discretion procedures as a function of log-value for two groups of tenders in the post-reform period. In both groups there is at least one checked bidder. The group depicted by the dashed-dotted line has only unconnected participants, while the dashed line stands for tenders with at least one connected bidder. Although the model fails to account for the slight increasing trend in the fraction of high-discretion procedures, it correctly predicts the spike below the threshold and the gap between the two groups of tenders.

1.7 Welfare

In this section I use my structural model to conduct policy simulations. I calculate the effects of numerous alternative procurement thresholds (among them, the actual threshold

introduced in 2011) relative to the benchmark policy of requiring open auctions for all contract values. The structural estimates on normalized price and productivity allow me to assess two important consequences of different threshold policies. First, by measuring the average price of one dollar of anticipated contract value, which is equivalent to the value weighted average of the normalized price,[6] I quantify the transfer from taxpayers to contractors. Second, the value weighted average of contractor productivity is a good measure of overall efficiency of public purchases. Indeed, as long as the production function of the representative contractor is homogeneous of degree one, the change of its total factor productivity is equal to the reciprocal of the change in aggregate production costs.

Hence, the transfer and the efficiency effects are given by

$$W_s = \frac{E_{Y,V}\left[\exp\left(Y_i^s\right) \cdot V_i \mid \theta,\, T\right] / E_V\left[V_i \mid \theta,\, T\right]}{E_{Y,V}\left[\exp\left(Y_i^s\right) \cdot V_i \mid \theta,\, \underline{T}\right] / E_V\left[V_i \mid \theta,\, \underline{T}\right]} - 1, \tag{1.16}$$

where the numerator is the value weighted expectation of the procurement outcome (normalized price for the transfer and TFP for the efficiency effect) conditional on a given threshold T. The denominator is the value weighted expectation of the outcome under the benchmark policy of a zero value threshold, $\underline{T} \equiv 0$, which implies the obligation to use an open auction for all values.

Introduction of a threshold affects outcomes through two different channels. First, the availability of the high-discretion procedure has a direct positive effect on prices and a negative effect on productivity. Second, as we have seen in Figure 1.4, the introduction of a value threshold changes the distribution of contract values. More specifically, the bunching of contracts below the threshold increases the fraction of small value contracts, which has an opposite effect on average productivity. Given the sorting of low productivity (and probably more corrupt) tenders into high-discretion procedures, the introduction of a value threshold disproportionately decreases the size of tenders with low-productivity winners. Although discretion directly decreases productivity, it can also increase aggregate production costs by making inefficient procurers spend less. Equation 1.16 measures the aggregate effect of all channels.

I parametrize the model with the structural estimates reported in Table 1.5 and conduct simulations with a number of different thresholds. I compute the transfer and efficiency effects by calculating the sample analogues of Equation 1.16 for the simulated samples. Results are plotted in Figure 1.16. Figure 1.16a shows that the introduction of a procurement threshold always transfers money from taxpayers to firms and that this transfer increases in the value of the threshold. It increases from zero at the no threshold to 2 percent at the 25-million, and 3 percent at the 50-million threshold. Procurement thresholds have a non-monotonous effect on efficiency. Figure 1.16b presents that small procurement thresholds increase the value weighted average productivity of contractors, hence decreasing aggregate production cost. The efficiency effect turns negative for larger procurement thresholds above

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[6]Average price of one dollar of anticipated contract value is the same as the value weighted average of the price-value ratio, $\frac{\sum P_i}{\sum V_i} = \sum \frac{P_i}{V_i} \frac{V_i}{\sum V_i}$.

15 million HUF. I find that the policy reform of 2011 decreased productivity, accordingly increasing production costs, by 1.6 percent. The effect would increase to as large as 4 percent with a 50-million threshold. The simulations suggest an optimal threshold of about 6 million, which would result in a one percent increase of average productivity relative to the no-threshold benchmark.

An important limitation of the welfare simulations is that they do not take into account higher administrative costs of auctions. Administrative costs would reduce the efficiency loss from high-discretion environments and would potentially increase the optimal value threshold. On the other hand, it seems very likely that if an online system for public auctions is already set up, which is the case in our setup, then the extra administrative costs of auctions are negligible relative to the 12 percent increase in production costs suggested by column 4 of Table 1.5.

The interpretation of the effect on production costs as a welfare effect is based on two implicit assumptions. First, contractors of public agencies hire from the same job market. Indeed, if contractors hired people who would be unemployed otherwise, the loss in GDP would be smaller. Second, allocation of contracts by public agencies does not affect the firms' private market shares. It can easily be violated if there are strong economies of scale or capacity constraints. In the presence of market share spillovers, the procurement reform has an ambiguous effect on the average productivity of private markets. Consequently, the full effect on the GDP can be either smaller or larger than the effect on average public productivity.

1.8   Conclusion

In this paper, I estimated the effects of buyers' discretion on the prices of contracts and the productivity of contractors in public procurement. I overcome the problem of tenders sorting into high-discretion procedures by exploiting the introduction of a value threshold to semi-parametrically estimate a selection correction model. I find that discretion increases prices and decreases productivity of selected contractors. I document that tenders, where the productivity of the winning firm is low, are more likely to be awarded by high-discretion procedures. This selection suggests that corruption and shirking might be important determinants of the demand for discretion. Moreover, the structural estimation of procurement decisions sheds more light on the determinants of the demand for discretion. I provide strong suggestive evidence for the link between discretion and favoritism by showing that agencies choose discretion more often if politically connected firms participate in the tender. Finally, I use my model to quantify the transfer and welfare consequences of the procurement reform. I find that the reform transferred 2 percent of total procured value from taxpayers to firms and decreased average productivity of public spending by 1.6 percent.

I conclude by discussing some broader implications of my results. Although corruption is considered a major impediment to economic growth, we have very limited reliable evidence on the welfare consequences of corruption and political favoritism. This paper documents a

clear negative relationship between an important tool of political favoritism and the efficiency of public spending. Moreover, it contributes to our knowledge about the effects of specific policies on corruption by highlighting the usefulness of transparency in limiting political favoritism.

Tables and figures

Table 1.1: Descriptive stats for high-discretion and other tenders

	High-discretion	Other tender	All
	Panel A - Tender characteristics		
Log(anticipated value)	16.36	16.74	16.60
Number of bidders	2.25	2.88	2.64
Log(price/value)	-0.068	-0.190	-0.153
At least one checked bidder	0.153	0.305	0.248
At least one connected bidder	0.035	0.044	0.040
	Panel B - Winner characteristics		
Log(TFP)	6.58	6.86	6.77
Log(Employment)	2.45	3.23	2.93
Firm Age	13.1	15.1	14.35
Domestic	0.915	0.805	0.847
Local	0.392	0.370	0.378
Connected	0.576	0.382	0.445

Note: The fraction of connected winners is computed for tenders with at least one connected participant.

Table 1.2: Discontinuities in tender level outcomes

	Panel A - Reduced form results	
	Tender characteristics	
	No. of bidders	Normalized price
	(1)	(2)
1(value>threshold)	0.133	-0.0593***
	(0.0887)	(0.00803)
	Panel B - Second stage results	
High discretion	-0.239*	0.0894***
	(0.137)	(0.0136)
	Panel C - First stage results	
	Dep. var.: High discretion	
1(value>threshold)	-0.670***	-0.663***
	(0.0136)	(0.0116)
Observations	45,956	44,679

Note: Each observation is an individual contract. The sample consists of all non-construction tenders for 2009-2014. Robust standard errors in parentheses. * p<0.10,** p<0.05, *** p<0.01

Table 1.3: Discontinuities in winning firm level outcomes

	Panel A - Reduced form results					
	Winner characteristics					
	Log(prod)	Log(emp)	Firm Age	Local	Domestic	Connected
	(1)	(2)	(3)	(4)	(5)	(6)
1(value>threshold)	0.207***	0.669***	2.819***	-0.0427**	-0.117***	-0.189***
	(0.0331)	(0.0649)	(0.320)	(0.0179)	(0.0151)	(0.0660)
	Panel B - Second stage results					
High discretion	-0.326***	-1.015***	-4.578***	0.0662**	0.176***	0.280***
	(0.0602)	(0.103)	(0.572)	(0.0302)	(0.0226)	(0.0916)
	Panel C - First stage results					
	Dep. var.: High discretion					
1(value>threshold)	-0.667***	-0.665***	-0.660***	-0.654***	-0.664***	-0.663***
	(0.0145)	(0.0140)	(0.0125)	(0.0141)	(0.0132)	(0.0461)
Observations	29,944	35,030	35,937	34,485	35,937	2,280

Note: Each observation is an individual contract. The sample consists of all non-construction tenders for 2009-2014. Robust standard errors in parentheses. * p<0.10,** p<0.05, *** p<0.01.

Table 1.4: Semi-parametric selection correction estimates

	Normalized price		Log(TFP)	
	(1)	(2)	(3)	(4)
High discretion	0.0514***	0.0783***	-0.300***	-0.115*
	(0.00326)	(0.0140)	(0.0145)	(0.0691)
Post reform	-0.00727**	-0.0234***	0.0537***	-0.0573
	(0.00304)	(0.00852)	(0.0119)	(0.0427)
Control Function		-0.0187**		-0.126***
		(0.00941)		(0.0457)
Functional form	Lin	Lin	Quad	Quad
Observations	45,908	45,908	31,557	31,557

Note: Each observation is an individual contract. The sample consist of all non-construction tenders for 2009-2014. Bootstrapped standard errors in parentheses. * p<0.10,** p<0.05, *** p<0.01

Table 1.5: Structural estimates

	Log(price/value)	Log(TFP)
Effects of discretion (δ)	0.057	-0.097
	(0.038)	(0.038)
Correlation of benefit and residual ($\rho_{b,u}$)	-0.043	-0.144
	(0.098)	(0.033)
Private rent from favoritism (π)	0.248	
	(0.040)	

Note: Each observation is an individual contract. The sample consist of all non-construction tenders for 2009-2014.

(a) Number of contracts
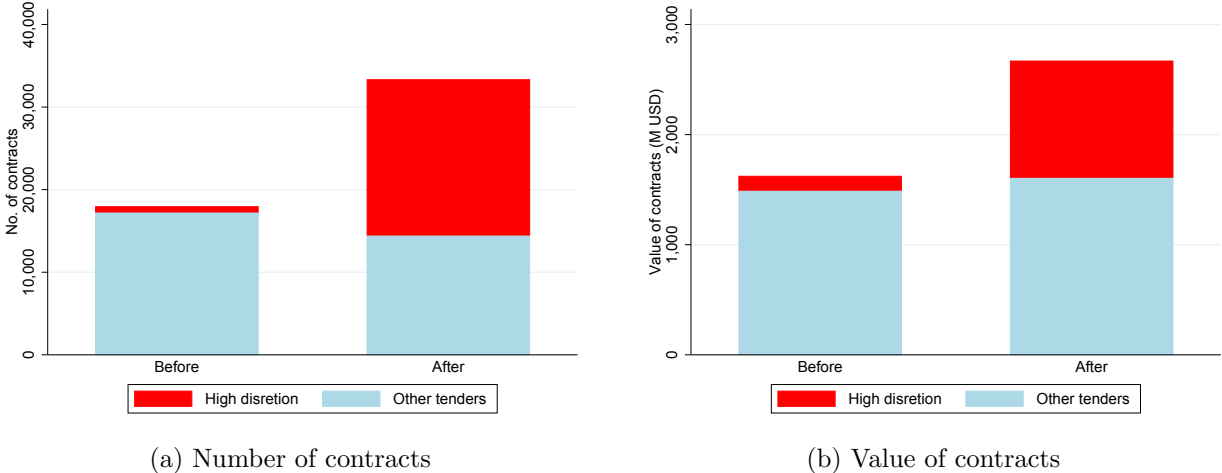
(b) Value of contracts

Figure 1.1: Number and aggregate value of high-discretion and other tenders

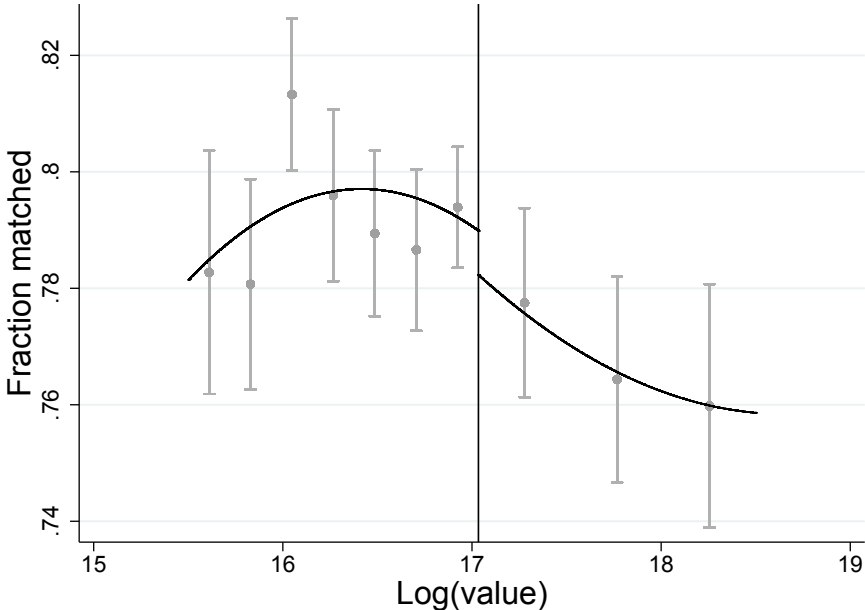Figure 1.2: Discontinuity in matching of datasets
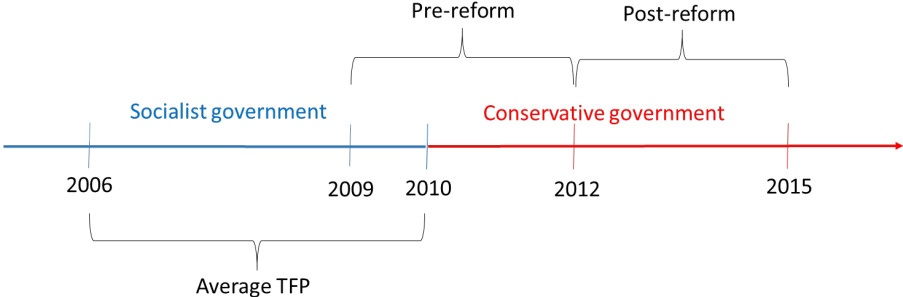
Figure 1.3: Timeline

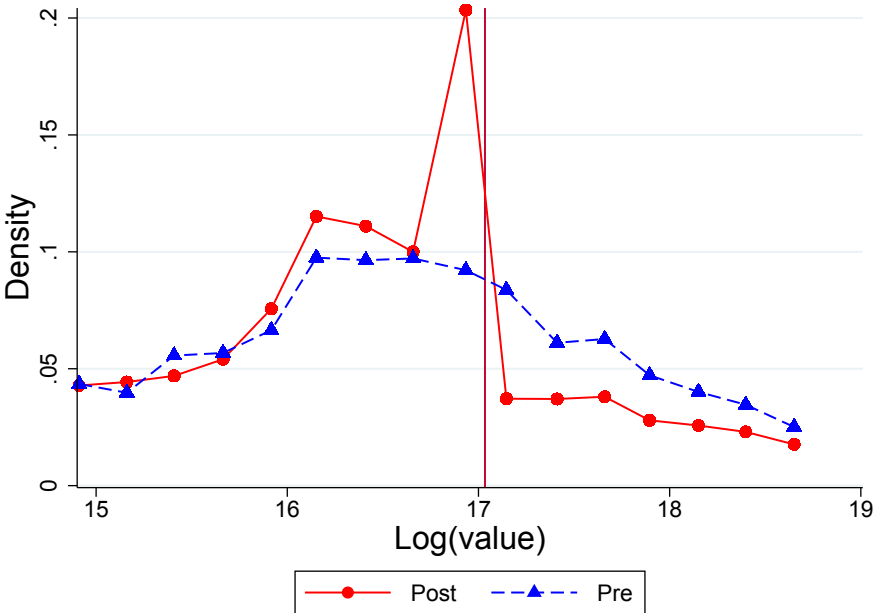Figure 1.4: Distribution of anticipated values

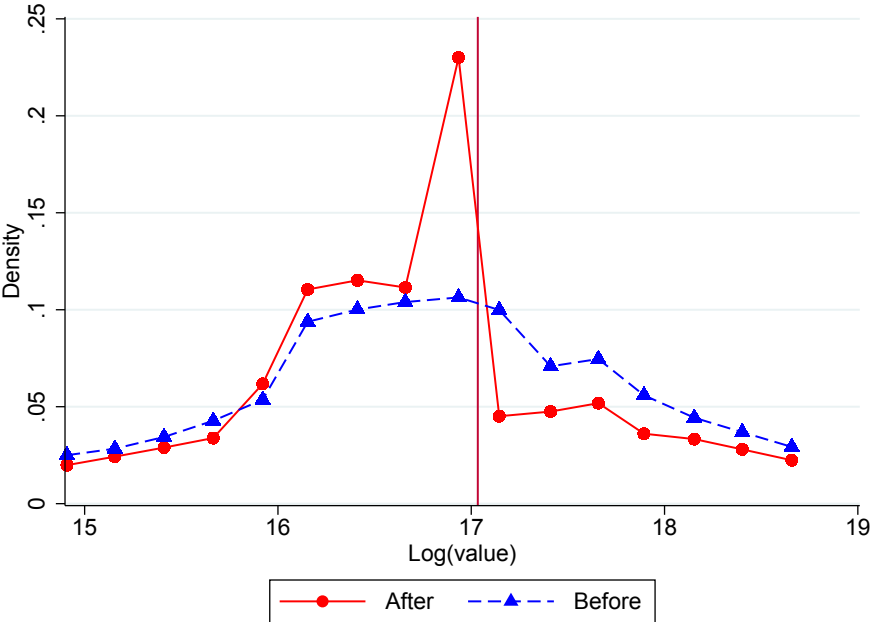Figure 1.5: Distribution of anticipated values for agency-firm-year

Figure 1.6: Distribution of anticipated values by connection status

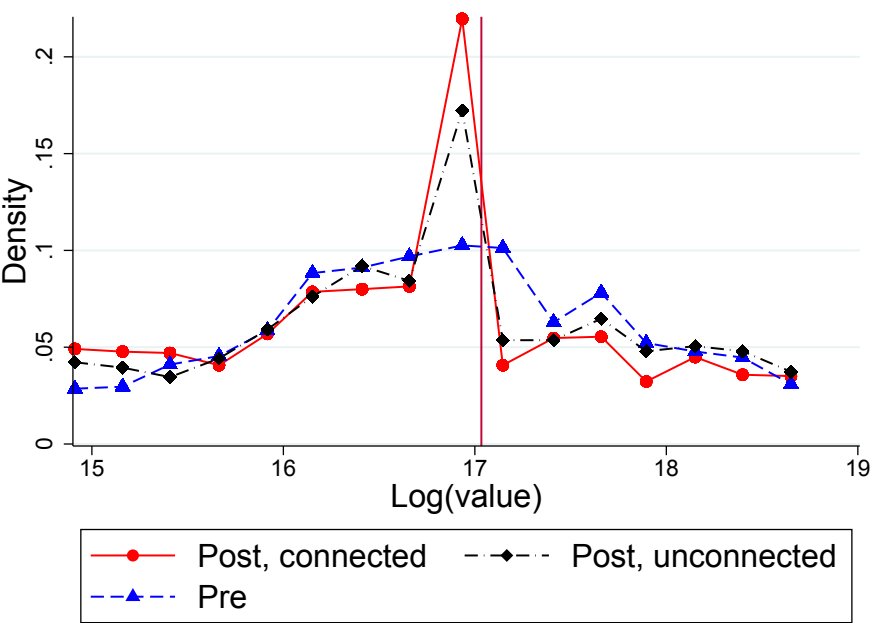Figure 1.7: Distribution of anticipated values for different product categories
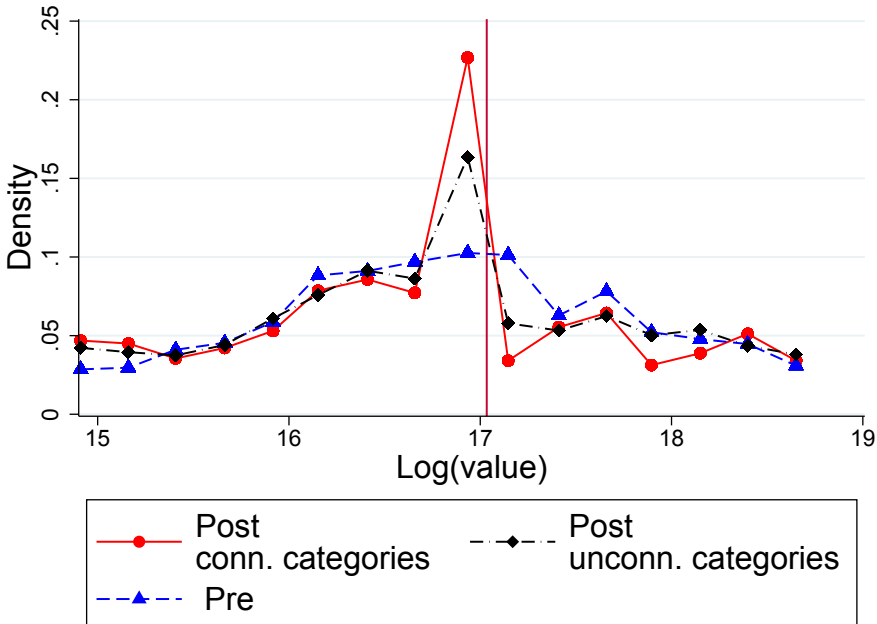
Figure 1.8: Fraction of high-discretion procedures

(a) Number of bidders

(b) Normalized price
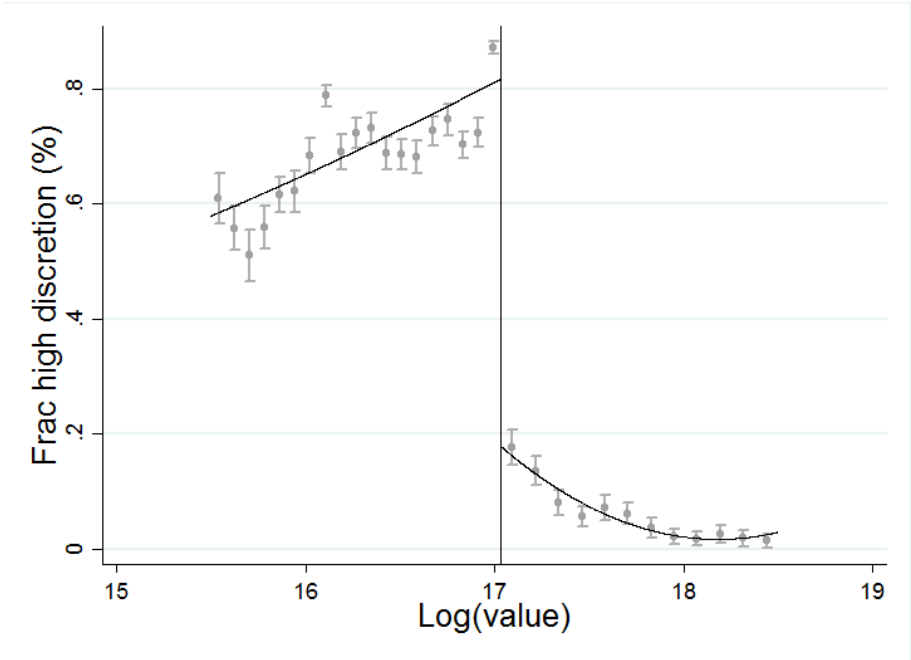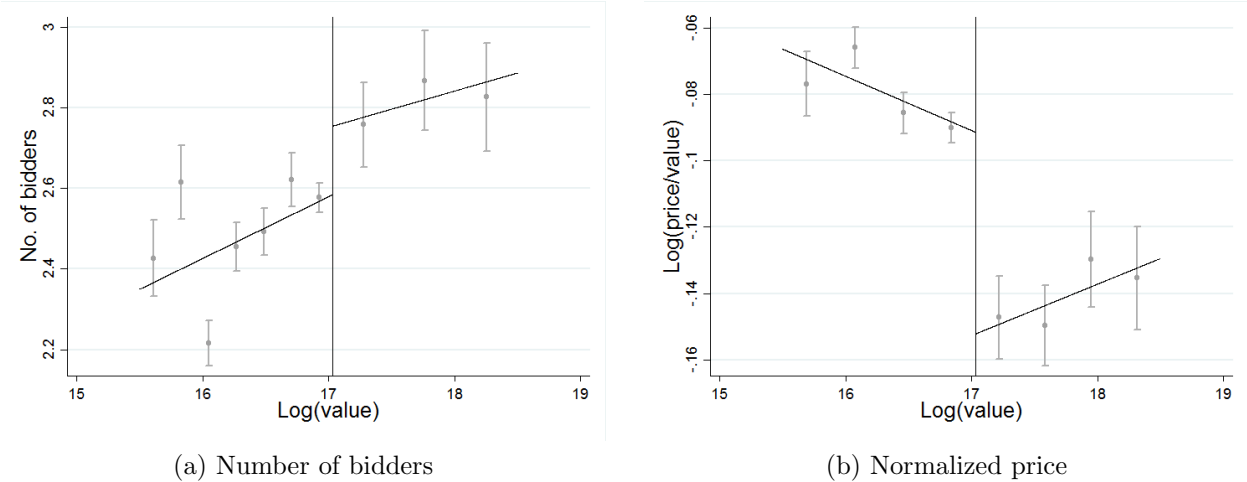
Figure 1.9: Discontinuity in tender outcomes

(a) Number of bidders

(b) Normalized price

(c) Normalized price

(d) Number of bidders

(e) Normalized price

(f) Normalized price
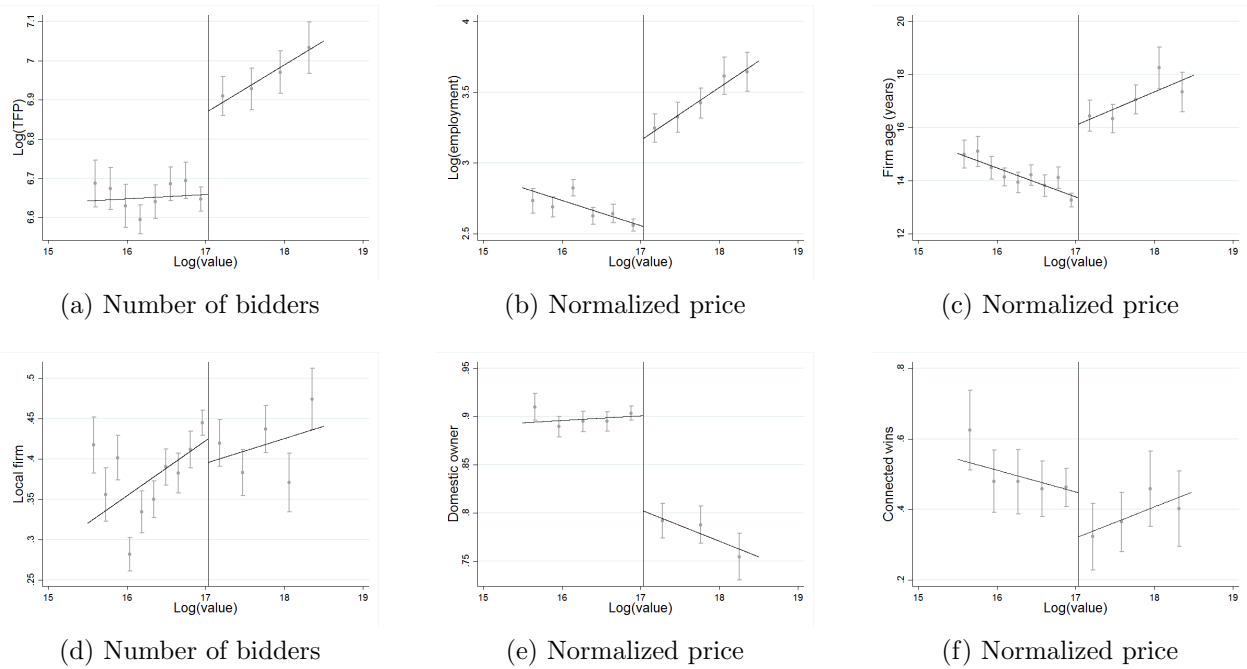
Figure 1.10: Discontinuity in winner outcomes

(a) Optimal contract value

(b) Optimal procurement procedure
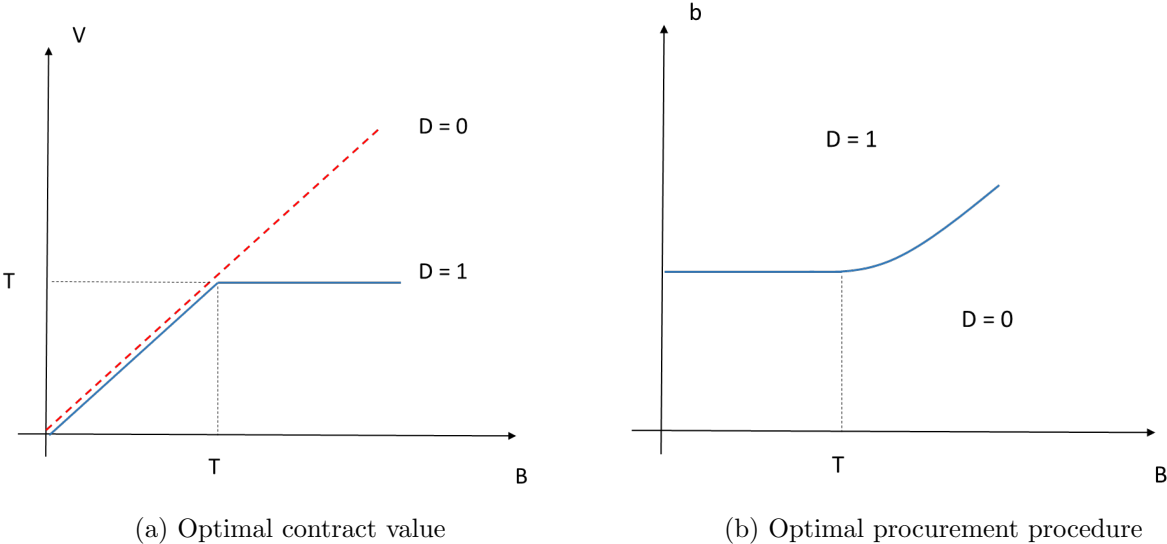
Figure 1.11: Solution of the model

Figure 1.12: Functional form stability

(a) Log-productivity by period for open auctions

(b) Log-productivity by procedure in the post-period
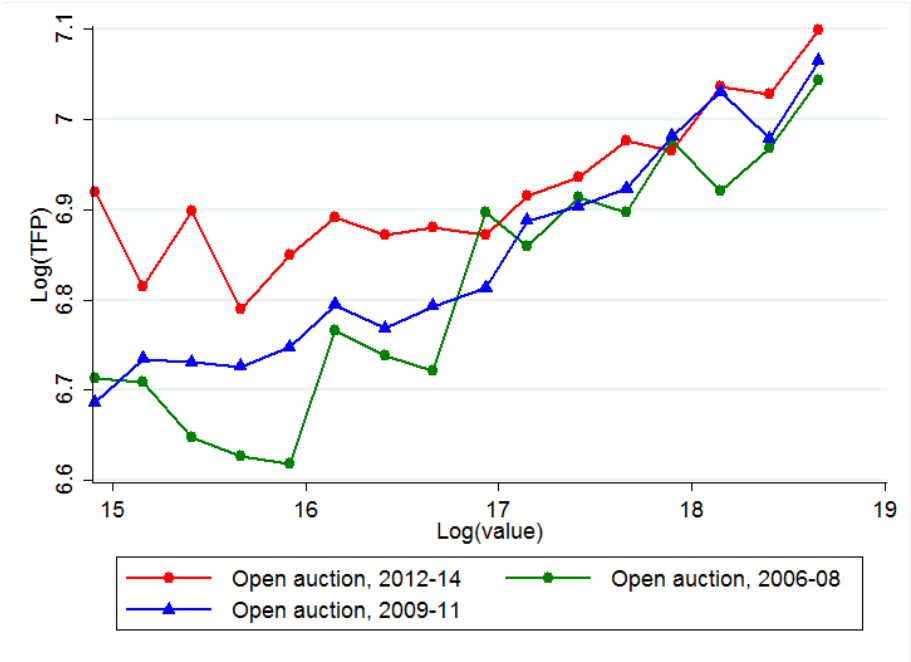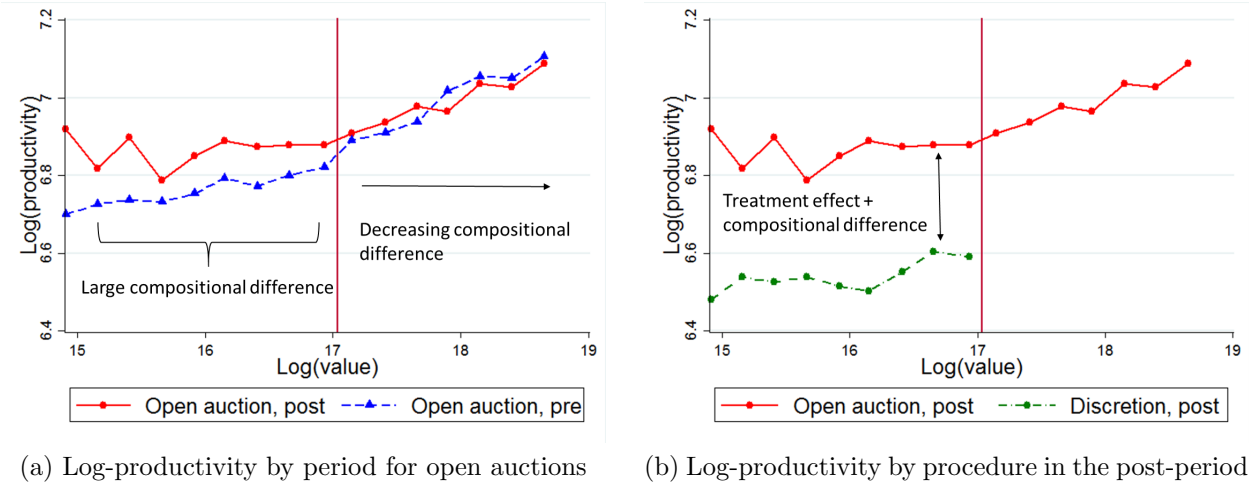
Figure 1.13: Identification

(a) Model without selection

(b) Model with selection

Figure 1.14: Model predictions

(a) Density of log-value

(b) Fraction of high-discretion in the post-period

Figure 1.15: Simulated and empirical distributions of decision variables
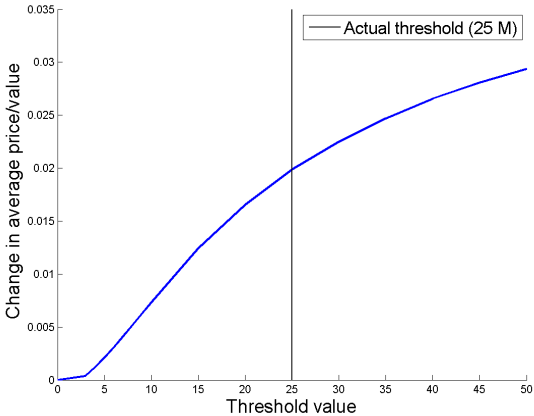
(a) Transfer effect
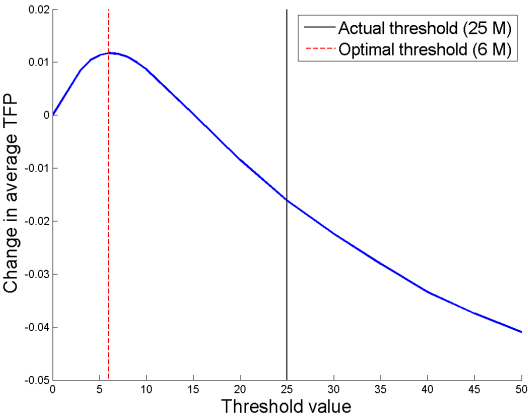
(b) Efficiency effect

Figure 1.16: Transfer and efficiency effects of different thresholds

Chapter 2

Media Capture through Favor Exchange

2.1 Introduction

Political distortions to media freedom limit government accountability and may assist the rise of autocracy.[1] But can such distortions emerge in the shadow of democratic institutions? If they can, how do they emerge, and what are their economic costs? Answering these questions can shed light on the sources and mechanisms of autocratic drift.

In this paper we use data from Hungary to explore these issues and establish three results. First, we document distortive two-way favors, in the form of advertising and coverage, between politicians and the media. For either direction of favors, 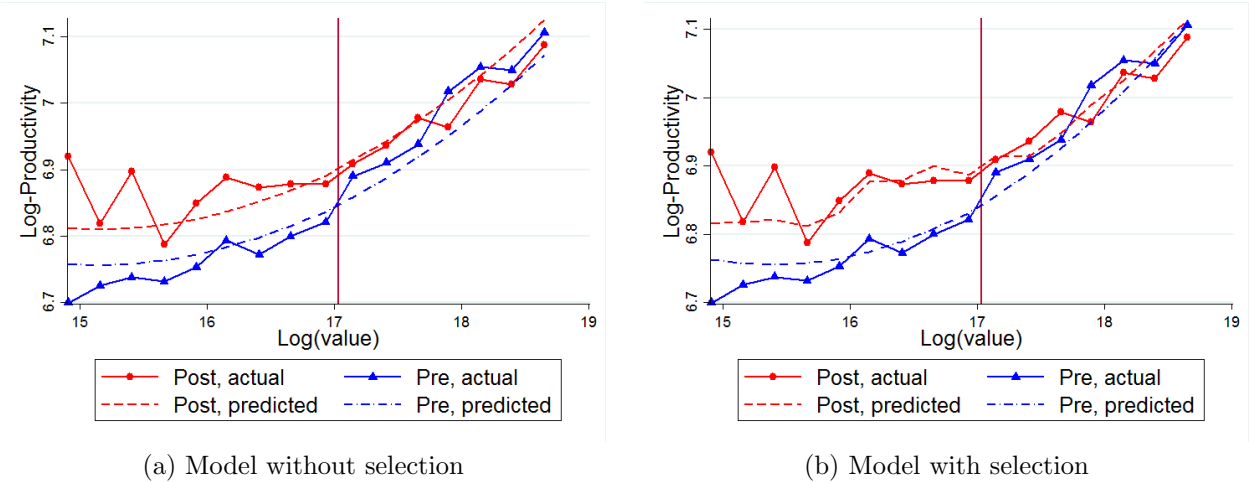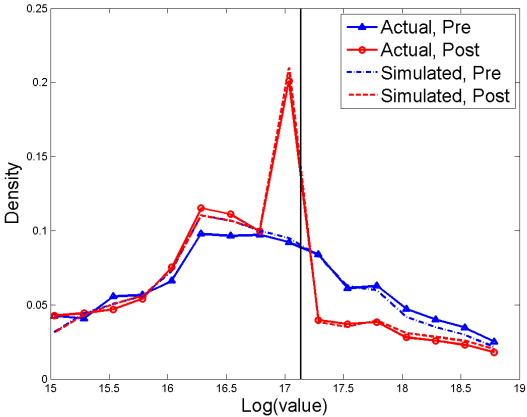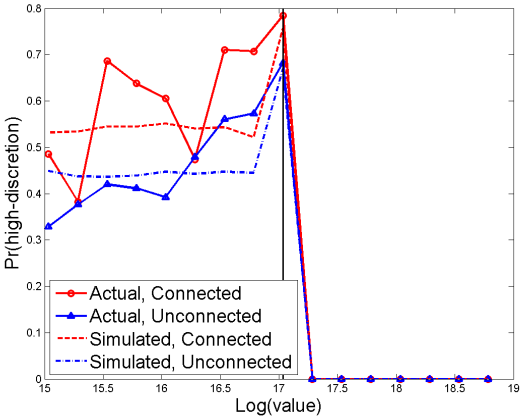our empirical strategy is to compare the allocations of actors with changing versus unchanging connection status. In doing this we build on existing work—especially DiTella and Franceschelli (2011) and DellaVigna, Durante, Knight, and La Ferrara (2015)—and contribute by establishing both the favors' non-market nature and bidirectional presence between politicians and the media. These findings allow us to interpret the favors as media capture. Second, we document a change in the organization of favors. In a first phase control of most favored media was in the hands of a single connected investor; in a second phase this relationship broke down and two-way favors were terminated; and in a third phase control of favored media was divided between multiple different investors. These findings shed light on the dynamics of power sharing within the elite. Third, we develop a new structural approach to measure the economic cost of misallocative favoritism and find it to be substantial in our setting. Our approach is easily portable to other contexts studied in the literature.

In Section 2.2 we describe the political context and our data. During our sample period, 1994-2016, Hungary has been a parliamentary democracy, with political power alternating between left-wing parties and right-wing parties. Based on ownership and personal connec-

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[1]Prat and Stromberg (2013) survey the research on the political economy of mass media, while Enikolopov and Petrova (2015) survey the evidence on media capture. We review these literatures in detail below.

tions, we classify outlets in print media, billboards, online media and television as connected to the left, connected to the right, or unconnected. Most of our analysis focuses on media connected to the right, and based on changes in the structure of these connections we divide our sample period into three phases. In phase 1, before 2015, most right-connected media were owned by the business group of a single investor Lajos Simicska—former roommate of right-wing prime minister Viktor Orban—whom we label the "right-connected investor". In phase 2, around 2015 February, the two had a fallout. And in phase 3, since the fallout, the control of right-connected media has been divided between multiple connected investors.

In Section 2.3 we document favors from politicians to connected media in the form of state-owned firms' advertising. We define a favor to be a preferential allocation driven by non-market motives. To document favors, we compare state-owned firms' advertising composition to private firms' advertising composition and to circulation shares, where the latter two act as benchmarks for the market-based allocation.[2,3] We begin with phase 1 (1994-2014) and first explore advertising in the two most important daily newspapers, one of which was owned by the right-connected investor Simicska (Magyar Nemzet), while the other was connected to the left (Nepszabadsag). We find that, relative to both private firms' advertising composition and circulation shares, state-owned firms dramatically shifted advertising—by 37 percentage points in our main specification—to the right-connected daily under right-wing governments. In contrast, state-owned firms' advertising shares aligned with the market shares and circulation shares under left-wing governments.

These shifts look like distortive advertising favors under right-wing governments. But there is an alternative market-based explanation: that state-owned firms had a different target audience under right-wing governments. To rule out this explanation we exploit a change in media ownership. In 2011, the right-connected investor's group purchased Metropol, a major freely distributed tabloid newspaper. In a single month, state-owned firms increased the share of their print advertising allocated to Metropol from 20% to 50%. Private firms' advertising share of Metropol remained low. Because media consumption patterns are unlikely to change this quickly, we conclude that the patterns represent favors.

Possible motives for favors include the expectation of return favors, but also shared ideology: the desire to support the conservative values of the newspaper. We explore motives using billboard advertising. The right-connected investor's business group purchased several billboard companies in 2009. We show that after the 2010 electoral win of the right, the share of state-owned firms' billboard advertising placed on these billboards rapidly increased from 30% to over 80%. Private firms' advertising share remained below 30%. Because billboards do not carry additional content, these facts cannot be easily explained with shared ideology.

We next turn to phase 2. In February 2015, several journalists in the right-connected daily resigned—soon to join the state media—and in interviews the right-connected investor personally attacked the prime minister. This event seems to signal a breakdown in their

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[2]This parallels Schoenherr (2016) who compares politically more and less influenced procurement in Korea.

[3]State-owned firms include the national lottery, the national tourism company, transportation and utilities companies.

relationship. Consistent with this interpretation, advertising favors immediately stopped. State-owned firms' print advertising share allocated to Simicska's two dailies (Magyar Nemzet and Metropol) dropped from 60% to 20%, and there was a similar decline in their advertising on the investor's billboards. In contrast, private firms' advertising composition did not change. Because it is hard to think of a market-based motive driving these changes, they further support the favors interpretation.

In the period since 2015—phase 3—several new right-connected media emerged. Their ownership was divided between multiple connected investors who did not have close business ties between them. In the paper we document advertising favors in this phase in three markets, but for brevity here we only discuss one, online media, which we also exploit in the content analysis. One of the two leading online news portals, Origo, was bought in 2016 by a business group connected to the governor of the central bank who is political ally of Orban. Subsequently state-owned firms sharply increased their relative advertising on Origo. There was no associated increase for private firms' advertising or for page views. We obtain similar results in the television and print markets. Taken together, the evidence from the three phases suggests a shift in the organization of favors towards a divide-and-rule style arrangement.

In Section 2.4 we document favors from the media to politicians. We first explore news coverage and then the selective hosting of political campaigns. In this context too, we define a favor as an allocation driven by non-market motives. For news coverage we interpret this to mean that coverage is shaped not by the demand for, but by the supply of news. Our empirical approach is to compare the coverage of government corruption scandals before versus after various events. We begin with the fallout (phase 2) and compare the online content of Simicska's main political daily Magyar Nemzet—the "affected" daily—with two benchmarks: the left-connected daily, and a smaller "unaffected" right-connected daily (unrelated to Simicska). We show that after the fallout the share of articles covering corruption scandals in the affected daily significantly increased, from the low level of the unaffected right-connected daily to the much higher level of the left-connected daily.[4] We next conduct a similar analysis for online media, and show that after the purchase of Origo, its corruption coverage—relative to a similarly large but unaffected portal—significantly decreased. Under the identifying assumption that holding fixed everything else an outlet's connection status does not affect news demand for that outlet, these results imply that media content was shaped by the supply side, i.e., by a non-market motive.

We then turn to the second form of media favor: the selective hosting of political campaigns on billboards. Because the group of Simicska purchased key billboard companies in 2009, we separately look at elections during 1998-2006 and during 2010-14. In the former period, the right-wing party, other political parties, and private firm advertisers placed essentially the same share of their billboard advertising on these—not yet connected—billboards. But in the latter period, the right-wing party placed a significantly larger, and the other

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[4]We collectively label news to be corruption scandals if they involve allegations of the abuse of public resources.

parties a significantly smaller, share of advertising on these billboards, than did private firm advertisers. Our interpretation is that connected billboards sponsored the campaign advertising of the right-wing party and rationed that of other parties, i.e., that billboard campaign advertising was shaped by a non-market motive.

Our results show two-way favors between politicians and connected media. The most natural interpretation is that they represent media capture through favor exchange: that advertising revenue was exchanged for favorable coverage. We briefly discuss two alternatives. One is mutual altruism between the prime minister and media owners. While this explanation may help rationalize the first phase of favors, it is at odds with the third phase during which connected media owners were not—at least based on the available information—personally close to the prime minister. A second interpretation is shared values: that connected media provided favorable coverage not because of advertising revenue but because of owners' genuine political beliefs. Although it seems implausible to us that connected owners ignored the high revenues associated with favorable coverage, even if this explanation is correct the broader point remains that distortive advertising supported precisely those media which chose to favorably cover politicians for reasons unrelated to news demand. We conclude that even under this logic the patterns represent a form of media capture.

In Section 2.5 we study economic costs and magnitudes. Our main contribution here is a new methodology to measure the economic cost of misallocative favoritism. In contrast to existing work Khwaja and Mian (2005), Mironov and Zhuravskaya (2016), Schoenherr (2016), our approach is based not on particular consequences but on a comparison of allocations. This approach requires stronger structural assumptions, but can more fully capture the cost of misallocation and is easily portable to other settings. Our starting point is a simple model of firms' demand for advertising, in which—paralleling the Hsieh and Klenow (2009a) analysis of supply-side distortions—we express the welfare loss from demand-side distortions with the difference between the actual and the optimal allocation shares and the elasticity of substitution between different outlets. Using elasticities in a plausible range— both direct estimates and off-the-shelf values—we find that on average favoritism cost 9-33% of advertising expenses. Combining our direct estimates with the value of favors, we estimate the Besley and Prat (2006) tunneling inefficiency parameter, the cost to the government of a dollar of connected advertising, to be about 1.9 dollars.

In the concluding Section 2.6 we discuss some caveats with and broader implications of our results. We note that probably there were additional favors beyond those we document. But given their large magnitude advertising favors were likely important, and hence we expect that a policy of regulating government advertising would significantly reduce media capture. In light of the evidence that media affects electoral outcomes DellaVigna and Kaplan (2007), Enikolopov, Petrova, and Zhuravskaya (2011), our results suggest that a key motive for misallocative favoritism was the desire to protect political power. This motive represents a new link between institutions as the fundamental driver and misallocation as the proximate cause of cross-country income differences. Beyond misallocation, another likely social cost of media favoritism was the distortion in voters' beliefs. We believe this cost to be important but do not measure it in this paper. Finally, we speculatively argue that a

within-elite relational contract can rationalize several observed patterns through a tradeoff between efficiency and loyalty Board (2011).

Our work builds on a literature studying media capture. Theories in this area include Besley and Prat (2006), Petrova (2008) and Gehlbach and Sonin (2014). The most convincing evidence is for autocracies and documents capture through bribes or direct state ownership McMillan and Zoido (2004), Qin, Stromberg, and Wu (2016). For democracies, a key study by DiTella and Franceschelli (2011) presents correlational evidence from Argentina consistent with two-way favors, but cannot rule out plausible market-based explanations such as private advertising crowding out government advertising when corruption scandals increase newspaper demand. We contribute to this work by establishing the favors' non-market nature, which allows us to interpret them as media capture.[5] We also contribute by documenting changes in the organization of favors, and with a methodology to measure their economic cost.

Other research emphasizes the demand-side determinants of media content, including the models in Mullainathan and Shleifer (2005) and Gentzkow and Shapiro (2006), and the evidence that audiences shape US newspapers' slant in Gentzkow and Shapiro (2010). Our contribution to this work is to show the importance of a supply-side determinant of coverage.

We also build on a literature about favoritism emanating from Fisman (2001), which includes studies of asset prices Faccio (2006), procurement Goldman, Rocholl, and So (2013a), Borgaard, Denes, and Duchin (2015), Schoenherr (2016), credit Khwaja and Mian (2005) and sales Cingano and Pinotti (2013), among other contributions. These papers all focus on favors in a single direction. The work on favoritism most closely related to ours is DellaVigna et al. (2015) who document favors from third party businesses to connected media. In contrast to that paper, we document favors between different actors—politicians and connected media—which allow us to interpret the results as media capture. More broadly, we contribute to this body of research by establishing the presence of bidirectional favors, a change in the organization of favors, and with a methodology to measure their economic cost.

2.2 Context and data

Politics and media in Hungary

Since 1990 Hungary has been a parliamentary democracy. Table 2.1 presents summary statistics on the political cycle during our sample period 1994-2016. We divide parliamentary parties into three groups: the left, the right, and the far right, and the first three columns in

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[5]In related work, for historic US newspapers Petrova (2011) shows that growing private advertising increased media independence, but does not study capture. In the same market Gentzkow, Petek, Shapiro, and Sinkinson (2015) find essentially no evidence for capture. Enikolopov and Petrova (2015) and Prat (2015) are excellent surveys of political media capture. And a growing literature documents capture by non-political groups Reuter and Zitzewitz (2006), Gambaro and Puglisi (2015).

the table show the share of members of parliament who belong to each.[6] The final column shows the political affiliation of the government and the prime minister, which always agrees with the political side that has the majority of seats in parliament. During our sample period political power was held by either the left or the right, and there were three changes in power: 1998, 2002 and 2010. During both the 1998-2002 and the 2010-16 right wing governments, the prime minister was the same person, Viktor Orban.

Media. We study four media markets: publicly oriented daily newspapers, billboards, online news portals and television. The daily newspaper market—to which we also slightly imprecisely refer as print media—includes all major daily newspapers that cover at least some political news. The billboards market includes all major billboard companies with the exception of one firm about which we do not have data.[7] The online market includes all major online news portals, which have been an increasingly important source of news in Hungary. And we define the television market to include the two main commercial channels as well as the state-owned national channel. In all of these markets we classify privately owned media outlets based on the political connections of owners into three categories: connected to the left, connected to the right, or independent. We base the classification on media reports, especially the detailed documentation in Batorfy (2015) and Renyi (2017), and we directly verify the links using data on firm ownership. Here we give an overview of the classification and then provide more details when we present the results.

We begin with connections to the right, our main focus in the analysis. Because of changes in the structure of these connections we divide the sample period into three phases. During the first phase, 1994-2014, almost all media connected to the right was owned by the business group of a single investor, Lajos Simicska, who was a college roommate of the right-wing prime minister Viktor Orban. Simicska was also head of the Tax Authority for a period during 1998-2002. Because of these connections we sometimes refer to him as the "right-connected investor". Simicska's business group has owned the main right-wing daily newspaper *Magyar Nemzet* since 2000, and before 2000 owned various predecessors which were then merged into Magyar Nemzet. His close business partner (co-owner in several companies) purchased a large tabloid daily newspaper, *Metropol*, in 2011. In addition to the holdings in the print market, Simicska's group purchased several billboard companies in 2009. And it was later revealed that in 2013 Simicska had secretely purchased an option to buy one of the two main commercial television channels, TV2.[8]

In phase 2, in February 2015, in a surprise event, on a single day several top journalists in the right-connected daily Magyar Nemzet resigned. A number of these journalists subsequently joined the state media. Later the same day, the right-wing investor Simicska called

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[6]Independent members on average represented less than a quarter percent of parliament and are not reported.

[7]That firm, Mahir, was also owned by the right-connected investor, so our results which do not account for it are likely to be conservative.

[8] The fact that a single investor owned several media outlets is consistent with the worldwide pattern that a majority of private media organizations are owned by families Djankov, McLiesh, Nenova, and Shleifer (2003).

the prime minister unprintable names in interviews. We interpret this event as a fallout between Simicska and Orban, and we classify media owned by Simicska's group as independent after the fallout.

In phase 3, after the fallout, multiple new right-connected media emerged. In the print market, the former editor of Simicska's daily Magyar Nemzet who left at the fallout (who had also been founding member of the right-wing party MDF), became owner and editor of a newly created right-leaning daily newspaper *Magyar Idok* in April 2015. And a friend of Orban—mayor of the village of his weekend home—purchased multiple local daily newspapers in October 2016. In the online market, in early 2016 a firm connected to the cousin of the central bank's governor—who is a former minister of the economy and a political ally of Orban—purchased *Origo*, one of the two main online portals. And in the television market, a government commissioner bought, after a legal struggle with Simicska, TV2.

Concerning connections to the left, the main left-connected daily newspaper was *Nepszabadsag*, which was until 2013 co-owned by a foundation of MSZP, the largest left-wing party in Hungary. Two other media often labeled by the press as left-connected for parts of our sample period—but with less clear ties—were daily newspaper *Nepszava* and billboard company *ESMA*. We treat these as left-connected but do not focus on them in the analysis.[9] Finally, another smaller daily newspaper which we do use in our content analysis is *Magyar Hirlap*. This newspaper had ties to the left until 2006, when it was purchased by an investor—unrelated to Simicska—who was a former member of the right-wing party MDF. Since then, and in particular during the period in which we use its content, we classify the newspaper as connected to the right.

Table 2.2 summarizes in our four markets the market shares of connected media—measured with the share of private firms' advertising—at different points in time. In 2000 the left was dominant with a 33% share in the print market. By 2006 their market share declined to 11%, in part because of the entry of new independent print media. In 2012, after Simicska's group purchased billboards and Metropol, the right became dominant with over 25% market shares in both the print and billboards market. Finally, in 2016 after the fallout, the new right-connected media represented large shares in three of the four markets: over 25% of the print and online market, and over 40% of the television market.[10]

Data and sample definitions

We work with three main datasets.

Advertising, 1994-2016. We have monthly data on the list price and advertising surface of most large advertisers in most newspapers, magazines, billboards, radios and televisions, which we obtained from a private company Kantar Media, whose business is to collect and

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[9]In 2015 ESMA allegedly changed sides when an investor reported to be a friend of Orban purchased it. Because this connection is less clear, we make the conservative assumption that ESMA became independent in 2015.

[10]For television we measure market shares using minutes of advertising time because after 2013 the list price data in this market are not reliable.

sell advertising data. We study three types of advertisers: private firms, state-owned firms, and government agencies. Among government agencies we distinguish between agencies that are involved in government administration, such as ministries; and agencies involved in the provision of public goods, such as hospitals or theaters.

In our analysis we focus only on the 500 largest private firm advertisers, the 200 largest state-owned firm advertisers, and all 470 government agencies, which constitute our main sample.[11] Table 2.3 present summary statistics on advertising spending in this sample. State-owned firms, which are of primary interest to us, account for 26%, 15%, 15% and 7% of total advertising in the print, billboard, online and television markets. In this table we report advertising value at list prices for all markets, computed by Kantar Media as the product of advertising surface and list price, using the the price specific to the concrete ad (position, color, day, media, etc.). Because after 2013 list price data are of poorer quality in the television market, in that market we use minutes to measure advertising volume in the rest of the paper.[12]

Firm level data, 1992-2015. We have balance sheet information for essentially all firms in Hungary, approximately 910,000 firms, from the Hungarian Tax Authority for 1992-1999, from the Hungarian Statistics Office for 2000-2012, and from the Hungarian Company Register for 2013-15. These data contain ownership shares for each firm by the following categories of owners: the central government, municipal governments, domestic private entities, and foreign entities. In addition the Hungarian Company Register contains for 1992-2016 name and address data of firm owners and firm officials with signing rights, including directors, board members, the CEO, and some important employees. We use these data to verify the political connections of media outlets.

Media content and circulation. We scraped the online content of three daily newspapers and two online portals: Nepszabadsag, the main left-connected daily (content available 2012-16), Magyar Nemzet, the main right-connected daily (content available 2010-16) and Magyar Hirlap, a smaller daily connected to the right in the relevant period (content available 2014-16); as well as Index and Origo, the two main online portals, of which Origo became right-connected in 2016 (content available 2013-16). And we also obtained data on the circulation, page views and prime time viewers of print media, online media and television from public sources (matesz.hu, dkt.hu, and brandtrend.hu).

2.3 Favors from Politicians to the Media

In this section we present evidence on advertising favors from politicians to connected media.

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[11]We define the largest advertisers based on the sum of the value of advertising in print plus billboard markets for the print and the billboard markets; and the analogous sum of television plus online advertising for the television and the online markets. Using other definitions has small effects on our results.

[12]Although there is variation in list prices because of price changes and composition effects, the results we present in the analysis below are largely driven by variation in advertising surface. Because we do not observe advertiser-specific prices, we cannot study price discrimination, such as inflated prices at connected media for state-owned firm advertisers.

Graphical Evidence

We begin with figures which illustrate the main patterns in the data, separately looking at the three phases. Because the patterns are sharp, the figures tell essentially the whole story.

Phase 1: One dominant investor (1994-2014)

We explore three markets in the first phase. We start with daily newspapers: Figure 2.1 plots a variable we call *rightshare*, computed as the share of advertising in the main right-connected daily (Magyar Nemzet) relative to that in the left and the right-connected daily (Nepszabadsag and Magyar Nemzet), that is, $R/(L+R)$. This variable is always between zero and one, and is higher when the share of advertising allocated to the right-connected daily is higher. We plot *rightshare* separately for state-owned firms' advertising and for private firms' advertising. For comparison, we also plot the relative circulation of the two newspapers. Shaded areas correspond to right-wing governments.[13,14]

Begin the interpretation with the plot of relative circulation, which—due to data availability—starts in 2000. In the early 2000s the right-connected daily represented only about 25% of the combined circulation of the two newspapers, but by 2014 its circulation share increased to 45%. The figure shows that the composition of advertising by private firms closely tracked the composition of circulation: as the relative circulation of the right-connected daily increased, a corresponding share of advertising migrated to that newspaper.

The interesting part of the figure is the pattern of advertising for state-owned firms. During left-wing governments, their composition of advertising was fairly similar to that of private firms, that is, it roughly aligned with the market shares. However, during right-wing governments there was a dramatic shift towards advertising in the right-connected daily. During the first right-wing administration *rightshare* increased from 21% to a peak of 71%. After the change in government in 2002 it quickly dropped; and after the next change in government in 2010 there was another increase from 43% all the way up to 91%.

A natural interpretation of the figure is that under right-wing governments state-owned firms' advertising was distorted, i.e., governed by non-market motives. The leading alternative explanation is that the shifting allocations represent a more subtle market motive, such as a change in the target audience. We now present direct evidence that rules out this alternative explanation. As we discuss below, our results on phases 2 and 3 further support the favors interpretation.

Target audiences and Metropol. We show that advertising shifts were shaped not by the audience of the media but by its owner using a different source of variation: a change in ownership. In 2011, a regular business partner of the right-wing investor Simicska purchased Metropol, a freely distributed newspaper which represented a large share of the print adver-

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[13]Observations are 12-month periods starting in June of each year, which is the approximate date when a change in political power occurs after an election.

[14]In the definition of the right-connected daily also we included the antecedents of Magyar Nemzet: Uj Magyarorszag, renamed Napi Magyarorszag in 1997 and merged into Magyar Nemzet in 2000.

tising market. Metropol was essentially a tabloid which covered political news lightly. In Figure 2.2 we plot the advertising and circulation share of Metropol relative to all publicly oriented daily print media.[15]

Before the change in ownership, Metropol's share in state-owned firms' and in private firms' print advertising was below 20%, slightly lower than its circulation share. Immediately after the month of purchase, its share in state-owned firms' print advertising jumped to above 50%. This was accompanied by a much smaller increase of its circulation and essentially no change of its share in private firms' print advertising. Because audiences—especially for a newspaper distributed in subway stations—are unlikely to change this quickly, the rapid change in allocations is direct evidence for distortive favors.

Shared values and billboards. We next explore the motive for distortive favors. A natural possibility is that favors were given in expectation of return favors. An alternative may be shared ideology or values DiTella and Franceschelli (2011): that right-wing governments advertised in connected media to support the conservative values these represented. A key point here is that even if shared values was the motive, the favors still distorted the media market by helping particular outlets to survive or thrive. But we also have direct evidence that speaks about motives: advertising on billboards, which do not carry additional content and therefore do not represent values or ideologies.

Several billboard companies were purchased in 2009 by the right-connected investor. Figure 2.3 plots the share of these right-connected billboards in state-owned firms' and private firms' total billboard advertising during 2006-2014. The patterns are clear. Before 2010 both state-owned and private firms allocated less than 30% of their billboard advertising to these right-connected billboards. After the 2010 election, the share of these billboards in state-owned firms' billboard advertising increased all the way up to 93%, while their share in private firms' advertising was essentially unchanged. These patterns are not easily explained by shared values.

Summary of phase 1. Figure 2.4 summarizes the patterns in these three markets by plotting the difference in the allocation share of connected media around the discussed changes in government and in ownership status. We consistently see small changes in private firms' allocation shares but large changes in state-owned firms' allocation shares. The 95% confidence bands indicate that all our effects are highly significant. Importantly, all connected media in this figure were owned by the right-connected investor Simicska and his close business partners.

Phase 2: Fallout (2015 February)

In February 2015, in a surprise event, on a single day several top journalists in the right-connected daily Magyar Nemzet resigned. Several of these journalists subsequently joined the state media. Later the same day, the right-connected investor Simicska called the prime

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[15]Because it was purchased after 2010, we cannot use variation coming from changes in political power for Metropol.

minister unprintable names in interviews. This event signalled the breakdown in the relationship between the prime minister and Simicska.

To confirm this interpretation, in Figure 2.5 we show the combined advertising share of the two daily newspapers of the investor, Magyar Nemzet and Metropol. The increase in state-owned firms advertising after the 2010 election is the familiar pattern of phase 1. The novelty in the Figure is the period of the "fallout" in February 2015. In the course of just a few months, the share of state-owned firms' advertising in the investor's papers dropped from above 60% to below 20%. That is, advertising favors were terminated. The decline started a few months earlier, suggesting that cracks in the relationship appeared before the public fallout.

Figure 2.6 shows a similar if somewhat more noisy pattern in the billboard market: advertising favors on billboards also stopped immediately after the fallout. The rapid reallocations in both markets provide further evidence that the patterns represent distortions, as changes in target or actual audiences are unlikely to be this quick.

The fallout likely represents a power struggle within the elite. One possible explanation for its occurrence and timing is an increase in the political power of the prime minister. In the 2014 election, as a result of both permanent and temporary factors—institutional changes such as redistricting as well as a campaign partly based on reducing utility costs— the right-wing party won 67% of seats in a landslide victory.[16] The prime minister may have wanted to convert this increased strength with voters into a stronger position in the elite by forcing out a dominant partner.

Phase 3: Multiple smaller investors (2015-present)

After the fallout new connected media outlets emerged. We explore three such outlets, in the online, television and print markets. Because the value added from discussing all three markets is small, in the text we focus on online media—which is relevant for the content analysis we present below—and only show a summary figure for the other two.

Online media. In the 2010s in Hungary online news portals have been a growing source of news and entertainment. Data on page views shows the emergence of two about equally popular leading portals, *Index* and *Origo*. Here we explore two events concerning Origo, which was owned by the Hungarian subsidiary of the German telecommunications giant Telekom until 2016. In August 2014 the editor of Origo was replaced, allegedly because of pressure from the government after Origo investigated a government scandal Batorfy (2015). And in January 2016 Origo was sold to a business group connected to the cousin of the governor of the central bank. The governor was formerly a member of the cabinet in both Orban's first and second administrations.[17]

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[16]A report by the OSCE Office for Democratic Institutions and Human Rights (2014) discusses institutional changes and their impact on the 2014 election.

[17]The specific connection was that a business partner of the governor's cousin was a co-owner of the firm that purchased Origo. Then in 2017 Origo was sold on to the son of the central bank's governor.

Figure 2.7 plots the advertising share of Origo in the combined advertising on Origo and Index. We also show the composition of page views, which serves as a measure of relative market size and confirms that the two portals were roughly equally popular during the period. The figure indicates a small increase in state-owned firms' relative advertising on Origo after the first event; and a large increase in their relative advertising on Origo after the second event. There were no corresponding increases in private firms' relative advertising or in the relative number of page views.

The evidence from the first event is consistent with the government rewarding Telekom after the removal of an editor. And the second event is an example of favors flowing to newly connected media after the fallout in 2015.

Summary of phase 3. Figure 2.8 summarizes the patterns of phase 3 from the three markets we investigate. The figure plots the changes in the advertising share between periods when the respective outlet was unconnected versus connected. For Origo, these are periods before the change in editor in 2014 versus after the change in owner in 2016. For television, they are periods before Simicska signed a secret option contract on TV2 in 2013 versus after a government commissioner finally bought TV2 in 2016. And for print media they are periods before versus after the profile change leading to the emergence of the new right-connected daily Magyar Idok.[18] The figure consistently shows small changes in private firms' allocation shares but large changes in state-owned firms' allocation shares. The 95% confidence bands indicate that all our effects are highly significant. In all three markets connected outlets received distortive advertising favors.

A key point here is that—based on the Hungarian Company Register—there have been no direct business relationships between the owners of these three media. In addition, each owner is connected to the prime minister and his party through a different path. We conclude that control of connected media was divided between multiple unrelated investors after the fallout.

Regression analysis

In the text we only present regression evidence for three results: the left versus right-connected daily, Metropol, and Origo. This evidence further confirms that our effects are highly significant and yields some insights about the behavior of other actors.

Left- versus right-connected daily. We aggregate the spending of each advertiser in each of the two main dailies to the the electoral cycle level, and estimate

$$\text{Right share}_{ac} = \text{const} + \sum_{l=1}^{m} \rho_l \cdot \text{advertiser category}_{ac}^l \times \text{right cycle}_{ac} + \text{controls} + \mu_c + \varepsilon_{ac}. \quad (2.1)$$

The dependent variable is "Right/(Left+Right)", the share of advertising in the right-connected daily relative to advertising in the two dailies, measured at the level of an adver-

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[18]Earlier this daily was a business newspaper called Napi Gazdasag; it was purchased in 2015 by the former editor of Magyar Nemzet who left that daily at the fallout, and then underwent a name and profile change to become a political newspaper.

tiser a in a given electoral cycle c. Advertiser categories can be private firms, state-owned firms, and different types of government agencies; and the controls include either indicators for advertising categories or—in more demanding specifications—advertiser fixed effects. We always include cycle fixed effects μ_c. Our main interest is in the ρ_l coefficients, which measure, by advertiser category, the extent to which the composition of advertising differs when the right is in power.

Table 2.4 reports results from this regression in various specifications. We focus on four advertiser categories: (i) state-owned firms; (ii) government agencies involved in administration, such as ministries; (iii) government agencies involved in public goods provision, such as hospitals; and (iv) private firms, which are the omitted category. Columns 1 and 2 present unweighted specifications which measure the behavior of the average advertiser. Column 1 shows a baseline specification without advertiser fixed effects. Relative to the omitted category of private firms, state-owned firms changed the composition of advertising substantially more with the political cycle: they allocated 29 percentage points more of their advertising budget to the right-connected newspaper under right-wing governments than under left-wing governments. Similarly, administrative government agencies allocated 28 percentage points more, and public good providing agencies allocated 12 percentage points more to the right-connected newspaper under right-wing governments. All these estimates are highly significant. Finally, the coefficient of the (uninteracted) state-owned firm variable shows that under left-wing governments state-owned companies allocated about 10 percentage points more to the right-connected newspaper —that is, 10 percentage points *less* to the left-connected newspaper—than did private firms. It appears that there was no favoritism under left-wing governments in this market.

In column 2 we include advertiser fixed effects. These soak up level differences between government-controlled and private advertisers, and hence do not allow us to determine which side engaged in favoritism. But we can now identify the effect of changes in government from time-series variation *within* advertisers. The results are essentially unchanged and confirm the statistical significance of the advertising favors.

Columns 3 and 4 repeat these specifications but—following DellaVigna et al. (2015)—weight observations by the total value (at list prices) of the advertiser's advertising in the two newspapers. With these weights, the results measure how the allocation of the average advertising dollar changed with the political cycle. For state-owned firms and administrative government agencies the patterns are similar to columns 1 and 2, but the magnitudes are larger. Intuitively, large advertisers shifted their spending more than small advertisers. For example, column 4 shows that the share of state-owned firms' advertising allocated to the right-connected daily increased by 37 percentage points under right-wing governments. A possible explanation—which also helps explain the smaller reallocation of public-good providing agencies—is that larger advertisers were under tighter political control.

Metropol. Because for Metropol we are interested in the immediate effect of the change in ownership, we conduct an event study. Focusing on the sample of private firm and state-owned firm advertisers, zooming in on the two-year window surrounding the acquisition, and

using quarterly data, we estimate

$$\text{Metropol share}_{at} = \text{const} + \sum_{-4 \leq q \leq 3, q \neq -1} \rho_k \cdot \text{state owned}_{at} \times \text{post acquisition}_t^q + \text{controls} + \varepsilon_{at}.$$

(2.2)

The dependent variable is measured as "Metropol/All", that is, the share of the advertising spending of advertiser a in quarter t in the print market which is allocated to Metropol. And *post acquisition*$_{it}^q$ is an indicator for the q-th quarter after Metropol was acquired by the right-connected business group, where a negative q denotes a period before the acquisition. We omit the period immediately before the acquisition ($q = -1$), hence we compare changes in the public-to-private advertising gap relative to this quarter. As controls we always include quarter effects, and either an indicator for state-owned firms or advertiser fixed effects.

Table 2.5 shows the results. Confirming the graphical evidence, state-owned firms significantly shifted advertising to Metropol right after the acquisition. For example, column 2 shows that the average state-owned firm increased the share of advertising allocated to Metropol by more than 10 percentage points by the second quarter after the acquisition. The weighted specifications show more rapid and larger adjustment: for example, in column 4 we see an immediate and persistent effect of over 20 percentage points ($p < 0.01$ in all quarters). These results imply that larger advertisers responded faster and tilted more. Because the audience of Metropol, a freely available newspaper distributed in subway stations, is unlikely to change this quickly, the results are evidence for distortive favors.

Online media. For online media we focus on the sample of private firm, state-owned firm and administrative government agency advertisers, consider the period 2013-16 and estimate using quarterly data

$$\text{Origo share}_{at} = \text{const} + \sum_{l=1}^{m} \rho_l^e \cdot \text{advertiser category}_{at} \times \text{new editor}_t$$
$$+ \sum_{l=1}^{m} \rho_l^o \cdot \text{advertiser category}_{at} \times \text{new owner}_t + \text{controls} + \varepsilon_{at}. \quad (2.3)$$

The dependent variable is measured as "Origo/(Index+Origo)", that is, the share of the advertising spending of advertiser a in quarter t in the combined market of the two main portals which is allocated to Origo. And *new editor*$_t$ respectively *new owner*$_t$ are indicators for the period when Origo had a new editor during the Telekom ownership, and the period when Origo had a new owner connected to the governor of the central bank. As controls we always include quarter effects, and either an indicator for state-owned firms or advertiser fixed effects.

Table 2.7 shows the results. Compared to the period before the events, state-owned firms increased their advertising share on Origo (relative to private firms) by 17-21 percentage points after the change in editor, and by 49-61 percentage points after the change in owner. Both effects are significant in all specifications. The results are slightly weaker but broadly similar for administrative government agencies.

Discussion

Our leading interpretation of the results is that they represent distortive favors: preferential advertising based on non-market motives. Here we briefly discuss alternative explanations and the motive for favors, and then compare our results with related findings in the literature.

Different target audiences. The leading alternative explanation is that state-owned firms had different target audiences under right-wing governments. As discussed above, this explanation is inconsistent with the Metropol result. It also cannot easily explain the drop in advertising after fallout as audiences—especially for billboards—are unlikely to rapidly change in response to that event. Finally, to explain the variation in state-owned firms' advertising between left-wing and right-wing governments the target audience of these firms must also change with the political cycle. If target audiences vary so much within advertisers, we expect them to also vary considerably across advertisers. As we show in Table 2.12, there were no major differences in private advertisers' allocation shares across industries or by firm size; and for private advertisers these allocation shares did not vary with the political cycle.

Media giving discounts to the right-wing government. Another explanation may be that the patterns represent favors in the opposite direction: that connected media supported the government by offering discounts. This story seems to go against basic economic logic. State-owned firms are controlled by the government which has direct access to the budget, and hence are unlikely to need support. And a more effective way to support the governing party would be gifts or campaign finance. This interpretation is also at odds with the fact that the annual average profit of the publisher of Magyar Nemzet increased by about 200% from 2002-09 to 2010-14. A variant of this explanation is that right-wing governments could use their connections to get better deals out of connected newspapers. The fact that profits increased is inconsistent with this logic.

Shared values. What motivated distortive favors? A possible answer is shared values. But—because billboards do not represent values—this logic cannot easily explain the favors on billboards, or the drop in billboard advertising after the fallout. A variant of this logic is that advertising on billboards was used to indirectly support the values of Magyar Nemzet, owned by the same business group owning the billboards. But this also seems implausible as Magyar Nemzet was already making a profit in the period.[19]

Connections to the literature. DiTella and Franceschelli (2011) show that government advertising in Argentina was negatively correlated with corruption coverage within newspapers, a pattern consistent with advertising favors. As they clarify, their findings also have market-based explanations, such as increases in the price of advertising following increased demand due to the corruption scandals. We advance on their results by using the comparison with private firms' advertising and with circulation, and by exploiting several changes in con-

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[19]A related question is how politicians controlled state-owned firms' advertising. Anecdotal evidence suggests, and in ongoing work we explore, a clientelism channel in which former employees of the right-connected investor were placed in key positions in state-owned firms.

nection status. This approach allows us to convincingly establish the presence of non-market favors.

DellaVigna et al. (2015) document advertising favors from private actors to media owned by Berlusconi. Our results show favors flowing between different actors: from the government to connected media. A key distinction between these sets of results is that the favors we document can lead to media capture by the government. Indeed, we argue below that this is their most likely interpretation.

The changing organization of favors highlights a power struggle within the elite. This result lends support to a small theoretical literature emphasizing the key role of within-elite interactions, including the models of Myerson (2008) and Boix and Svolik (2013) which show that a sufficiently strong autocratic ruler chooses to dismantle power-sharing institutions. And the arrangement with multiple investors we document in phase 3 resembles the divide-and-rule strategy formalized in Acemoglu, Verdier, and Robinson (2004).

2.4 Favors from the Media to Politicians

We document two forms of media favors: scandal coverage and campaign hosting. Our definition of favors continues to be preferential treatment based on non-market motives. In the context of scandal coverage this means that media content is shaped not by the demand for news but by the supply of news. And in the context of campaign hosting it means that billboard space is not allocated to all political parties at the same price.

Scandal coverage

We explore changes in corruption coverage around changes in connection status. First we look at the right-connected investor's main daily newspaper around the fallout, and then we look at Origo around the changes in editor and owner. In both cases we compare coverage to other media not directly affected by the events.

To conduct the analysis, we first created a procedure to measure corruption coverage. We reviewed a number of articles in several daily and online newspapers and built a list of scandals which involved allegations of the abuse of public resources. We collectively label these corruption scandals.[20] Then, for each scandal, we identified a set of relevant keywords.[21] We then searched the online content of all media used in the comparisons, and for each scandal identified all articles containing the set of keywords. We hand-checked a random subset of these articles to ensure that they indeed mention the relevant scandal, and

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[20]It is possible that we missed some scandals, but because our analysis compares *between* media, this does not affect the interpretation of our results.

[21]For example, when foundations created by the central bank gave money to firms affiliated with relatives of the bank's governor, we used as keywords the abbreviation of the central bank's name and the word "foundation". A list of scandals and keywords is available upon request.

adjusted keywords when necessary to eliminate false matches. Finally, using this definition, we computed for each month the share of articles that covered at least one corruption scandal.

Dailies around fallout. Beginning with the fallout, we compare the online content of Simicska's main daily newspaper, Magyar Nemzet—which we label the "affected" right-connected daily—with the online content of two benchmarks: the left-connected daily Nepszabadsag, and the smaller "unaffected" right-connected daily Magyar Hirlap, which was not related to Simicska.[22]

Figure 2.9 plots the fraction of articles covering scandals for the three newspapers. We focus on the period September 2013-July 2016 which forms a symmetric window around the fallout. There were fluctuation in corruption coverage, in part because of fluctuations in the number of scandals. The key point of the figure is that corruption coverage in the affected right-wing daily gradually increased after the fallout: from the low level of the unaffected right-connected daily to the higher level of the left-connected daily. In contrast, the gap between the two benchmark daily newspapers was essentially unchanged. Thus the affected daily had low corruption coverage while it received advertising favors, but high corruption coverage after favors were terminated.

To infer the statistical significance of the observed shift in coverage, we estimate

$$\text{Corruption coverage}_{it} = \text{const} + \sum_{i=1}^{n} \eta_i \cdot \text{newspaper}_i \times \text{post fallout}_t + \nu_i + \mu_t + \varepsilon_{it}. \quad (2.4)$$

Observations are (newspaper, month) cells, and the dependent variable is the share of articles in newspaper i in month t which cover corruption scandals. The controls always include newspaper and month fixed effects. The η_i coefficients of the interactions measure the change in coverage in newspaper i after the fallout.

Table 2.6 reports the results. Column 1 shows a specification for the period 2014-2016 during which we have content data for all three newspapers. The uninteracted coefficients compare corruption coverage across newspapers before the fallout. These reveal that relative to the unaffected right-connected daily (the omitted category), the left-connected daily covered corruption in a significantly higher share of articles (1.1 pp), while the affected right-connected daily covered corruption in a slightly lower share of articles (-0.36 pp).

The interactions show that corruption coverage did not change after the fallout in the left-connected daily Nepszabadsag, but did significantly increase in the affected right-connected daily Magyar Nemzet (1.3 pp). From this we infer that after the fallout the affected right-connected daily allocated about 70 percent more space to corruption than the unaffected right-connected daily.[23]

Column 2 shows a specification that includes only the two main political newspapers, the affected right-connected daily and the left-connected daily. Because for these two papers

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[22]Simicska's other daily newspaper, Metropol, was a tabloid that covered political news lightly, which is the reason in the content analysis we focus on Magyar Nemzet.

[23]The mean dependent variable for the omitted newspaper after the fallout was 1.3%, and (1.25-0.36)/1.3=0.68.

online content was available for a longer time window, this specification allows us to go back as far as August 2012. The patterns are similar. The significant gap between these dailies' corruption coverage before the fallout (1.1pp) fell significantly (by 0.95pp) and thus essentially closed after the fallout.

Online media. We conduct a similar exercise for online media: we compare the online content of Origo with that of the other main portal Index. Figure 2.10 plots the fraction of articles covering scandals for Origo and Index, during the same period used in Figure 2.7 which showed advertising in these portals. Corruption coverage in Origo was slightly higher than that in Index in the period before the new editor; dropped below that of Index during the period with the new editor; and the gap widened substantially in the period with the new owner. The comparison with the advertising results shows that Origo decreased corruption coverage simultaneously with receiving more government advertising in two stages: in a small adjustment following the change in editor, and in a large adjustment following the change in owner.

To assess significance of these coverage changes we estimate a variant of (2.4) for Origo and Index. Table 2.8 reports the results. Compared to the period before the events, corruption coverage on Origo (relative to Index) declined by 0.5 percentage points after the change in editor, and by 1.65 percentage points after the change in owner. Both of these changes are significant.

Interpretation. To interpret these results we make the key identification assumption that the connection status of a media affects the demand for that media only through content. That is, absent changes in content, changes in connection status do not affect demand. Under this key assumption, the above patterns are evidence for supply-side determination of media content. Since this is our definition of favors, under our identification assumption all three events represent favors from connected media to politicians.

Our identification assumption is slightly less plausible for the fallout, which may have directly created hostility in the supporters of the prime minister towards the media owner and as a result may have independently affected the demand for Magyar Nemzet. But the assumption appears quite plausible for the changes in editor and owner of Origo, which were much less publicized events. All three events generated similar patterns, and each change in coverage coincided with a change in advertising revenue, lending additional support to our interpretation.

We also note that the lower corruption coverage of connected media probably harmed consumers, since—given that readers often do not read all articles—more reporting of corruption generally helps increase awareness. Indeed, models such as Besley and Prat (2006) suggest that independent and opposition newspapers cover government scandals more objectively, so that closing the gap relative to such outlets corresponds to more balanced reporting.[24]

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[24]Consistent with this logic, we are not aware of any model that predicts "too much" corruption coverage; while Stanig (2015) shows in a cross section of Mexican states that legal restrictions on freedom of speech were associated with lower corruption coverage.

Political campaigns on billboards

We turn to the second form of media bias: selective campaign hosting on connected billboards. We focus on political parties' campaign advertising during parliamentary and municipal election periods. Because the right-connected investor's group purchased its key billboard companies in 2009, we separately look at the elections before and after 2009. And since the main right-wing party Fidesz was relatively small in 1994, we start the analysis in 1998.

We study billboard advertising using regressions of the form

$$\text{Right share}_{at} = \text{const} + \sum_{l=1}^{m} \lambda_l \cdot \text{advertiser category}_{at}^l + \mu_t + \varepsilon_{at} \tag{2.5}$$

Observations are (advertiser, campaign period) pairs, where campaign periods are the three month windows before parliamentary or municipal elections. The dependent variable is the share of advertising placed on the billboards which became connected in 2009. We estimate this regression separately for 1998-2006 (campaigns in 1998, 2002 and 2006) and for 2010-14 (2010 and 2014). Advertiser categories are the right wing party, other parties, and private firm advertisers, the later being the omitted category.

Table 2.9 shows the results. The first two columns refer to the 1998-2006 period. The constant in the weighted specification of column 2 indicates that during 1998-2006, private firm advertisers placed about 33 percent of their billboard advertising on these (not yet connected) billboards. The other coefficients show that the right-wing party, and other parties, placed a similar share of their advertising on these billboards. These results support the interpretation that in pre-2009 elections campaign advertising, just like private advertising, was governed by market forces.[25] The last two columns use data from 2010-14 when the billboards were already connected to the right. Column 4 shows that during this period the right-wing party placed 31 percentage points more, and other parties placed 22 percentage points less advertising on the right-connected billboards than did private firms. Both of these coefficients are highly significant. The unweighted specification gives similar results.

The leading interpretation of these patterns is that connected billboards gave discounts to the right-wing party and rationed other parties, that is, allocated space based on a non-market motive, which is our definition of favors. A possible alternative interpretation is favors in the opposite direction: from the party to billboards. But this logic fails to explain the reduced advertising on connected billboards by other parties. It also feels implausible as during campaigns political parties are typically in need rather than in excess of resources.

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[25]In the unweighted specification political parties placed a somewhat lower share of advertising on these not-yet connected billboards than private firms; but the change after 2009 is sharp in these specifications as well.

Discussion

The evidence discussed so far documents simultaneous two-way favors between politicians and connected media. The most natural interpretation is media capture through favor exchange: that advertising revenue was exchanged for favorable coverage. We briefly discuss two possible alternatives. The first is that two-way favors emerged because of mutual altruism between the prime minister and media owners. While this explanation may help rationalize the first phase of favors, it is at odds with the third phase during which the newly emerging connected media owners were not—at least based on the publicly available information—personally close to the prime minister. This is especially clear for Origo, where the change in editor occurred while the portal was owned by German multinational Telekom, and where the eventual new owner was connected to the cousin of the governor of the central bank, with no clear personal ties to Orban.

A second possible interpretation is a variant of the shared values logic: that connected media provided favorable coverage not because of the advertising revenue but because of the owners' genuine political beliefs. The key point here is that irrespective of the motives of media owners, the resulting allocation is a form of media capture. Indeed, our results show that distortive advertising was used to support precise those media which chose for non-market reasons to favorably cover politicians, thus creating a political distortion in the market for news.

Our results contribute to an empirical literature on media capture McMillan and Zoido (2004), DiTella and Franceschelli (2011), Gentzkow et al. (2015), Qin et al. (2016) by documenting media capture in a democracy.[26] They also inform a literature that emphasizes the demand-side determinants of media content in democracies Gentzkow and Shapiro (2010) by identifying a supply-side determinant. And they contribute to the work on favoritism by being the first study (to our knowledge) that documents the simultaneous presence of two-way favors.[27] We now turn to explore the economic costs of these favors.

2.5 Economic Cost and Magnitudes

Our main contribution in this section is to develop a new portable structural approach to measure the economic cost of distortive favoritism. In our setting this approach shows that the favors were fairly costly, indicating that politicians highly valued the indirect benefits of favoritism.

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[26]The key role of advertising in our context is consistent with its role in increasing the independence of the press in historic US newspapers Petrova (2011).

[27]Beyond the papers cited earlier, this literature include work on ethnic favoritism Burgess, Jedwaby, Miguel, Morjariax, and Padro i Miquel (2014), Do, Nguyen, and Tran (2013) and regional favoritism Hodler and Rashky (2014). Also related are studies about the revolving door in lobbying Blanes i Vidal, Draca, and Fons-Rosen (2012), Bertrand, Bombardini, and Trebbi (2014).

An approach to measure the economic cost of misallocative favoritism

Existing efforts to measure its economic costs focus on particular consequences of favoritism, such as defaults, delays in project completion, or the productivity of contractors Khwaja and Mian (2005), Schoenherr (2016), Mironov and Zhuravskaya (2016). Instead of using such proxies, we develop a new methodology in which we directly compare distorted allocations with the market benchmark. Formally, we express the welfare loss from demand-side allocational distortions with a structural approach that parallels but is distinct from the Hsieh and Klenow (2009a) analysis of supply-side distortions. An advantage of our approach is that it is easily portable and can more fully capture the economic costs of misallocation. Indeed, assuming that private advertisers correctly anticipate the impact of their choices, and that the media do not treat government and private advertising differently, the departure from the market allocation should capture all consequences of favoritism. A disadvantage is that our approach relies on structural assumptions and in particular on an elasticity parameter. We argue that using a range of values for this parameter—based on our own estimates as well as estimates in other work—can provide meaningful bounds on the magnitude of the economic cost.

Model of advertising demand. We begin with a stylized structural model. Consider a firm which advertises in n different media in a given market—for example, n newspapers in the print market. Assume that, holding fixed all other input, factor, and pricing choices, total firm revenue is a monotone increasing function of

$$R(x_1, x_2, ..., x_n) = \left[\sum_{i=1}^{n} \lambda_i x_i^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}. \tag{2.6}$$

Here x_i denotes advertising surface in media i, λ_i is a demand shifter that could be governed by the circulation of media i or other factors, and σ is the elasticity of substitution between different media.[28] The implicit assumption behind (2.6) is that different media reach a somewhat different set of readers and hence dividing advertising across media is beneficial. A higher σ means that different media are closer substitutes, in which case it matters less for profits where the firm advertises.

Suppose that the advertiser allocates budget W_A for advertising, so that—denoting the price of advertising per unit of surface in media i by p_i—it faces the budget constraint

$$\sum_{i=1}^{n} p_i x_i = W_A. \tag{2.7}$$

Fix p_i and W_A, then the budget shares $s_i = p_i x_i / W_A$ fully characterize an advertising allocation. Denote the optimal allocations by x_i^* and the optimal budget shares by s_i^*. Let

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[28]A concrete example is when firm sales to consumers are given by $F(K, L, M, R)$ where K is capital, L is labor, M is a vector of intermediate inputs, and F is a production function. In this formulation advertising is just another intermediate input which makes output visible to consumers.

$L(s_1, ..., s_n) = 1 - R(x_1, ..., x_n)/R(x_1^*, ..., x_n^*)$, a measure of the reduction in revenue (and profit) in allocation s relative to allocation s^*. Because R is homogenous of degree one, $L(s)$ equals the share of the advertising budget that could be saved by using the efficient allocation: the advertiser could reduce W_A by a share $L(s)$ and maintain the same level of firm revenue by switching from allocation s to allocation s^*. As a result $L(s)$ is a measure of the welfare loss from allocation s.[29]

Proposition 2. *We can express the welfare loss as*

$$L(s) = 1 - \left[\sum_{i=1}^{n} s_i^* \left(\frac{s_i}{s_i^*} \right)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \approx \frac{1}{2\sigma} \sum_{i=1}^{n} s_i^* \left(\frac{s_i - s_i^*}{s_i^*} \right)^2 \qquad (2.8)$$

where the last expression is a second-order approximation.

Proof. Let $\gamma_i = \lambda_i^\sigma p_i^{1-\sigma}/(\sum_{j=1}^{n} \lambda_j^\sigma p_j^{1-\sigma})$. Maximizing (2.6) subject to (2.7) yields, after some calculations, that $s_i^* = \gamma_i$. Moreover, denoting $V(s) = 1 - L(s)$ it is straightforward to verify that

$$V(s) = \left[\sum_{i=1}^{n} \gamma_i^{\frac{1}{\sigma}} s_i^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}. \qquad (2.9)$$

This gives the first expression in the Proposition. To derive the approximation, for any $s = (s_1, ..., s_n)$ which satisfies $\sum_{j=1}^{n} = 1$, let $\tilde{s} = (s_1, ..., s_{n-1})$. Define $\tilde{V}(\tilde{s}) = V(s_1, ..., s_{n-1}, 1 - \sum_{i=1}^{n-1} s_i)$. Clearly $V(s) = \tilde{V}(\tilde{s})$. A second-order Taylor approximation of $\bar{V}(\tilde{s})$ around $\tilde{s}^*$ gives

$$\tilde{V}(\tilde{s}) \approx \tilde{V}(\tilde{s}^*) + \frac{\partial \tilde{V}}{\partial \tilde{s}}(\tilde{s}^*) \cdot (\tilde{s} - \tilde{s}^*) + \frac{1}{2}(\tilde{s} - \tilde{s}^*)' \cdot \frac{\partial^2 \tilde{V}}{\partial^2 \tilde{s}}(\tilde{s}^*) \cdot (\tilde{s} - \tilde{s}^*)'. \qquad (2.10)$$

Here by definition $\tilde{V}(\tilde{s}^*) = 1$, and by the first-order condition the vector $\partial \tilde{V}(\tilde{s}^*)/\partial \tilde{s} = 0$. Computing the second derivatives requires several steps of straightforward algebra and yields, when $i \neq j$

$$\frac{\partial^2 \tilde{V}(\tilde{s}^*)}{\partial s_i \partial s_j} = -\frac{1}{\sigma \gamma_n}$$

and when $i = j$

$$\frac{\partial^2 \tilde{V}(\tilde{s}^*)}{\partial^2 s_i} = \frac{1}{\sigma} - \frac{1}{\sigma \gamma_i}.$$

Substituting these expressions into (2.10) and using $s_n - s_n^* = -\sum_{i=1}^{n-1}(s_i - s_i^*)$ the Proposition follows. □

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[29]Switching to the efficient composition s^* will in general also imply a different optimal level of total advertising. This reflects additional misallocation which we do not measure here, hence our estimated welfare loss can be interpreted as a lower bound.

The first expression shows that to measure $L(s)$ we need data on the actual and optimal allocation shares and the elasticity of substitution σ. The second, approximate, expression provides some intuition for the impact of these parameters. That expression is zero when $s = s^*$, because there is no welfare loss in the optimal allocation. It does not have a linear term because of the envelope theorem: deviations from the optimum have second-order welfare effects. It implies that proportional deviations from the optimum are more costly for more important media (s_i^* high). And the loss is inversely proportional to σ: when the different media are close substitutes (σ high), shifting advertising between them has smaller welfare effects.

Empirical implementation. Proposition 2 shows that to infer the economic cost of mis-allocation we need three pieces of data: (i) actual allocation shares; (ii) optimal allocation shares; and (iii) the elasticity of substitution. Because proxies for these data are likely to exist in many contexts with favoritism, our approach has the potential to be portable. We now implement the approach for the three advertising markets we discussed in the main text: daily newspapers, billboards and online media. We measure the optimal allocation share s^* with the allocation share of private firm advertisers, and the actual allocation share s with the allocation share of state-owned firm advertisers. The assumption that profit maximization requires similar advertising strategies for these two groups of firms is supported by the fact that under left-wing governments their advertising composition was similar. For further support, in Table 2.12 we show that among private firms there was only slight heterogeneity in advertising composition by advertiser size and industry.

The key remaining parameter is σ. Here we use two approaches. First we estimate it directly with a demand system for each market, exploiting variation in private firms' advertising in response to changes in prices, controlling for shifts in demand. This estimation is fairly standard, and Table 2.13 presents the results. We obtain σ estimates of 0.61, 1.41 and 1.05 for daily newspapers, billboards and online media. While these elasticities may appear small, to us they seem plausible. Indeed, if the readers of different media do not overlap much—which is especially likely in the print and online markets—then we should expect a lack of substitution. Second, we follow Hsieh and Klenow (2009a) in using elasticities of 3 and 5 as benchmarks based on the literature estimating the substitutability of competing firm products. We view these values as conservative because we believe competing manufactures to be more substitutable than different media outlets.

We represent the daily newspaper market with five actors when we apply the model: the four largest daily newspapers by advertising volume in the given period, and all other dailies combined into a hypothetical fifth newspaper. Similarly, we represent the billboard market with five actors: the four largest publishers by advertising volume, and all other billboards. And we represent online media with three actors: the two largest, and all other media.[30] We then compute the economic cost using the exact formula in Proposition 2, and express it as a share of the advertising budget for the particular market that state-owned firms could have saved by switching to the efficient allocation.

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[30]Using other plausible definitions has little effect on our results.

Table 2.10 reports the results. Focusing on the top panel (right-wing governments), our direct estimates show fairly high welfare losses due to favoritism, ranging between 11 and 50 percent. Although the welfare loss is second order in the extent of misallocation, because misallocation is so substantial the loss is quite large. The loss in the print market is smaller in 1998-2002 than in 2010-14, because in the former period only one newspaper (Magyar Nemzet) while in the latter period two newspapers (Magyar Nemzet and Metropol) were favored.

The conservative estimates with $\sigma = 3$ and $\sigma = 5$ show smaller but still substantial losses. On average across the four different markets and periods, the lost budget share was 33% using the directly estimated σ, 14% using $\sigma = 3$, and 9% using $\sigma = 5$. Taking the most conservative and the direct estimates as lower and upper bounds, we conclude that misallocation wasted on average 9-33% of the advertising budget. Favoritism substantially reduced economic efficiency.[31]

Magnitudes

Here we compare the magnitudes of the favors and economic costs. The first row of Table 2.11 measures the value of advertising favors, computed as the total value of state-owned firms' misallocated advertising: $s - s^*$ multiplied by the advertising budget of state-owned firms, expressed as a share of industry value added.[32,33] The values are the tunneled amounts, which exceed the money actually reaching media owners because the costs of advertising are not subtracted. The numbers range between 1.5% and 3.7%, suggesting that tunneling is substantial even relative to the size of the industry.

The second row in the table reports the economic loss due to misallocation. These are the direct—and our preferred—estimates from Table 2.10, expressed as shares of industry value added.

We can combine these estimates to measure the efficiency of tunneling. Row 3 reports the implied measure of the τ transaction cost parameter of Besley and Prat (2006), computed as the total cost of advertising favors (row 1 plus row 2) divided by the tunneled amount (row 1). Consistently across markets, the estimates range between 1.74 and 2.06, indicating that each dollar transferred to the connected media cost about 1.9 dollars to the government budget. Politicians valued the vote-buying power of media bias to be almost twice the vote-buying

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[31]For comparison we also included in the table the welfare losses under the left-wing administrations of 2002-2006 and 2006-2010. Consistent with the similar allocation shares for state-owned and private firms in these periods, the estimated welfare losses are much lower. In fact, much of the welfare loss for the print market during 2002-2010 is driven by the fact that during this period state-owned firms advertised relatively less in tabloids than private firms.

[32]Industry is defined as the four-digit publishing industry for print and online media, and the four-digit advertising industry for billboards.

[33]Because favors are computed using list prices, the estimates do not reflect discounts to advertisers. While discounts are common in the industry, they are probably much less common for state-owned advertisers whose motive is in part to provide favors.

power of efficient public spending. These estimates are larger but comparable to estimates by Schoenherr (2016) of τ for procurement in Korea, which range between 1.17-1.21.

2.6 Conclusion

In this paper we documented two-way favors between politicians and the media, and argued that they represent media capture through favor exchange. We also documented the shifting organization of favors towards a within-elite divide-and-rule arrangement. And we developed and implemented a portable approach to measure the economic cost of misallocative favoritism.

We conclude by discussing some caveats with and broader implications of our results. We first note that we probably did not document all favors in either direction. For example, politicians may use regulation, and media owners may use direct bribes. But the large magnitudes documented in Section 2.5, and the fact that politicians were willing to use them despite their costs, suggest that advertising favors were important. We conclude that a policy intervention which regulates government advertising is likely to reduce media capture.

We focused on measuring the economic cost of favoritism. Another cost is voters' misinformation due to the media distortion. Evidence on the effect of media coverage on votes DellaVigna and Kaplan (2007), Chiang and Knight (2011), Enikolopov et al. (2011), Barone, D'Acunto, and Narciso (2015) suggests this cost can be high, but in the current paper we do not measure it.

A possible mechanism underlying the two-way favors we document is a relational contract. Such a contract can rationalize several key facts. It solves the commitment problem inherent in within-elite interactions Acemoglu (2003), generates persistently inefficient allocations by trading off efficiency for loyalty Board (2011), and can break down when the balance of power in the elite changes Myerson (2008), Boix and Svolik (2013). This logic suggests that our results may be more broadly relevant for within-elite interactions.

Our findings highlight a new link between institutions as the fundamental driver and misallocation as the proximate cause of cross-country income differences, through the logic that misallocative favoritism helps protect political power. This link is distinct from the "political losers" channel of Acemoglu, Johnson, and Robinson (2005) in which the desire to protect power leads the elite to block economic innovation. Further exploring this link seems important to us.

Tables and figures

Table 2.1: Political cycle in Hungary

| | Share in parliament of | | | Central |
	Left	Right	Far right	government
1994-1998	**72%**	28%	0%	left
1998-2002	42%	**55%**	4%	right
2002-2006	**52%**	48%	0%	left
2006-2010	**54%**	46%	0%	left
2010-2014	20%	**68%**	12%	right
2014-2018	23%	**65%**	12%	right

Table 2.2: Market shares of connected media

	2000	2006	2012	2016
Share of right-connected media				
Print	3%	4%	26%	26%
Billboards	0%	0%	28%	0%
Online	0%	0%	0%	25%
Television	0%	0%	0%	42%
Share of left-connected media				
Print	33%	11%	7%	3%
Billboards	0%	7%	8%	0%

Note: Market shares defined with private firms' advertising, measured with minutes in the television, and value at list prices in the other markets. Left-connected media had zero shares in the online and television markets.

Table 2.3: Summary statistics on advertising, 1994-2016

	Number of advertisers	Spending shares			
		print	billboards	online	television
Private firm	500	65.1%	79.9%	80.3%	91.6%
State-owned firm	200	25.5%	14.9%	15.1%	7.2%
Govt. agency	470	9.5%	5.2%	4.6%	1.2%
Total spending (USD M)		2,228	2,186	795	18,631

Note: Total spending and spending shares are computed for the sample period 1994-2016.

Table 2.4: Daily newspapers: political cycle and advertising composition

Dependent variable:	Share of right-connected daily, R/(L+R)			
	unweighted		weighted	
State-owned × right cycle	0.290***	0.267***	0.385***	0.365***
	(0.0344)	(0.0347)	(0.0556)	(0.0603)
Govt. agency (admin) × right cycle	0.276***	0.243***	0.403***	0.374***
	(0.0363)	(0.0373)	(0.0484)	(0.0538)
Govt. agency (public good) × right cycle	0.124***	0.137***	0.0861**	0.103***
	(0.0331)	(0.0322)	(0.0385)	(0.0392)
State-owned	0.0978***		0.116***	
	(0.0242)		(0.0311)	
Govt. agency (admin)	0.129***		0.0497	
	(0.0251)		(0.0332)	
Govt. agency (public good)	0.133***		0.0801	
	(0.0249)		(0.0636)	
Advertiser FE		X		X
Cycle FE	X	X	X	X
Observations	2841	2841	2841	2841

Note: Each observation is an advertiser × cycle pair. The sample contains the top 500 private, the top 200 state-owned, and all government agency advertisers for 1994-2014. Columns 3 and 4 are weighted by the advertiser's total spending in the two newspapers. Standard errors clustered by advertiser in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.5: Metropol: ownership change and advertising composition

| Dependent variable: | Share of Metropol, Metropol/All | | | |
	unweighted		weighted	
State-owned×pre-acquisition 4	0.00804	-0.0113	-0.000672	-0.00138
	(0.0515)	(0.0471)	(0.0867)	(0.0863)
State-owned×pre-acquisition 3	0.0189	-0.00866	-0.0104	-0.00708
	(0.0409)	(0.0274)	(0.0246)	(0.0211)
State-owned×pre-acquisition 2	0.0453	0.00708	0.00296	-0.00411
	(0.0498)	(0.0315)	(0.0386)	(0.0393)
State-owned×post-acquisition 0	0.0831	0.0399	0.281***	0.284***
	(0.0511)	(0.0449)	(0.105)	(0.106)
State-owned×post-acquisition 1	0.106*	0.0493	0.228***	0.236***
	(0.0546)	(0.0456)	(0.0843)	(0.0848)
State-owned×post-acquisition 2	0.183***	0.151***	0.286***	0.291***
	(0.0648)	(0.0577)	(0.0712)	(0.0642)
State-owned×post-acquisition 3	0.168**	0.112*	0.300***	0.294***
	(0.0738)	(0.0630)	(0.0678)	(0.0679)
Advertiser FE		X		X
Quarter FE	X	X	X	X
Observations	3487	3487	3487	3487

Note: Each observation is an advertiser × quarter pair. The sample contains the top 500 private, the top 200 state-owned, and all government agency advertisers in a 2 year window around the acquisition in 2011. Columns 3 and 4 are weighted by the advertiser's total spending in daily newspapers. Standard errors clustered by advertiser in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.6: Corruption coverage in dailies around fallout

Dependent variable:	Share of articles on corruption (pp)	
	All three dailies	Right and left daily
Affected right-wing daily × post fallout	1.25***	0.95***
	(0.24)	(0.21)
Left-wing daily × post fallout	-0.08	
	(0.27)	
Affected right-wing daily	-0.36**	-1.1***
	(0.14)	(0.13)
Left-wing daily	1.13***	
	(0.19)	
Month FE	X	X
Observations	75	96

Note: Each observation is a newspaper × month pair. Dependent variable measured in percentage points. Column 1 uses all three dailies in 2014-2016. Column 2 uses the two main dailies in 2012-2016. Heteroscedasticity corrected standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.7: Origo: connection changes and advertising composition

| Dependent variable: | Share of Origo, O/(I+O) | | | |
	unweighted		weighted	
State-owned × new editor	0.169**	0.181**	0.209***	0.177**
	(0.0778)	(0.0738)	(0.0603)	(0.0700)
State-owned × new owner	0.494***	0.545***	0.611***	0.604***
	(0.156)	(0.171)	(0.188)	(0.197)
Govt. agency (admin) × new editor	0.402***	0.422***	0.260**	0.311***
	(0.0850)	(0.0919)	(0.116)	(0.0940)
Govt. agency (admin) × new owner	0.404***	0.473***	0.366	0.381
	(0.144)	(0.156)	(0.312)	(0.310)
State owned	-0.178*		-0.281**	
	(0.0944)		(0.109)	
Govt. agency (admin)	-0.269***		-0.147**	
	(0.0649)		(0.0669)	
Advertiser FE		X		X
Quarter FE	X	X	X	X
Observations	2917	2917	2917	2917

Note: Each observation is an advertiser × quarter pair. The sample contains the top 500 private, the top 200 state-owned, and all administrative government agency advertisers in 2013-2016. Columns 3 and 4 are weighted by the advertiser's total spending in the two online portals. Standard errors clustered by advertiser in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.8: Corruption coverage in online portals

Dependent variable:	Share of articles on corruption (pp)	
Origo × new editor	-0.5*	-0.5***
	(0.29)	(0.12)
Origo × new owner	-1.65***	-1.65***
	(0.46)	(0.37)
Origo	0.09	0.09
	(0.22)	(0.1)
Period FE	X	
Month FE		X
Observations	94	94

Note: Each observation is a newspaper × month pair. Dependent variable measured in percentage points. Both columns use the two main online portals in 2013-2016. Heteroscedasticity corrected standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.9: Campaign finance

Dependent variable:	Share of right-connected billboards, R/All			
	1998-2006		2010-2014	
Right party	-0.0766***	-0.0415	0.306***	0.305***
	(0.0220)	(0.0278)	(0.0257)	(0.0405)
Other party	-0.0380	0.0284	-0.225***	-0.215***
	(0.0256)	(0.0317)	(0.0260)	(0.0402)
Constant	0.398***	0.327***	0.395***	0.340***
	(0.0560)	(0.0786)	(0.0494)	(0.0582)
Month FE	X	X	X	X
Weighted		X		X
Observations	819	819	718	718

Note: Each observation is an advertiser × campaign pair. The sample contains the top 500 private firms, right and other party advertisers. Columns 1 and 2 use the 3 month periods before 1998, 2002, and 2006 parliamentary and municipal elections, columns 3 and 4 uses the campaign periods before 2010 and 2014 elections. Columns 2 and 4 are weighted by the advertiser's total spending in billboards. Standard errors clustered by advertiser in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.10: Economic cost of misallocation as a share of the advertising budget

	Direct estimate $0.61 \leq \sigma \leq 1.41$	Conservative estimate 1 $\sigma = 3$	Conservative estimate 2 $\sigma = 5$
Right-wing governments			
Dailies 1998-2002	23%	9%	6%
Dailies 2010-2014	47%	16%	10%
Billboards 2010-2014	50%	27%	17%
Online 2015	11%	4%	2%
Left-wing governments			
Dailies 2002-2010	15%	3%	2%
Billboards 2006-2010	5%	2%	1%

Table 2.11: Magnitudes

	Dailies		Billboards	Online
	1998-2002	2010-14	2010-14	2016
	Fraction of industry value added			
Favors from politician to media	1.5%	3.7%	2.6%	1.9%
Economic loss (direct estimate)	1.3%	3.9%	2.3%	1.4%
Transaction cost of tunneling (τ)	1.90	2.06	1.87	1.74

Table 2.12: Heterogeneity among private advertisers in two main dailies

Dependent variable:	Share of right-connected daily, R/(L+R)					
	unweighted			weighted		
Manufacturing × right cycle	-0.00336			0.0117		
	(0.0296)			(0.0409)		
Finance × right cycle	-0.0517			-0.0541		
	(0.0411)			(0.0433)		
Transportation × right cycle	0.0298			0.00882		
	(0.0566)			(0.0390)		
Real estate × right cycle	-0.0637			-0.0365		
	(0.0448)			(0.0560)		
Other × right cycle	-0.0598			-0.114*		
	(0.0409)			(0.0680)		
Manufacturing	0.0223			0.00780		
	(0.0175)			(0.0238)		
Finance	0.0940***			0.0899***		
	(0.0330)			(0.0236)		
Transportation	0.120**			0.0428*		
	(0.0497)			(0.0241)		
Real estate	0.0870**			0.0594		
	(0.0422)			(0.0598)		
Other	0.131***			0.167**		
	(0.0436)			(0.0676)		
Log(emp) × right cycle		0.00677			0.0114*	
		(0.00751)			(0.00646)	
Log(emp)		-0.00739			0.000273	
		(0.00632)			(0.00642)	
Log(sales) × right cycle			0.000572			0.00726
			(0.00695)			(0.00567)
Log(sales)			-0.00802*			-0.00669
			(0.00475)			(0.00427)
Cycle FE	X	X	X	X	X	X
Observations	1424	1394	1404	1424	1394	1404

Note: Each observation is an advertiser × cycle pair. The sample contains the top 500 private, the top 200 state-owned, and all government agency advertisers for the period 1994-2014. Columns 4-6 are weighted by the advertiser's total spending in the two newspapers during the sample period. Standard errors clustered by advertiser in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.13: Demand elasticities

Dependent variable:	Log(advertising ratio)		
	Print media	Billboards	Online
Log(price ratio)	-0.611**	-1.414***	-1.051***
	(0.297)	(0.517)	(0.0876)
Other covariates	X	X	X
Observations	1950	1648	1066

Note: Each observation is an advertiser $\times$ month pair. The sample contains the bottom 80% of the top 500 private advertisers. Column 1 uses the two main daily newspapers, column 2 the two largest non-connected billboard companies, column 3 the two largest online newspapers. Standard errors clustered by advertiser in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure 2.1: Share of right daily relative to left and right daily, $R/(L + R)$

Shaded areas represent right-wing governments.
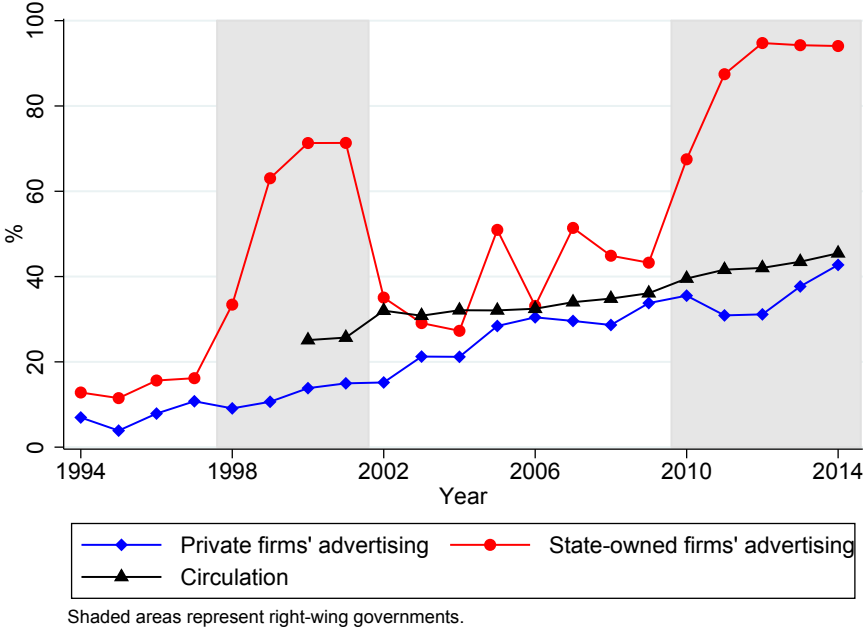
Figure 2.2: Share of Metropol around purchase by connected investor, $Metropol/All$

Shaded areas represent right-wing governments.
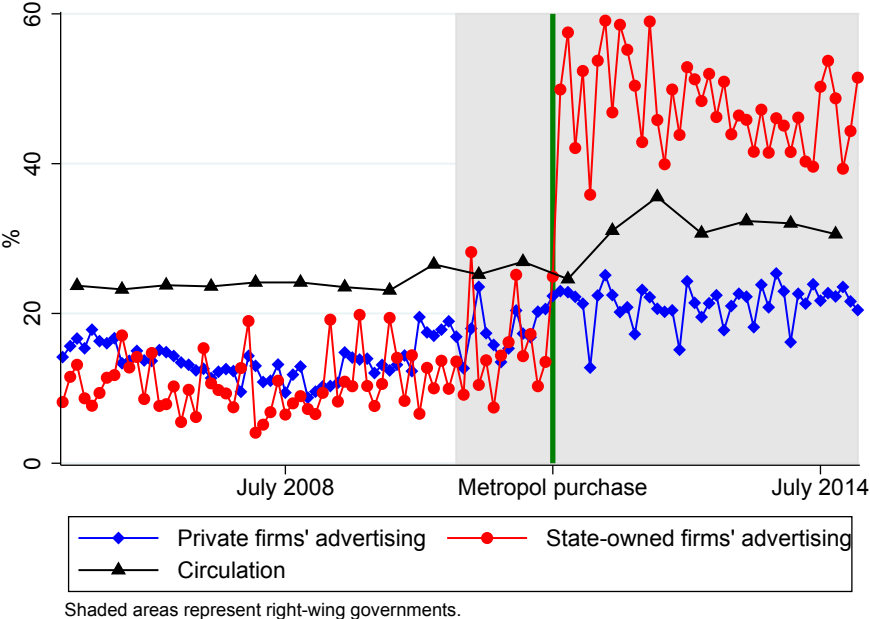
Figure 2.3: Share of right-connected billboards, R/All

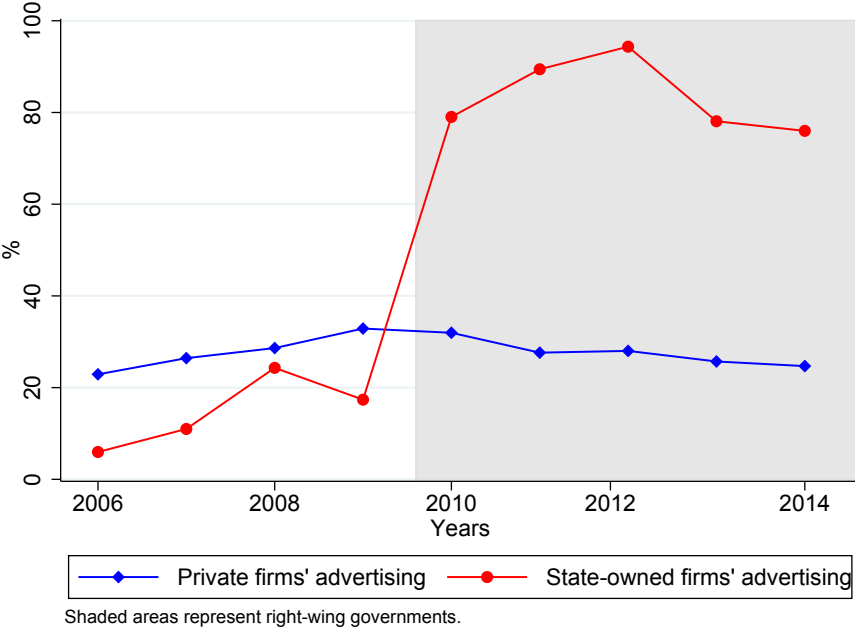Shaded areas represent right-wing governments.

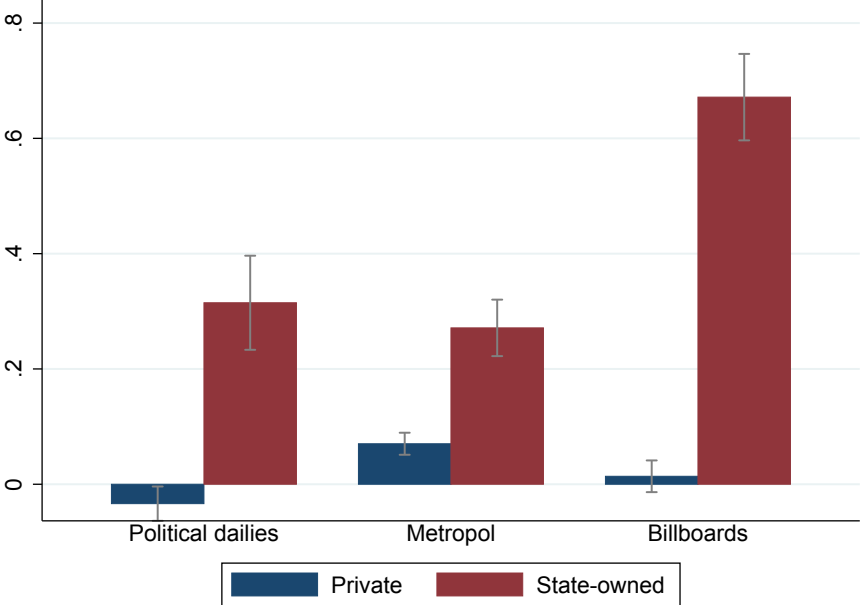Figure 2.4: Phase 1—Change in allocation shares of right-connected outlets

Figure 2.5: Share of investor's dailies around fallout, *R/All*

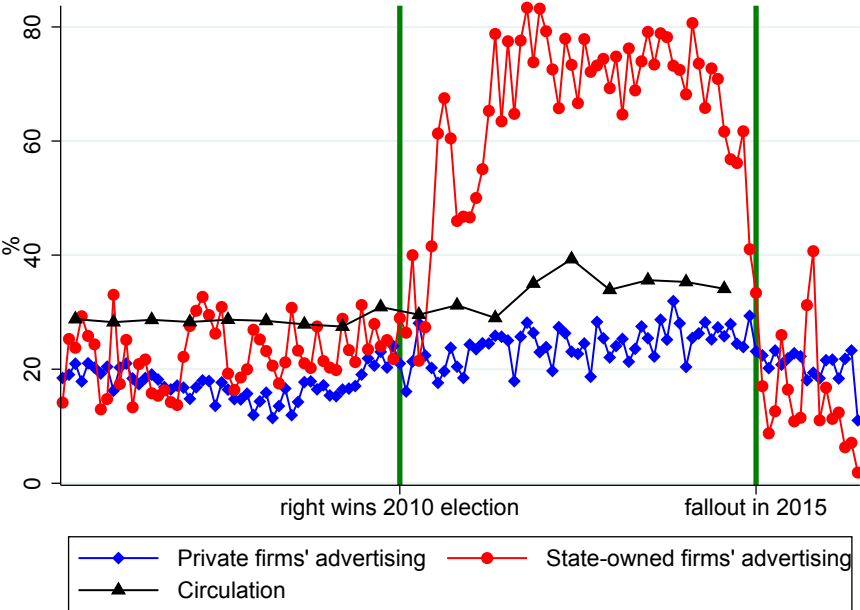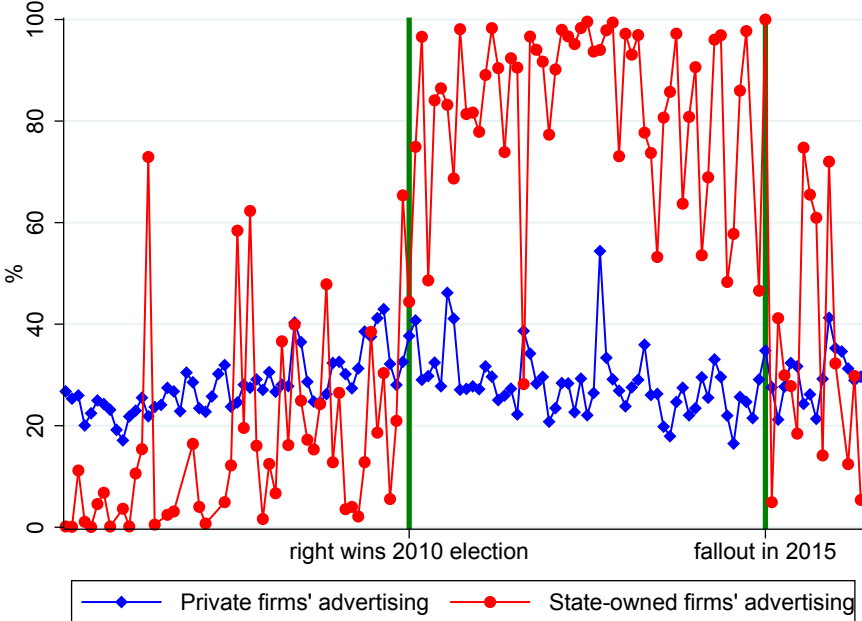Figure 2.6: Share of investor's billboards around fallout, R/All

Figure 2.7: Share of Origo around change in editor and owner, $Origo/(Index + Origo)$
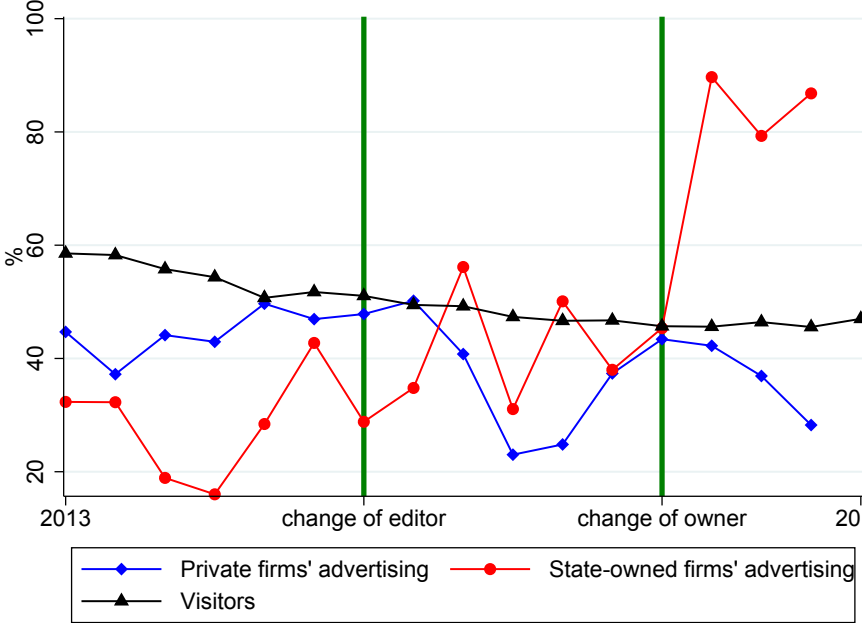
Figure 2.8: Phase 3—Change in allocation shares of new right-connected outlets
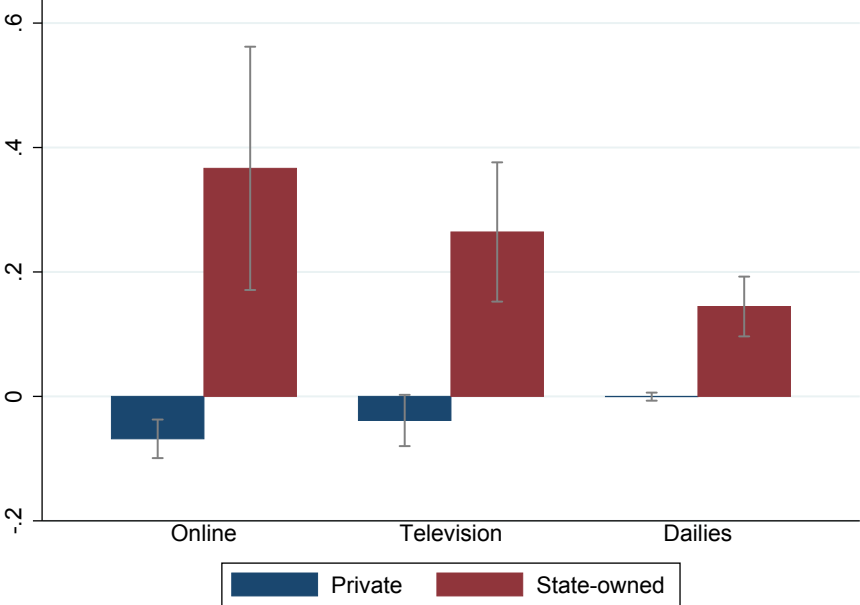

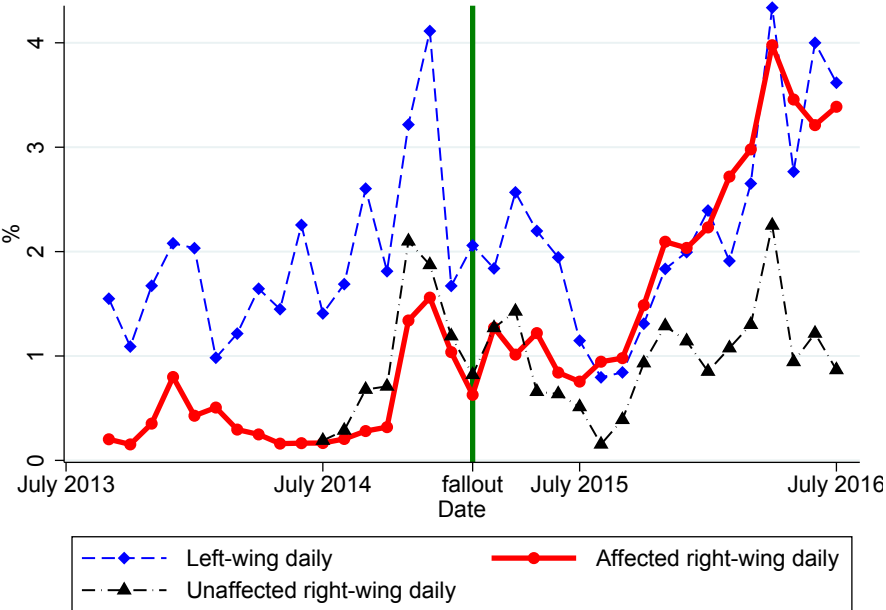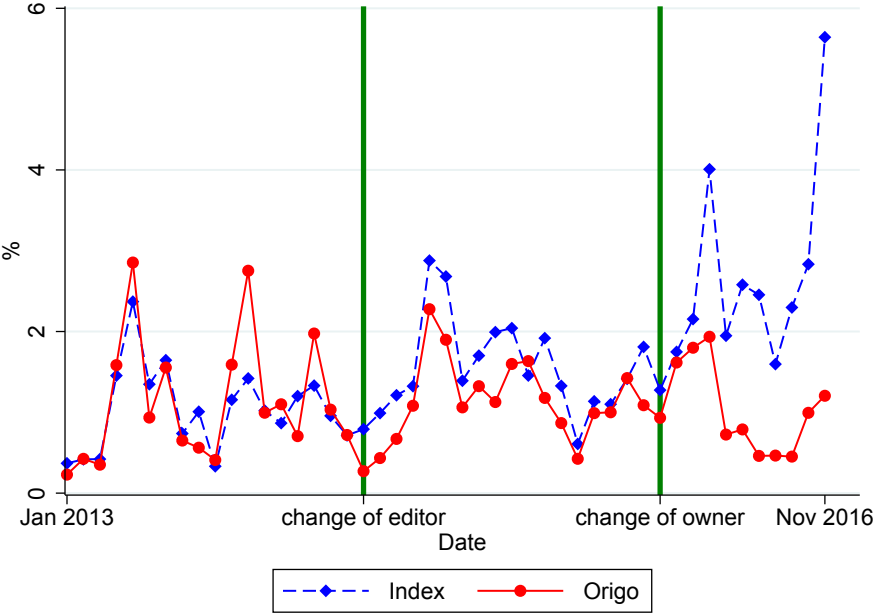Figure 2.9: Coverage of corruption scandals around fallout

Figure 2.10: Coverage of corruption scandals in Origo around new editor and acquisition

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