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Procuring Low Growth

The Impact of Political Favoritism on Public Procurement and Firm Performance in Bulgaria

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Abstract

This paper assesses the impact of favoritism in public procurement on private sector productivity growth. To this end, it combines three novel microeconomic data sets: administrative data on firms, including more than 4 million firm-year observations and rich financial and ownership information; public procurement transaction data for 150,000 published contracts and their tenders; and a newly assembled data set on firms' political connections, drawing on asset declarations, sanction lists, and offshore leaks. This comprehensive data set allows tracing the impact of favoritism in allocating government contracts to economic growth. The findings show that politically connected firms are 18 to 32 percent more likely to win public procurement contracts due to their preferential access to uncompetitive tenders. Public procurement results in higher subsequent productivity and employment growth only if it has been awarded through competitive tenders. Firms winning contracts through uncompetitive procedures have flat growth but higher profit margins. Consistent with these findings, the paper shows that firms that are awarded uncompetitive public procurement contracts obtain rents of 9 to 11 percent from overpaid contracts. The results suggest that aggregate annual total factor productivity growth would have been 8 percent higher in the absence of favoritism in public procurement.

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1. Introduction

Research on the value of political connections and favoritism has given rise to a central question: does cronyism have only distributional consequences, or does it also influence economic growth? The value and performance of connected firms and their access to policy privileges such as favored access to finance have been well documented. Such comparisons, however, cannot address whether political connections promote or slow down aggregate economic growth. For example, connected firms' may grow faster because they are better managed or due to policy protection or privileges. The latter, however, can lead to less competitive market structures undermining the ability of all other firms to compete, slowing aggregate economic growth.

To answer this question, this paper assesses the impact of political favoritism in public procurement on private sector growth. Public procurement constitutes a sizeable portion of national economies on its own, e.g., 13-15 percent of GDP in OECD countries.[1] Moreover, it represents the purchase of goods and services critical to economic growth while also affording powerful levers to the government to direct private sector investment (e.g., requiring green products). However, public procurement may not allocate fiscal resources to more productive firms, rather it may help unproductive firms accumulate scarce capital. In the latter case, a successful business model is based on investing in political connections which can be exploited for preferential access to government contracts, for example through lobbying or hiring less competent yet well-connected staff, instead of investing in innovation. Such connections can make sure that the firm is awarded contracts through uncompetitive tenders and thus receives public

[1] See OECD Government at a Glance dataset: https://data-explorer.oecd.org/vis?lc=en&fs[0]=Topic%2C1%7CGovernment%23GOV%23%7CGeneral%20government%23GOV_GG%23&pg=0&fc=Topic&bp=true&snb=22&df[ds]=dsDisseminateFinalDMZ&df[id]=DSD_GOV%40DF_GOV_PPROC_YU&df[ag]=OECD.GOV.GIP&df[vs]=1.0&pd=2007%2C&dq=A.AUT.GPROC.....&to[TIME_PERIOD]=false&vw=tb (accessed 5/8/2024).

resources it may not have accessed otherwise. This reduces the efficiency of the overall resource allocation in the economy, undermining aggregate growth. Uncompetitive public procurement can thus not only have static ramifications by wasting public resources, but also dynamic consequences by undermining allocative efficiency and aggregate productivity growth in the economy.

We study the link between public procurement, political favoritism, and economic growth in Bulgaria. Bulgaria provides a suitable case study because (i) public procurement amounts to 14 percent of the country's GDP, implying that it is responsible for a significant share of resource allocation in the economy;[2] (ii) the private sector also saw muted aggregate productivity growth in recent years despite considerable public investment; and (iii) while the de jure economic legislation including for public procurement has been harmonized with the EU, there is evidence that de facto discretion of contracting authorities to direct contracts to specific sellers remains (World Bank, 2022). In addition, Bulgaria's EU membership resulted in better data transparency giving rise to open data on firms, public procurement transactions, and asset declarations revealing business ownership of politically exposed persons (PEPs).

We combine three novel microeconomic datasets: (i) administrative data on firms registered in Bulgaria with over 4 million firm-year observations from 2010 to 2018 with rich information on firms' financials and immediate and ultimate ownership; (ii) administrative data on public procurement tenders and resulting contracts, extracted from the national e-procurement system covering over 150,000 contracts, allowing to identify uncompetitive practices at the tender as well as firm levels; and (iii) a newly assembled comprehensive dataset on political connections of firms in Bulgaria drawing on information from asset declarations, sanction lists, and offshore

[2] https://www.globalpublicprocurementdata.org/gppd/country_profile/BG (accessed 05/08/2024).

leaks and covering a wide range of influential political positions held by businesspeople and their family members in national and local governments, and regulatory agencies.

The combined dataset matched at the firm-year level allows, to the best of our knowledge, for the first time to use microeconomic data to comprehensively analyze how political connections of firms lead to favoritism in public procurement, and how this favoritism impacts private sector productivity growth. First, the data provide sufficient information to identify if the use of uncompetitive public procurement practices originates from political connections of firms. Second, the rich administrative data on firms and public procurement transactions allow for constructing a valid control group of firms that, ex ante, had a comparable productivity growth potential and probability to be awarded with the same state contract, allowing to estimate the causal impact of favoritism or corruption risks in public procurement on firms' economic performance. Third, the combined data show a positive impact of favoritism in procurement on awarded firms' profits despite absent productivity growth which is consistent with windfall profits from overpriced government contracts.

We find that political favoritism mutes the impact of public procurement on economic growth. First, politically connected firms are 18-32 percent more likely to win public procurement contracts due to their preferential access to contracts that have been allocated through uncompetitive practices, often by local governments. Specifically, different types of political connections increase the probability of public procurement contract allocation by 20-41 percent in uncompetitive, high-risk tenders, while they have no impact on winning chances in competitive, low-risk tenders. Second, applying a difference-in-differences estimator combined with a matching procedure ensuring that firms operate in the same 4-digit sector, we find that government contracts enable higher subsequent productivity growth only if they have been awarded through competitive

tenders. Firms winning contracts through uncompetitive procedures have flat growth, but make higher profit margins, suggesting that they obtain rents. Third, demonstrating the main impact mechanism for rent-seeking, we find that firms winning uncompetitive contracts are 9%-11% overpaid for the goods and services they provided to the public sector. The results suggest that aggregate annual TFP growth would have been 8 percent higher—growing at a rate of 1.63 instead of 1.5 percent from 2010-2019—in the absence of favoritism in public procurement.

In section 2, we review the relevant literature. Section 3 describes the underlying data. Section 4 discusses the measurement of favoritism in public procurement and presents descriptive statistics of the combined dataset. Section 5 presents our empirical identification strategy and section 6 outlines the results. Section 7 concludes.

2. Literature review

Aghion et al. (2001) provide a theoretical framework to predict the impact of cost advantages that firms receive from their political connections on productivity growth. They consider an oligopolistic intermediate sector where innovation enables a firm to break away from competition for a certain period. The authors predict that firms operating in sectors with neck-and-neck competition are forced to constantly enhance their cost-effectiveness to make (temporary) profits. In contrast, in sectors where some firms have an exogenous cost advantage—for example, due to political connections providing access to public procurement contracts at favorable terms or regulatory protection from competitors—firms have less incentive to raise their productivity. The model implies that in an economy in which political connections can provide access to significant privileges, firms can make profits by investing in political connections instead of innovating. The higher the expected returns from connections, the fewer firms invest in

productivity enhancements and the lower the allocative efficiency in the economy and the weaker the growth impact of public procurement.

Does the empirical evidence support these predictions? The empirical growth literature has initially relied on cross-country analysis given the lack of adequate microeconomic data (e.g., Buccirossi 2013). As highlighted by Durlauf et al. (2009), among others, cross-country growth regressions are, however, a limited tool to draw inference due to the difficulty to measure differences in competition across countries with different unobservable institutional environments. Moreover, Hauk and Wacziarg (2009) show that the small low-frequency sample sizes relative to the seemingly open-ended list of growth correlates make it almost impossible to obtain robust results and address the problem of endogeneity.

At the microeconomic level, literature on political connections often emphasizes three main effects: the value of political connections; the impact of political connections on the performance of individual firms; and the mechanisms through which politically connected firms receive policy favors. Fisman (2001) demonstrates the value of political connections by analyzing stock price movements of connected firms relative to others in response to exogenous changes in the likelihood of regime change (see also Chekir and Diwan 2012; Acemoglu et al. 2015).

Several contributions analyze the performance of connected relative to unconnected firms to shed light on the impacts connections have. Most researchers find that connected firms are more profitable (Ferguson and Voth, 2008; Haber and Maurer, 2007; Goldman et al. 2009; Earle and Gehlbach, 2015). A few studies find that connected firms are less profitable: Faccio (2007, 2010), for example, finds that politically connected firms in poorer and more corrupt European countries have lower returns on assets. Similarly, Colonnelli and Prem (2018) find that firms connected with

local municipalities raise their investment after randomized anti-corruption crackdowns in their region. They also find more economic activity in regions after anti-corruption crackdowns.

Notably, performance differences of connected firms have distributional consequences, but the implications for aggregate economic growth are inconclusive. On the one hand, a better performance could rest on politically connected entrepreneurs being more talented. On the other hand, their higher value and better potential performance can result from political privileges they receive which boost their profitability.

We contribute to this literature by identifying the aggregate growth impact by way of a specific channel through which political connections affect economic growth—rent-seeking in public procurement—and estimate its impact on firms' productivity performance, allowing to draw conclusions on the aggregate growth impact of favoritism in public procurement.

A large literature has unpacked the mechanism through which political connections impact the economy by tracking the exclusive policy privileges received by connected firms that other firms did not, undermining fair market competition. Most studies focus on access to finance showing that connected firms have higher debt, higher default rates, and are more likely to be bailed out (e.g., Cull and Xu 2005; Johnson and Mitton 2003; Khwaja and Mian 2005; Leuz and Oberholzer-Gee 2006; Claessens, et al. 2006; Diwan and Schiffbauer 2018; Schiffbauer et al. 2022). Others have shown that politically connected firms benefit from exclusive subsidies or regulatory advantages such as trade protection or access to exclusive licenses (Rijkers et al. 2017; Martinez-Bravo, Mukherjee and Stegmann 2017; Diwan et al. 2020; Kruse, Martinez-Zarzoso and Baghdadi 2021; Chu, Fisman, Tan and Wang 2021; Canen and Wantchekon 2022).

Several recent contributions focus on the link between political connections and public procurement as government contracts represent the biggest discretionary spending item for

governments, making them an ideal vehicle for benefiting connected firms. Goldman, et al. (2013) find that US stock market companies with politically connected board members obtained more valuable state procurement contracts. Lu and Wang (2022) show that political connections enable firms to exploit loopholes in public procurement in China such as single source procurement procedures or restrictive tendering conditions. Such loopholes or non-competitive tenders allow connected firms to extract rents: (i) in the bidding phase where they can win with inflated bid prices; or (ii) during the contract implementation phase when they can renegotiate contracts leading to cost overruns, or deliver services with limited supervision (Campos et al, 2021). Brugues et al. (2024) find that the appointment of one of the owners of a firm as a public worker increases the probability, value, and number of public procurement awards in Ecuador and show that this results in welfare losses from factor misallocation. While most studies focus on individual persons to establish political connections (i.e., a person with political or public office hired by or linked to the firm), the literature has increasingly looked at firms' other types of political connections such as political party donations (Boas et al, 2014; Fazekas, Ferralli and Wachs, 2023).

We contribute to this literature by tracing the comprehensive impact mechanism of political favoritism from manipulating tendering procedures of government contracts to muted private sector productivity and employment growth. In contrast to Brugues et al. (2024), we directly identify rent-seeking in public procurement by showing how uncompetitive procurement practices—such as manipulating the tendering process to use non-open procedure types or non-advertised bidding opportunities—enable rents to be channeled to politically connected firms. We also use comprehensive measures of favoritism, including wide-ranging measures of political

connections[3] and uncompetitive procurement practices. This allows showing how rent-seeking from captured procurement practices leads to higher profit margins without associated economic gains from higher productivity or employment growth. Consistent with these findings, we show that firms awarded uncompetitive public procurement contracts obtain rents from overpriced contracts.

3. Data

This section introduces the three datasets combined for the subsequent analysis: company, procurement, and political connections data. The three datasets have been matched using unique firm identifiers comprehensively available in the Orbis firm dataset.

3.1 Firm data

Measuring the potential macroeconomic impact of firms' political connections requires representative microeconomic data that allow to capture not only the performance of the connected firms, but also the performance of all the other firms in the economy that may compete with them and thus be affected by their impact on market structures. The analysis is thus based on a large firm panel administrative dataset for Bulgaria for the 2010-18 period. The data stem from Orbis which is a commercial database provided by Bureau van Dijk. The Orbis database is created by collecting data for countries from the national offices of the Registrar of Companies. They include accounting data and information from firms' balance sheets. For Bulgaria, the Orbis data cover all firms, independent of their size, in all economic activities apart from agriculture. The effective

[3] Our coverage of influential political connections goes beyond those of related studies in the literature thanks to the broader information sources considered: for example, Faccio (2007, 2010) and Diwan et al. (2018) constrain the analysis primarily to firms connected to members of cabinets and national parliaments, Akcigit et al. (2023) and Martinez-Bravo et al. (2017) to local government mayors, and Fisman (2001) and Rijkers et al. (2017) to members of the ruling family. See Section 4 for more details.

sample of joint non-missing information for all production function variables in Bulgaria comprises over 4 million firm-year observations implying almost 500,000 firms per year.[4]

We measure output as real value added. Capital, labor, and intermediate inputs are measured as real fixed tangible assets, the total number of employees, and total material costs. We also account for firms' age and the total compensation of employees when measuring markups. We deflate the nominal variables using detailed 2-digit NACE code producer price indices.

We compute total factor productivity (TFP) and markups following the integrated control function approach of De Loecker and Warzynski (2012) to estimate the unbiased measures for the output elasticities of inputs. This approach is critical for our purpose since it controls for unobserved firm-level productivity shocks, which corrects for the potential endogeneity bias in estimating the production function coefficients. It is valid under imperfect competition and allows to infer the impact on physical TFP. The approach is summarized in Appendix A.1.

In addition to financial information, the Orbis dataset provides extensive information on the ownership structure of firms including direct and indirect owners. Direct ownership includes all major shareholders of firms. Indirect ownership linkages are provided by the variable 'Global Ultimate Owner' which provides a unique identifier of the firm acting as the Global Ultimate Owner for the observed subsidiary.[5] The detailed ownership data enable us to uncover also indirect participations of politically exposed persons in firms (see Section 4.3). Moreover, they allow to capture indirect or partial ownership of the state in firms, providing a more complete measure of state-owned enterprises (SOEs).[6]

[4] We remove firms which have missing or negative values in the production function variables (see below).
[5] The data also provides a list of all the subsidiaries that had a change in the unique identifier since 2007, for example because of a change in the firms' legal status, allowing to keep track of ownership changes.
[6] We create a dummy variable for SOEs if the state owns at least 10 percent of the firm through direct or indirect ownership resulting from the investments of SOEs in private firms.

3.2 Public procurement contract data

The public procurement micro-level dataset stems from the administrative register and covers nearly the whole economy. These data include contracts and tenders sourced from the two national e-procurement portals.[7] We also collect the Bulgarian tenders from the EU-wide Tenders Electronic Daily (TED) portal to cross-check data completeness and quality on the national portal.

Constructing a standardized and consistent database using official public procurement records is complicated and challenging. A single tender, for example, contains multiple publications such as the call for tenders (or contract notice), a contract award document, potentially modifications or cancellations of notices, and a contract implementation publication. Moreover, tenders can award one or more contracts so that each contract needs to be stored as a separate observation which can be complex as the number of announced lots in multi-lot tenders can differ from the number of concluded contracts. Framework agreements also complicate data collection as they are at first 'pre-awarded' to firms while the details of the actual contracts are defined in the follow-up award during contract implementation.

We thus built on an existing and flexible data collection pipeline which can standardize a range of idiosyncrasies and changes in data publication rules.[8] The database construction pipeline starts by automated web scraping that is tailored to the specificities of the source websites. This process gathers all source information as comprehensively as possible. Then parser algorithms are run which create a standardized, structured public procurement contract dataset with information on 129 variables extracted from contract and tender announcement documents. Among others, the

[7] http://www.aop.bg and https://app.eop.bg

[8] For a detailed description of the data collection pipeline and dataset, see Fazekas et al (2024), and for full technical details, see https://opentender.eu/bg/about/how-opentender-works.

information includes the unique tax ID of awarded firms, the issuing government contracting authorities, the estimated and actual contract value, tender year, and bid submission deadline.

The information extracted also includes detailed information on variables characterizing tenders according to their openness to competition and the risk of corruption and favoritism such as the number of bidders, decision and advertisement periods, or the types of procurement procedure applied (the details of these indicators can be found in Section 5.3). The final dataset includes 148,637 public procurement contracts from 2011-2018.

3.3 Politically connected firm data

We define connected firms as those firms that are (co-) owned or managed by politically exposed persons who have the political power to influence the outcome of public spending procedures or legislation. Specifically, we consider all firms as politically connected that were co-owned or managed by a person or one of their family members that had a political post at one point in time between 2011 and 2021.[9]

For this, we consider a comprehensive list of political positions taken by businesspeople, going beyond past research looking at specific connection types only: minister, deputy minister, secretary general, chief expert and head of government departments (i.e., 1st tier positions in the national government with executive power); member of national or European parliaments, commissioner of regulatory agencies, member of the governing bodies of a political party (i.e., positions with legislative power); (deputy) mayor in a municipality, (deputy) district governor, chief municipal architect, municipal councilor (i.e., influential positions in local governments);

[9] The firm is thus defined as politically connected for the full effective sample period (2011-2018) since it is assumed that businesspeople who take influential political posts already had some degree of political connection, and thus influence on political decision-making, also before taking (or after leaving) the official political position. We note that this is a conservative assumption given that it may bias the results against finding differences between connected and unconnected firms. That is, it would reduce the measured differences between both firm groups if some connected firms were in fact unconnected in earlier years.

and further key political positions such as head of a regulatory agency, director of governing boards of SOEs, judge, prosecutor, and head of the administration of a court. Such a comprehensive list of influential political connections not only improves the detection of connected firms, but it is also critical for our purpose to identify firms that may have used their connections to obtain government contracts through favoritism, given that such contracts can be awarded by different government bodies at the national and local levels.

Several data sources are exploited to identify such a wide array of politically exposed persons and their firms in Bulgaria. First, asset declarations of persons holding senior public office positions who are obliged in Bulgaria to disclose if they or a family member co-own or manage a private firm.[10] Second, a list of businesspeople who have been sanctioned because of the participation in significant corruption involving public funds by the Office of Foreign Assets Control (OFAC) of the U.S. Department of the Treasury, known as the Global Magnitsky list.[11] Third, ownership information of firms from Orbis and from the Bulgarian Business Register to identify additional firms co-owned or managed by PEPs and their relatives. Fourth, business registry data from other countries, offshore leakages (e.g., the Panama Papers, Paradise Papers, Luxemburg Leaks), and other investigative journalism reports proving firms' co-ownership by Bulgarian PEPs and their relatives, to uncover more hidden ownership information.[12]

Arguably, even this broad list of political positions and data sources under-estimates the true prevalence of firms' political connections. It is very hard to track all types of connections, many of which are hidden or informal, e.g. playing in the same football club or being neighbors. Hence, we also consider the likely favoritism manipulation of procurement tenders as a much

[10] The list of persons holding senior public office is defined in the Counter-Corruption and Unlawfully Acquired Assets Forfeiture Act. The asset declarations are published by the Commission for Counter Corruption and Forfeiture of Unlawfully Acquired Assets.
[11] Persons and legal entities as published by OFAC on 2 June 2021 and the respective lists of related persons and companies, published by the Bulgarian Ministry of Finance on 5 June 2021.
[12] https://www.icij.org/investigations/

broader indication of connections at work. This approach considers the likely impact of political connections as an indirect indication of the phenomenon which potentially leads to over-estimating their prevalence.

4. Measuring favoritism and describing the combined dataset

Given its complexity and novelty, measuring procurement corruption and favoritism risks requires a detailed introduction which is provided in Section 4.1. Section 4.2 describes the combined dataset matching firm, procurement, and political connections and reports key statistics.

4.1 Measuring the risk of favoritism in public procurement

We adapt widely used risk indicator approaches to Bulgarian public procurement to measure the risk of favoritism or corruption, following Fazekas, Poltoratskaia, and Tóth (2023). Our methodology rests on identifying a range of risk factors, conducting validity tests for these, and pulling them together into a composite score which we will call the Corruption Risk Index (CRI). Following the literature, we define favoritism in public procurement as the allocation and performance of government contracts by violating the principles of open and fair procurement in order to favor connected bidder(s) to the detriment of all others (Fazekas, Ferralli, and Wachs, 2023). For the sake of simplicity, in this paper we consider favoritism and corruption in public procurement as overlapping concepts based on their core common feature relevant to the analysis: a public buyer favoring a bidder based on its connections, while disfavoring competing or potentially competing bidders without such connections. This definition leads to a range of indicators based on a vast literature offering conceptual, qualitative, and quantitative support for their validity (see, e.g., Fazekas et al., 2018).

The detailed information from the 148,637 public procurement contracts and their associated tender documents in Bulgaria provide rich information for measuring specific uncompetitive public procurement practices that facilitate favoritism. For example, in a competitive market, a single bid submitted in a tender (i.e. single bidding) is a strong outcome indicator for restricted competition in line with the above favoritism definition (Abdou et al, 2022).

There can, however, be special cases such as market characteristics for specific products for which single bidding may be justified. It is therefore important to assess its adequacy for signaling corruption in conjunction with other risk indicators of uncompetitive procurement practices that restrict competition after controlling for confounders. Not publishing a call for tender, for example, restricts access to information about the tender; hence, it can be used to limit competition to favor one firm. Similarly, a short advertisement period in a formally open tender can restrict the scope of bidders by not leaving sufficient bid preparation time for non-connected bidders, while the connected firm receives the technical specifications before the formal announcement. We therefore compound such indicators into a composite index, the CRI. Following the logic of favoritism in public procurement, the validity of included practices is determined by them predicting a key indication of restricted competition: single bidding, after controlling for likely confounders of bidder number. We use the following empirical specification:

$$y_{cst} = RF_{cst} + X_{cst} + F_s + F_t + \epsilon_{cst}, \quad (3)$$

where y_{cst} is a contract c in sector[13] s and year t with a single bidder; RF_{cst} are risk factors signaling uncompetitive practices such as length of advertisement and decision periods, procedure type, call for tender publication, and buyers repeatedly awarding the same firm; X_{cst} a matrix of

[13] Sector in this model refers to the Common Procurement Vocabulary (CPV) codes that are assigned by public buyers to each public tender. See: https://ted.europa.eu/en/simap/cpv.

confounders such as buyer location, supplier location, buyer type (e.g., municipal or national), product type (goods, services, or works), contract value deciles; F_s sector fixed effects controlling for market characteristics; F_t year fixed effects controlling for regulatory changes over time; and ϵ_{cst} represents the error term.[14]

The approach results in six specific risk indicators that are strong predictors of a process that favored a specific, single firm: single bidding, not publishing tenders on the national portal, non-open procurement procedure types (e.g. invitation tender), short advertisement periods, short decision periods, and a high dependence rate of contracting authorities on the same supplier.[15] The individual risk indicators and their rationale are defined in Table A.1 in the Appendix. The results of the validity tests are presented in Table A.2.[16]

The CRI operationalizes the above definition of favoritism and can be considered as an evidence-based proxy. For ease of interpretation, the CRI is calculated as the arithmetic average of the individual risk indicators which are normalized to 0 (low risk) and 1 (high risk), sometimes adding a medium risk category 0.5. As a result, the CRI varies from 0 to 1, whereby 0 implies that none of the uncompetitive practices were applied, and 1 corresponds to all six indicators signaling an elevated risk of corruption. The CRI is calculated for each contract and allows for consistent comparisons across suppliers, contracting authorities, years, sectors, and regions.

4.2 The matched firm, procurement, and political connection dataset

[14] The approach also allows to empirically determine thresholds for the length of advertisement and decision periods beyond which corruption risks are likely to increase substantially.

[15] The indicator 'high dependence rate of contracting authorities on the same supplier' is not part of the validity tests per se; however, it directly captures spending concentration, that would result in favoritism in the allocation of contracts. Note that while the validation regressions are based on a longer time series (between 2007 and 2021) and hence include 193,980 observations (Table A.2), in this analysis we only use years between 2011 and 2018, with 148,637 public contracts.

[16] In addition to the internal validity regressions, we gathered external validity results by estimating the extent to which contracts with risk factors were overpriced (for the detailed methodology see Abdou et al., 2022). The results suggest that the presence of the individual risk factors increases contract award prices by 5.3 percent or US$2.6 billion for the sample period.

The final matched dataset contains about 500,000 firms per year of which 19,206 firms have been awarded with a public procurement contract (4 percent of all firms), 4,566 were politically connected (0.9 percent of all firms), and 318 of the politically connected companies won a public contract (0.06 percent of all firms) between 2010 and 2018.

Among the connected firms, 98 firms are (co-)owned or managed by (a family member of) persons with influential positions in the executive power of the national government, 1,241 with connections to the national legislative power, 2,367 with connections to local governments, 368 with connections to regulatory agencies and SOEs, and 492 with connections to other influential positions such as prosecutors (Table 1). Politically connected firms operate in all major economic sectors in Bulgaria and are large. While they represent 0.9 percent of all firms, they account for 10 percent of total sales and 6.4 percent of all profits in the economy. Their presence is particularly strong in utilities, finance, transport, professional services, mining, and manufacturing. For example, a few connected manufacturing firms account for 14 percent of all manufacturing sales and 7 percent of positive net profits.

Among the connected firms, 318 (7 percent of the 4,566 politically connected firms) have obtained at least one public procurement contract, implying that they were almost twice as likely to obtain a state contract than unconnected firms (Table 1). The average size of public procurement contracts awarded to politically connected firms (EUR1.13 million) almost double of the average size of contracts awarded to unconnected firms (EUR0.62 million). Notably 60 percent of politically connected firms (191 out of the 318 in Table 1) have won contracts with a high average risk of corruption in that half of the measured procedures signal uncompetitive practices; this compares to 40 percent of all firms (7,644 out of 19,206). Almost one in five (18 percent)

politically connected firms relied on contracts awarded exclusively with uncompetitive practices, compared to 10 percent of all public contract winning companies (Table 1).

Nevertheless, elevated risks of favoritism, including single bidding, not publishing call for tenders, or fixed supplier-buyer relationships are widespread in Bulgaria. Almost 10,000 public procurement contracts (6.7 percent of all contracts) have all six risk indicators present. Moreover, almost 200 government contracting authorities always use procurement practices prone to a higher risk of favoritism or corruption (Fazekas, Poltoratskaia, and Tóth 2023). While many of the awarded firms face procedures allowing for competition, there is a considerable group of firms accounting for about 10 percent of all suppliers which were selected through procedures signaling a high risk of favoritism (CRI>0.5) (see Figure A.1).[17]

Politically connected firms and firms awarded public procurement contracts are larger and older than other firms operating in the same 2- or 4-digit sector (Table 2).[18] For example, the average number of employees of connected firms and state contract-awarded firms is 77 percent and 149 percent larger than those of other firms in the same 4-digit sector. Politically connected firms and firms awarded with public procurement contracts have 81 percent and 136 percent higher profits than other firms in the same 4-digit sector. At the same time, however, connected firms have a similar TFP but a higher labor productivity and capital intensity relative to same sector firms. Firms awarded with a public contract have a higher TFP (3.6 percent) when competitive procurement procedures have been applied while their TFP is not different from all other firms in their sector, including the many smaller and younger firms, when uncompetitive procedures have been applied.

[17] For more detailed evidence on the validity of the six risk indicators, their aggregation, and a more detailed summary of the CRI results for Bulgaria, see Fazekas, Poltoratskaia, and Tóth (2022) or Abdou et al (2022).
[18] Sector refers to companies' NACE sectors reported in Orbis.

5. Empirical strategy and causal identification

Unlike previous research, we combine rich administrative data covering all formal Bulgarian firms such as registry attributes, ownership, and financials with (i) detailed information on tenders and awarded contracts in public procurement and (ii) a newly assembled comprehensive dataset on political connections of firms, covering a wide range of influential political positions taken by businesspeople in the national and local governments, and regulatory agencies.

The combined data allows for novel analysis. First, they provide sufficient information to test if the use of uncompetitive procurement practices originates from political connections of firms. Second, the rich set of financial and ownership variables for more than 3 million firm-year observations facilitates constructing a valid control group of firms that, ex ante, had a comparable productivity growth potential and a comparable probability to be awarded with the same state contract, allowing to estimate the causal impact of favoritism in public procurement on firm outcomes such as productivity growth. Third, we show that the impact of favoritism in public procurement on firm performance is consistent with windfall profits from overpaid contracts.

5.1 The impact of firms' political connections on public procurement

We start by estimating if politically connected firms are more likely to obtain a public procurement contract in general and through uncompetitive procedures that signal a high risk of favoritism.. We restrict the comparison to unconnected control firms in the same 4-digit sector and with otherwise comparable characteristics using the following Probit estimation:

$$PP_{ist} = \beta_0 + \beta_1 PC_{is} + X_{ist} + F_s + F_t + \varepsilon_{ist} \quad (4)$$

where firm *i* operates in the 4-digit sector *s* in year *t*. PP_{ist} is a dummy variable indicating either (i) if firm *i* was awarded a government contract; (ii) if a contract was awarded using

uncompetitive practices signaling a high risk of corruption or favoritism (CRI>0.5)[19]; or (iii) if a contract was awarded using competitive practices (CRI<0.25).[20] The latter scenario serves as a placebo test. PC_{is} is a dummy variable equal to one for (different types of) politically connected firms and zero otherwise,[21] X_{ist} includes a firm's age, size (number of employees), in some specifications its productivity, and a dummy for (partial) state ownership, F_s and F_t are vectors controlling for 4-digit sector and year fixed effects, and ε is the error term. The standard errors are clustered at the sector level.[22]

β_1 measures if politically connected firms are more likely to win a government contract in general and by benefitting from uncompetitive procurement practices compared to their unconnected, same-sector competitors of the same size, age, private ownership status, and productivity. Notably, product or market features can influence the number of potential bidders and thus the choice and outcomes of procurement procedures (see Section 5.2). Most prominently, the procurement of large quantities or specific products from markets with only one suitable provider such as some utility services (see Fazekas et al, 2016). Moreover, older firms or firms with indirect state ownership may induce contracting authorities to apply uncompetitive practices to be able to favor those firms for reasons other than their productivity or political connections. It is thus important to restrict the comparison in (4) to unconnected firms that operate in the same 4-digit sector and have otherwise comparable characteristics to control for these factors.

We consider the impact of political connections on procurement practices—after controlling for firms' activity, size, age, state ownership, and productivity—as exogenous since,

[19] We consider a contract to have a high risk of corruption if at least 3 of the 6 uncompetitive practices are present (CRI>0.5).
[20] We consider a contract to have a very low risk of corruption if less than 2 of the 6 uncompetitive practices are present (CRI<0.25).
[21] When we estimate the impact of a specific type of political connection, we remove all other types from the sample to ensure that the control group only consists of unconnected firms with otherwise comparable characteristics operating in the same sector.
[22] The clustering allows for correlation in the standard errors across firms operating in the same sector. It also allows standard errors to be serially correlated.

other than using their connections, politically connected firms are expected to have the same ex ante probability to benefit from uncompetitive procurement practices as their unconnected same-sector competitors. The causal identification assumption is that, apart from using their political influence, connected firms have the same ex ante probability to benefit from uncompetitive public procurement practices than their unconnected competitors operating in the same 4-digit sector and having comparable firm characteristics (size, age, productivity, fully privately owned). It is difficult to construct scenarios in which preferential access to uncompetitive public procurement procedures is endogenous to firm characteristics other than their ownership, economic activity, size, or performance. We argue that the cases in which our identification assumption would be violated are unlikely and inconsistent with the empirical evidence.

First, politically connected firms may be better managed and thus able to negotiate better terms in public procurement-related procedures. In this case, however, they should also be more likely to win competitive procurement contracts and be more productive than their competitors, which is not the case (see Sections 6.1 and 6.2).

Second, contracting authorities may face asymmetric information about firms' capabilities and thus prefer to work with firms they know better. In fact, most politically connected firms are large and relatively old so that the government may have more information about them. Given that we control for firm size, age, and indirect state ownership, however, it is unclear why contracting authorities should have more information about connected firms relative to comparably large and old other private sector firms. Moreover, we find that connected firms are less productive than their competitors, implying that contracting authorities would need to hold favorable beliefs despite their lower productivity (see Sections 6.1). Furthermore, we should observe the same

preferential access to fully competitive public procurement tenders which is not the case (see Section 6.2).

Third, politically connected firms may provide highly specialized goods or services for which only few suppliers exist, limiting the number of bidders and potentially also making non-competitive procurement procedures more likely. But this systematic correlation between firms' ownership by politically exposed persons and firms' advances in specialization seems implausible. Previous research has shown that, if anything, politically connected firms tend to self-select in more standard activities which demand less sophistication and provide easier means to extract rents, implying a bias against our findings of preferential access to uncompetitive contracts (see, e.g. Fisman 2002; Faccio, 2007; Hussein, Francis, and Schiffbauer 2018).

Rich administrative data on firms with detailed information on firms' ownership, economic activity, and performance are thus critical to identify the causal effect of politically connected firms on corruption risk in public procurement.

5.2 The impact of favoritism in procurement practices on firm outcomes

The next step is to test the impact of public procurement on subsequent firm performance. This requires accounting for confounding factors determining firms' ability to obtain government contracts given that more productive, larger, older, or better-connected firms selling the same products are more likely to be awarded. The rich data at hand puts us in a unique position to do so (see Section 3). That is, the data include the main features of firm performance that allow them to successfully compete in public procurement while the large sample of about 500,000 firms per year allow to apply methods to narrow down the control group to a comparable subset of firms in the same 4-digit sector competing on equal footing for a contract. Unlike previous studies, the data

also capture key non-financial factors that explain firms' ability to win government contracts: their political connections to the relevant national or local government bodies.

We use this information to combine a difference-in-differences estimator with an adjusted propensity score matching procedure as suggested by Heckman, Ichimura, and Todd (1997) to narrow the control group to firms that sell the same products and have a comparable ex-ante probability in terms of their financial and ownership structure to be awarded the same contract. We then estimate if the performance of firms after obtaining (their first) public procurement contract differs for firms that have benefitted from uncompetitive procurement practices.

For our purpose, we need to adjust the standard PSM approach to fit the clustered structure of our data in that we need an exact match for firms' 4-digit sector to compare productivity performances only among firms that were potential direct competitors for the same contract.[23] Therefore, we apply a two-stage procedure. Fist, we estimate the following Probit model to determine the conditional probability, the propensity score *p(X)*, for a firm to be awarded a government contract given its pre-treatment characteristics (*X*) relative to their competitors operating in the same 4-digit sector:

$$PP_{ist} = \beta_0 + \beta_1 X_{ist} + \varepsilon_{ist} \qquad (6)$$

whereby PP_{ist} is the public procurement contract-awarded indicator defined above, X_{ist} includes firms' log TFP, number of employees, real sales, and real total fixed assets in the year before the state contract was awarded, the average age of a firm, its ownership status, and year dummies. The estimator summarizes the vector of the pretreatment variables (*X*) into a single-

[23] If we include a firm's 4-digit sector code as a regular matching variable, the PSM approach would make it more likely that matched control firms operate in the same sector, but it would not exclude matches with control firms selling different products.

index variable $\hat{p}(X)$ which is used in a second stage to create the matched control group of firms based on the following nearest-neighborhood or kernel matching with replacement procedure:

$$A_{rs} = \{ks' \in I_0 : \hat{p}_{ks'} = \min_{ks' \in I_0} |\hat{p}_{rs} - \hat{p}_{ks'}| < 0.25\hat{\sigma}_p; s = s'\} \qquad (7)$$

where *r* is a treatment firm, *k* a control firm, I_0 the sample of firms, and $\hat{p}$ the estimated propensity score from (6).[24] The matching procedure is applied when treatment and control firms are part of the same product cluster (s= s'), forcing them to operate in the same 4-digit sector.[25]

The matching procedure defines the matched sample and generates propensity score weights for matched control firms, giving larger weights to control firms with smaller distances. We use these to estimate the average treatment effect on the treated (*ATT*) adjusted for the clustered structure of our data from a weighted difference-in-differences regression of the first difference of the log of firms yearly performance indicators (TFP, labor productivity, intangible assets, or profits) on the public procurement contract-awarded indicator (PP_{ist}) with the standard errors clustered at the 4-digit sector level. We further estimate if the impact of public procurement contracts on firms' subsequent productivity growth differs if uncompetitive procedures bearing a high risk of corruption were applied and if the awarded firm was politically connected. The combined matching and difference-in-differences approach restricts the control group to same-sector firms with a comparable ex-ante probability of obtaining a state contract given their age, ownership status, and their previous year productivity, size, and financial performance indicators that may be associated with higher subsequent productivity growth.

[24] A caliper of one-fourth of the standard deviation of the estimated propensity score (σ^_p) is applied for the nearest neighborhood procedure to define the maximum tolerated distance between matched firms.
[25] As in Arpino and Cannas (2016), the routine in (7) allows to match similar firms outside clusters if zero matches are found within a cluster (as the treated firm would otherwise drop out); this applies to few cases and does not affect the qualitative results.

Therefore, the causal identification assumption is that, apart from the impact of favoritism in public procurement or the government contract itself, awarded firms have the same subsequent productivity, growth, and profitability potential as the constructed control group of non-awarded firms operating in the same 4-digit sector, having comparable ex ante financial and productive capacities, and having the same firm characteristics in terms of their size, age, and private ownership. Again, it is difficult to construct scenarios that are consistent with empirical evidence in which the identification assumption would be violated. Most prominently, one may argue that contract-awarded firms are better managed (for reasons other than their political connections) which can imply higher productivity growth prospects. In this case, however, their productivity growth performance after receiving a state contract should neither be affected by the corruption or favoritism risk of their procurement tenders, nor by their political connections, which are inconsistent with the empirical evidence (see Sections 6.1 and 6.3).

5.3 The relationship between favoritism in procurement practices and firm procurement profits

We also document the main channel through which firms benefitting from favoritism leading to uncompetitive procurement procedures can make windfall profits: overpriced government contracts. Specifically, we test if firms awarded by uncompetitive procurement tenders profit from overpriced contracts defined as the ratio of the awarded contract value to the estimated contract value—a relative price below 1 signals that the winning bid price is lower than the estimated contract value implying a discount paid by awarded firms. We restrict the comparison to firms in the same 4-digit sector and with otherwise comparable characteristics using the following estimation:

$$PPM_{ist} = \beta_0 + \beta_1 CRI_{ist} + X_{ist} + F_s + F_t + \varepsilon_{ist} \quad (8)$$

where firm i operates in the 4-digit sector s in year t. PPM_{ist} is the procurement price markup relative to the estimated contract value that government pay to awarded firms. CRI_{ist} is either (i) a continuous variable that fluctuates between 0 and 1 measuring the probability that public procurement contracts of firm *i* have been awarded through uncompetitive practices; (ii) a dummy variable indicating if a contract was awarded using uncompetitive practices signaling a high risk of corruption or favoritism (CRI>0.5 or CRI>0.75); or (iii) a dummy variable indicating if a contract was awarded using competitive practices (CRI<0.25). X_{ist} includes a firm's age, size, and a dummy for (partial) state ownership, F_s and F_t are vectors controlling for 4-digit sector and year fixed effects, and ε is the error term. The standard errors are clustered at the sector level.

β_1 measures if government pays a procurement price markup to firms depending on the degree of competitive / corruption risk practices that have been applied in the tendering process. A positive value indicates that governments overpay awarded firms. Relative price data are only available for about 6,000 contracts in the public procurement dataset, which is about 15 percent of all contracts. As a result, we can only estimate our models on 5,937 company-year pairs – instead of 27,172 (see Table 6 versus Table 3 respectively).

The estimated price, which is the main reason for missing relative prices, is set by buyers, who are by definition part of the corrupt scheme if there is one. As a result, there can be a selection bias since the availability and size of a relative price may not be independent of favoritism. We note, however, that in our sample we do not find that relative prices are less likely to be available for high CRI contracts (i.e. above 0.5) which is inconsistent with an availability bias. Still, when relative prices are available, estimated prices may have an upward bias, so that relative prices are artificially low–i.e., buyers set an estimated price that adjusts for 'corrupt rent', hence the relative price is less likely to be high. Our results may thus underestimate the strength of the relationship

between CRI and relative price. The consistently higher average contract value relative to the estimated price thus suggests that the supplier may enjoy a dominant or non-contested market position, which it can use to extract higher prices. This implies a bias against our finding which we thus interpret as a lower bound.

6. Results

6.1 Favoritism in public procurement is driven by politically connected firms

The combined dataset on public procurement, firms' political connections, and firm financial performance provides systematic, economy-wide evidence regarding the impact of politically connected firms on public procurement favoritism at the expense of otherwise comparable unconnected competing firms. The results are summarized in Table 3.

We find that politically connected firms are 20 percent more likely to obtain a public procurement contract than unconnected firms that operate in the same 4-digit sector and are of the same size, proxied by total sales,[26] same age, and are also fully privately-owned (first column of Table 3). The corresponding coefficient is significant at the 1 percent level. Notably, all types of politically connected firms benefit disproportionally from access to state contracts, independent if they are co-owned or managed by a (family member of a) person with an influential position in the central or local government or in a regulatory agency. The effect is strongest among first-tier connected firms co-owned by PEPs with the most influential political positions in the central government and among firms co-owned by directors of regulatory agencies: their probability to

[26] As expected, firm size, age, and indirect state ownership have a positive impact on firms' probability to obtain a public procurement contract (while productivity does not), highlighting the importance to use firm administrative data to control for these characteristics. The results are qualitatively equivalent if we proxy firm size with the number of employees or total tangible assets. The results are available from the authors upon request.

obtain a public procurement contract is 30-32 percent higher than that of otherwise comparable private firms selling the same products (columns 2 and 5 of Table 3).

The ability of politically connected firms to obtain public procurement contracts is explained by their favored access to contracts that have been allocated through uncompetitive tenders. Column 6 of Table 3 shows that politically connected firms are 20 percent more likely than their same-sector competitors to be awarded with one of the over 27,000 contracts that bear a high risk of corruption and favoritism (CRI>0.5). The result is driven by firms that are connected to local governments which are 41 percent more likely to absorb a risky contract. In other words, firms co-owned or managed by (deputy) majors or their families or by persons with other prominent local government posts appear to be able to tilt public procurement practices into their favor. In addition, firms with first-tier political connections to central government bodies are 37 percent more likely to obtain state contracts through uncompetitive procedures.

In contrast, connected and unconnected same-sector firms with otherwise similar characteristics are equally likely to win public procurement contracts with a relatively low risk of favoritism, that is where most of the applied procurement practices allowed for competition (CRI<0.25, columns 11-15 of Table 3). Firms with political connections to local governments are even 16 percent less likely to win a contract through competitive procedures.

Among all contracts awarded to politically connected firms, up to half have a high risk of favoritism (CRI>0.5), compared to only one-fourth of all contracts awarded to unconnected firms (Figure A.2). Many connected firms thus use their political influence to restrict or avoid competition when bidding for government contracts. Still, not all connected firms exploit their political influence to restrict competition in the tenders they apply for, at least not in the ways we can measure. Similarly, we can also see that while most non-connected firms have a low CRI, a

considerable group (about 25 percent of firms) have as high favoritism risks as connected firms. This indicates that they may actually have connections, albeit more hidden, which even our comprehensive methodology failed to identify.

The expected measurement error in identifying political connections imply that the above quantitative results are lower-bound estimates. That is, despite our more comprehensive approach compared to the literature, our measure of firms' political connections likely involves false negatives given PEPs' incentives to hide their co-ownership in private firms. Thus, some firms in the control group may in fact be politically connected which biases our results against finding differences in access to procurement between treatment and control firms. Note that we are more likely to have false negatives than false positives by construction.

Overall, the results quantify the extent to which connected firms use their political influence to gain public procurement contracts at the expense of their competitors. The results also show that studying the allocation of government contracts requires measuring firms' political connections. Once these are revealed, differences in firms' ability to win public procurement contracts can be explained by firm characteristics observable in company datasets such as firm size, age, and state co-ownership. It is thus beneficial to combine data on firms' financials, their co-ownership by politically exposed persons, and the details from public procurement to identify the drivers of access and the risk of favoritism in public procurement.

6.2 Favoritism in public procurement reduces firm productivity growth

So far, we have provided evidence that politically connected firms tend to be favored in public procurement conferring them higher winning chances. Next, we analyze if favoritism in public procurement reduces private sector productivity growth. As described in Section 3, this requires controlling for the confounding factors determining firms' ability to obtain contracts. Our

rich data allow us to do so as they combine detailed administrative data on firms' financial performance with novel data on political factors such as political connections and uncompetitive public procurement practices.

We combine a difference-in-differences estimator with propensity score matching as defined in (6) and (7). The matching approach allows to refine the control group not only to firms with the same activities and characteristics but also with comparable pre-treatment performance. The results are reported in Table 4. Table 5 reports the first stage results of the propensity score estimations and the balancing tests.

We find that firms obtaining government contracts have higher subsequent TFP and labor productivity growth relative to their same-sector competitors that had comparable pre-treatment size, age, ownership status, capital stock, employment, and productivity levels but were not awarded a contract (Table 4, columns 1 and 2). They also have employment growth, charge higher price markups, and raise their profit margins (columns 3-5). As expected, the results imply that the resources channeled to individual firms through public procurement helps them to outperform their competitors in subsequent years.

Importantly, the effect only applies to contracts awarded through competitive procedures. We do not find a significant impact of government contracts on firms' subsequent TFP growth, labor productivity growth, or employment growth relative to their same-sector competitors with comparable pre-contract period performances if uncompetitive procurement practices have been used (2nd row, columns 6-8 of Table 4). Despite their moderate productivity performance, however, firms awarded high favoritism risk contracts still achieve higher profit margins (column 10). The fact that firms winning high risk contracts do not see a higher growth of their productivity or factor

inputs after winning the contract, but make higher profits, suggests that these firms benefit from rents channeled through uncompetitive procurement practices.

In contrast, firms awarded contracts through competitive procedures experience positive and significant TFP growth in subsequent years and higher employment growth (3rd row, columns 6-8), demonstrating that the findings for the average contract are driven by the share firms awarded through competitive public procurement practices. For example, being awarded a government contract through competitive procedures raises firms' TFP growth by 17.2 percentage points (pps) resulting in higher employment growth and profit margins. The results (columns 1 and 6 in Table 2) suggest that aggregate annual TFP growth would have been 8 percent higher—growing at a rate of 1.63 instead of 1.5 percent from 2010-2019—in the absence of favoritism in public procurement.

The results are corroborated when we consider a higher threshold for associating a contract with high favoritism risks. That is, firms that are awarded public procurement contracts with a CRI>0.75—corresponding to uncompetitive practices in 4 out of the 6 procurement procedures as described in Section 5.2—do not have higher subsequent TFP or employment growth. They do experience higher labor productivity growth, implying an increase in their capital intensity given the absence of efficiency (TFP) growth (4th row, columns 11-15 of Table 4). Again, despite their stagnant efficiency they manage to achieve a 3.8 percentage points higher growth in their profit margins (profits per sales). This contrasts with the strong subsequent TFP and employment growth among firms awarded contracts of CRI<0.25 (5th row, columns 11-13 of Table 4).

The first-stage results of the matching procedure show that most pre-contract treated firm performance indicators are strongly correlated with the probability that a firm obtains a contract (Table 5, row 1). Specifically, firms' probability to be awarded a contract is driven by their initial

ownership status and their productivity, employment, total fixed assets (i.e., capital), and sales levels. Moreover, the balancing tests reject an unbalanced sample of treatment and control firms (Table 5, row 2). Specifically, the variance ratios[27] of the treated and untreated matched control firms for the different matching variables are reasonably close to 1 in all specifications, indicating a balanced sample.[28]

Overall, we find that public procurement only supports productivity growth within firms if competitive public procurement practices are applied. High risk contracts allocated through uncompetitive practices still enable awarded firms to make higher profits but fail to improve their productivity.

6.3 Favoritism allows firms to make windfall profits from overpaid contracts

The fact that firms awarded contracts with a high risk of favoritism manage to make higher subsequent profit margins despite their stagnant productivity suggests that these firms benefit from rents channeled through the uncompetitive procurement practices. We directly test for this mechanism by estimating if favoritism risks in procurement result in firms winning overpaid contracts. Specifically, we estimate the relationship between firms' public procurement CRI and their contracts' relative prices that are defined as the ratio of the awarded contract value to the estimated contract value. Lower relative prices mean that the winning bid price is lower than the estimated contract value, that is the discount was higher. Higher relative prices mean that the winning bid was higher compared to the estimate, that is discounts were smaller.

[27]Austin (2009), among others, shows that variance ratio tests have better properties than t-test to test for balanced samples after propensity score matching procedures. They conclude that t-test comparisons after propensity score matching are not suitable and too sensitive to sample sizes.

[28] A variance ratio of 1 between the treated firms and the untreated matched control firms indicates a perfectly balanced panel. Rosenbaum and Rubin (1985) provide critical values for the variance ratio test, indicating an unbalanced panel if the variance ratio is above 2 or smaller than 0.5. The authors further indicate that a variance ratio of [0.5, 0.8) or (1.25, 2] can be of concern. All variables in Table 5 are very close to 1, indicating a balanced panel, i.e., a valid counterfactual control group of firms.

Table 6 suggests that firms' risk of favoritism increases prices in public procurement. Moving from zero risk of favoritism (CRI of 0) to highest risk (CRI of 1) in public procurement is associated with an 11 percent higher contract price markup that government pays to awarded firms. Firms awarded with high risk of favoritism contracts (CRI>0.5 on average) benefit from a 4.2 percent higher value markup. In contrast, companies that were awarded contracts competitively with a CRI<0.25 see a decline in the contract value markup—companies receive a lower price relative to the estimated contract value (that is, they offer higher discounts). The result is consistent with the increase in profit margins of non-competitively awarded firms despite their lack of productivity growth.

7. Conclusion

Based on a uniquely comprehensive, linked database of public procurement, firms, and political connections, we thoroughly document how political favoritism mutes economic growth in Bulgaria through biasing public procurement processes and outcomes. Politically connected firms are 18-32 percent more likely to win public procurement tenders in general and 20-41 percent more in uncompetitive, high-risk tenders. Those firms winning contracts through uncompetitive tenders perform worse than their government supplier counterparts which win competitive tenders. They experience flat productivity and employment growth following procurement success, but make higher profit margins, suggesting that they extract rents from the government. The main impact mechanism for this goes through winning uncompetitive, high-risk contracts which are 9-11 percent overpriced.

Given the prevalence of politically connected firms and the substantial share of public procurement in GDP in Bulgaria (14%), the growth implications of favoritism and connections in

public procurement are substantial. The results imply that Bulgaria's annual TFP growth between 2010 and 2018 would have been 8 percent higher in the absence of favoritism in public procurement.

Naturally, the analysis is not without limitations. Crucially, we expect to under-estimate both the prevalence and impacts of political connections in the economy and in public procurement. It is difficult to reliably track down direct personal connections and even indirect measures may only capture part of the phenomena. Moreover, the administrative public procurement dataset is very rich in comparison but still incomplete since legal reasons for not publishing tender information also exist in EU countries while in other cases circumventing transparency requirements may not always be sanctioned (European Court of Auditors, 2023). It is safe to assume that corruption and favoritism are more prevalent in less transparent, less stringently monitored transactions, hence the true risk levels and their costs are likely to be higher than here reported.

Another reason why we may under-estimate the prevalence and impacts of favoritism is that we only considered a sub-set of strategies and types of favoritism in public procurement, focusing on those which are reliably measurable. Certainly, there is a range of other, potentially more insidious strategies which are hard to measure, such as manipulating the detail of the tendering terms (see, e.g., Lu and Wang, 2022). Similarly, overpricing and extracting rents can occur not only at the tendering stage, but also during contract implementation, which we cannot measure due to lack of data. Further research should expand the data coverage and scope of measurement to get an even more comprehensive picture.

Nevertheless, the policy lessons from the above analysis are straightforward and actionable. In line with recent advice from international organizations like the World Bank (World

Bank, 2022) or the European Court of Auditors (European Court of Auditors, 2023), our findings point at the importance of promoting open and competitive public procurement practices. Using open procedure types, transparently publishing bidding opportunities, or allowing bidders sufficient time to prepare their bids are all likely to weaken the grip of politically connected firms and lower the overall cost of favoritism. In addition, our findings also support further curbing the scope for personal connections between top political office holders and bidding firms, for example by implementing broader and stricter conflict of interest regulations.

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Tables and Figures

Table 1: Number of firms by type of political connection and access to public procurement

	Politically connected firms						
	All	1st tier	Executive	Legislative	Local gov	Reg Agency	Other
number of firms	4,566	415	98	1241	2367	368	492
share of firms in 2018	0.9%	0.1%	0.0%	0.3%	0.5%	0.1%	0.1%
	Firms awarded with public procurement contracts						
	PP contract	CRI >= 0.5		CRI >= 0.75			CRI = 1
number of firms	19,206	7,644		3,411			2,015
share of firms in 2018	4.0%	1.6%		0.7%			0.4%
	Politically connected firms awarded with public procurement contracts						
	PC + PP	PC + CRI >= 0.5		PC + CRI >= 0.75			PC + CRI = 1
number of firms	318	191		88			58
share of all connected firms	7.0%	4.2%		1.9%			1.3%

Source: Orbis firm data, e-procurement data, and data on politically connected firms.

Table 2: Two-samples t-tests comparing connected versus unconnected, and government contract versus no contract firms

		Politically connected versus unconnected firms			Connected to legislative versus unconnected firms			Public Procurement awarded versus not			Public Procurement with High Corruption Risk (CRI>=0.5) versus not		
	Observations	All firms	within 2-digit sectors	within 4-digit sectors	All firms	within 2-digit sectors	within 4-digit sectors	All firms	within 2-digit sectors	within 4-digit sectors	All firms	within 2-digit sectors	within 4-digit sectors
ln(Age)	3,606,379	.306**	.228**	.208**	.237**	.007	.007	.402**	.435**	.409**	.409**	.420**	.372**
		(63.0)	(6.79)	(7.61)	(5.93)	(0.09)	(0.07)	(86.7)	(12.3)	(44.4)	(44.4)	(7.87)	(11.1)
ln(Sales)	3,134,675	1.42**	1.41**	1.14**	1.90**	1.45**	1.11**	3.26**	2.61**	2.38**	3.29**	2.66**	2.28**
		(97.5)	(7.80)	(17.3)	(34.1)	(5.48)	(60.1)	(274.7)	(20.7)	(37.1)	(130.5)	(12.9)	(25.1)
ln(VA)	1,543,913	1.51**	1.42**	1.06**	1.49**	1.31**	1.10**	2.62**	2.12**	1.94**	2.69**	2.16**	1.84**
		(88.3)	(6.26)	(15.5)	(47.2)	(8.12)	(12.0)	(207.6)	(19.3)	(32.4)	(100.8)	(15.7)	(22.8)
ln(L)	3,798,960	.981**	.933**	.772**	.878**	.823**	.769**	1.79**	1.58**	1.49**	1.68**	1.45**	1.35**
		(103.8)	(5.98)	(12.9)	(49.8)	(7.44)	(10.5)	(189.8)	(16.6)	(23.4)	(88.7)	(10.3)	(16.1)
ln(VA/L)	1,543,913	.409**	.350**	.252**	.406**	.285**	.742**	1.04**	.728**	.617**	1.17**	.837**	.652**
		(40.2)	(8.46)	(9.92)	(5.84)	(6.68)	(19.6)	(121.2)	(9.32)	(18.6)	(65.2)	7.51	(15.5)
ln(K/L)	1,499,293	.564**	.363**	.302**	.609**	.313**	.259**	.265**	.388**	.338**	.421**	.487**	.362**
		(36.4)	(4.61)	(4.62)	(19.8)	(2.56)	(2.13)	(24.6)	(3.91)	(5.61)	(18.9)	(3.69)	(5.71)
ln(TFP)	819,151	-.074**	.013	-.004	-.054**	.010	.008	.257**	.073*	.036**	.288**	.084	.013
		(-9.47)	(0.41)	(-0.16)	(-4.00)	(0.24)	(0.20)	(43.7)	(1.70)	(3.05)	(24.4)	(1.53)	(1.05)
ln(Markups)	714,220	-.244**	-.101**	-.105**	-.291**	-.162**	-.147**	-.055**	-.143*	-.110**	-.053**	-.140**	-.143**
		(-23.9)	(-3.01)	(-2.95)	(-15.2)	(-3.35)	(-2.63)	(-8.17)	(-1.73)	(-3.42)	(-3.71)	(-2.16)	(-5.57)
Profits (mil)	2,743,824	.289**	.272**	.235*	.225**	.197	.190	.282**	.253**	.240**	.349**	.318**	.306**
		(5.06)	(2.15)	(1.85)	(3.73)	(1.34)	(1.33)	(8.03)	(7.34)	(7.67)	(5.77)	(4.14)	(2.64)
ln(Profits)	1,873,520	1.33**	1.00**	.809*	1.40**	1.03**	.907*	1.95**	1.52**	1.36**	1.95**	1.52**	1.30**
		(76.8)	(8.12)	(14.5)	(42.1)	(8.50)	(9.89)	(148.5)	(18.2)	(30.0)	(73.5)	(10.8)	(20.1)

Source: Orbis firm data, e-procurement data, and data on politically connected firms.

Table 3: Politically connected firms are more likely to be awarded government contracts, especially when the applied procurement procedures involve a high risk of favoritism

	Public Procurement Contract awarded [Yes/No]					Among public procurement awarded firms, contract with…									
						High Corruption Risk (CRI>0.5) [Yes/No]					*Low* Corruption Risk (CRI<0.25) [Yes/No]				
	(1)	(2)	(3)	(4)	(5)	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*	*(13)*	*(14)*	*(15)*
PC all	.201**					.198**					-.047				
	(4.87)					(2.55)					(-0.83)				
PC 1st tier		.296*					.369*					-.225			
		(1.94)					(1.82)					(-0.80)			
PC legislative			.181**					.015					.007		
			(2.20)					(0.10)					(0.05)		
PC local gov				.187**					.409**					-.162*	
				(3.17)					(3.81)					(-1.89)	
PC reg agency					.322**					.302					-.129
					(2.53)					(1.59)					(-1.15)
4-digit sec FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sales, Age, SOE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs total	2,734,332	2,707,101	2,712,700	2,718,298	2,710,722	27,820	27,026	27,172	27,278	27,134	27,977	27,212	27,355	27,466	27,304

Source: Orbis firm data, e-procurement data, and data on politically connected firms. *Note*: PC is a dummy equal to 1 if the firms is politically connected (by type) and 0 if it is unconnected. Connection types: co-owned by a person or one of her family members with 1st tier, high-level positions in national government, with legislative power in national government, with influential position in a local government, who is a director of a regulatory agency (see Section 3.3). The number of observations in columns 6-15 vary as PC firms with types of connections other the specific connection type looked at (e.g. PC legislative in row 3) are excluded from the analysis. The corruption risk index (CRI) is based on information extracted from public procurement contracts and tenders (see Sections 4.2 and 5.2). All regressions control for 4-digit sector and year fixed effects, firm size (log-sales), log-age, and a dummy for (partially) public owned firms. Standard errors are clustered at the 4-digit sector level, t-statistics in parenthesis; *,** significance at 10, 5 percent level.

Table 4: Corruption risk in procurement reduces the productivity growth within firms

	Δln(TFP)	Δln(VA/L)	Δln(Empl)	Δln(Markup)	Δln(Profit margin)	Δln(TFP)	Δln(VA/L)	Δln(Empl)	Δln(Markup)	Δln(Profit margin)	Δln(TFP)	Δln(VA/L)	Δln(Empl)	Δln(Markup)	Δln(Profit margin)
PP contract	.178**	.138**	.463**	.110**	.072**										
	(7.80)	(5.84)	(11.0)	(5.19)	(2.57)										
CRI>=0.5						.042	.160	.097	.129	.064**					
						(0.44)	(1.39)	(1.59)	(1.60)	(1.99)					
CRI<0.5						.172**	.065	.453**	.050	.044*					
						(2.96)	(1.03)	(9.81)	(1.05)	(1.87)					
CRI>=0.75											.088	.363**	-.115	.203	.042**
											(0.62)	(2.01)	(-1.10)	(1.62)	(2.19)
CRI<0.25											.177**	.093	.251**	.034	.041**
											(2.35)	(1.37)	(4.31)	(0.58)	(2.19)
Same 4-digt sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs total	652,117	652,117	652,117	652,117	652,117	652,117	652,117	652,117	652,117	652,117	652,117	652,117	652,117	652,117	652,117

Source: Orbis firm data and e-procurement data. *Note*: Each cell corresponds to a separate regression. The counterfactual is based on an exact match on firms' 4-digit NACE Rev.2 sector codes, and a nearest neighborhood matching with replacement as defined in equation (6) and (7). The second stage regression of the first difference of logged firm performance variables on a public procurement contract dummy equal to 1 in and after the first year a firm obtained a contract and zero otherwise, measuring the medium-term impact over the sample period. CRI is the probability that a firm was awarded with a corruption-risk contract. A CRI of 0.5 indicates, for example, that 3 of the 6 uncompetitive practices were applied awarding a contract. Standard errors are clustered at the 4-digit sector level; t-statistics in parenthesis; *,** significance at 10, 5 percent level.

Table 5: Balancing Test, First stage regression results

	ln(Age)	SOE dummy	ln(TFP)	ln(Sales)	ln(Fix assets)	ln(Employees)	Same 4-digit sec	Year FE	Observations
First stage regression	.011	.175**	.026**	.084**	.005*	.087**	Yes	Yes	652,117
	(1.47)	(2.48)	(5.49)	(17.5)	(1.66)	(15.9)			
Balancing test Variance ratio	1.04	0.98	1.10	0.86	0.96	1.01	Yes	Yes	652,117

Source: Orbis firm data and e-procurement data. *Note*: First stage Probit regression of a dummy—equal to 1 in the first contract year and 0 otherwise—on firms' pre-contract (lagged) log TFP, sales, total fixed assets, employees, age, SOE dummy, and year fixed effects as defined in (6). Standard errors are clustered at the 4-digit sector level, t-statistics in parenthesis; *,** significance at 10, 5 percent level. Balancing test 'of concern' if variance ratio in [0.5, 0.8) or (1.25, 2] and 'unbalanced' if [<0.5 or >2].

Table 6: Firms awarded with high corruption risk public procurement contracts make windfall profits from being overpaid by public buyers

	Average public procurement contract value markup per company-year			
CRI	.107**			
	(4.61)			
CRI>=0.5		.042**		
		(3.81)		
CRI>=0.75			.043**	
			(2.62)	
CRI<25				-.051**
				(5.69)
4-digit sector FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sales, Age, SOE	Yes	Yes	Yes	Yes
Obs total	5,937	5,937	5,937	5,937

Source: Orbis firm data and e-procurement data. *Note*: Relative prices are defined as the ratio of awarded to estimated contract value. In case the relative price is below 1, firms (suppliers) offer a discount. CRI is the probability that a firm was awarded with a corruption-risk contract. For example, a CRI of 0.5 implies that 3 of the 6 uncompetitive practices were applied awarding a contract. Standard errors are clustered at the 4-digit sector level; t-statistics in parenthesis; *,** significance at 10, 5 percent level.

Appendix

Appendix A.1. Deriving firms' TFP and markups

We restrict the analysis to production functions with a scalar Hicks-neutral productivity term and common parameters (β_s) across the set of firms (I) within each sector s. We can thus define a firm's production function as:

$$y_{ist} = \beta_{ls} l_{ist} + \beta_{ks} k_{ist} + \omega_{ist} + \epsilon_{ist}, \qquad (1)$$

where y_{ist}, k_{ist}, l_{ist} are the logs of real value added, capital, and labor of firm i in sector s and year t, ω_{ist} is an unobserved contemporaneous productivity shock, and ϵ_{ist} is the error term. We estimate (1) separately for each sector s.

The specification allows to use control function methods to obtain consistent estimates of β_s. We follow the two-stage procedure of Ackerberg, Caves, and Frazer (2015). In the first stage, we use the control function $m_{ist} = f(k_{ist}, \omega_{ist}, a_{ist})$, assuming that a firm's demand for material inputs in t (m_{ist}) is a function of its capital stock in t, an unobservable contemporaneous firm productivity shock, and other firm-specific attributes (a_{ist}) such as age. We can then proxy for the unobserved contemporaneous productivity shock by estimating the inverted control function: $\omega_{ist} = h(m_{ist}, k_{it}, a_{ist})$ to obtain estimates of ϵ_{ist}, $\omega_{ist}(\beta)$, and a firm's expected output $\hat{\phi}_{st}(\beta)$.

In the second stage, the parameters β are identified from the law of motion for productivity, in which current productivity is a function of past productivity and the firm attributes: $\omega_{ist} = g_t(\omega_{ist-1}, a_{ist}) + \varphi_{ist}$. By nonparametrically estimating the function g_t, the approach recovers the innovation to a firm's productivity term given β, $\varphi_{ist}(\beta)$, which is assumed to be uncorrelated with the second order polynomials of lagged employment and the predetermined capital stock.

This allows to estimate β using a generalized method of moments (GMM) approach. The approach results in reasonable ranges for the estimated output elasticities of labor and capital.

Plugging the estimated production function parameters into the expression for a firm's productivity $\omega_{ist}(\beta)$ provides an unbiased estimate of firm TFP. De Loecker and Warzynski (2012) further show that a firm's markup μ_{it} can be defined as the price-marginal cost fraction:

$$\mu^{it} = \theta^{X}_{it} \left(\frac{P^{X}_{it} X_{it}}{P_{it} Q_{it}}\right)^{-1} \quad (2)$$

where the output elasticity on an input X_{it} is denoted by θ^{X}_{it}. We obtain a firm's markup by plugging into (2) the estimated unbiased output elasticity for the labor input (θ^{L}_{it}) and the share of expenditures of total labor cost in total output ($P_{it}Q_{it}$). When computing firm TFP and markups, we apply the authors' correction for unobserved variation in firm-level prices that are uncorrelated with firms' input choices and are thus captured by the error term ϵ_{ist}.

Appendix A.2. Uncompetitive public procurement indicators and additional robustness

Table A.1. Definition of the corruption risk indicators from public procurement contract data

Indicator name	Indicator definition	Rationale
Single bidder contract	0 = more than one bid received 1 = one bid received	Single bidding indicates that a given tender only had one bidder during the procurement process, hence there was no competition for the contract. The lack of competition is one of the main signs of corruption in the public procurement system (Abdou et al, 2022).

Call for tenders publication	0 = call for tenders advertised 1 = call for tenders not advertised	Not publishing a call for tenders in the official journal limits access to information about the tender, reducing the number of bidders. It is also shown to facilitate awarding contracts repeatedly to the same firm (Fazekas, Tóth, and King, 2016). Some tenders do not have a call for tenders' publication despite a legal requirement, hence the

Indicator name	Indicator definition	Rationale
		indicator captures the de facto and not the de jure uncompetitive procurement practice.
Procedure type	0 = open 0.5 = negotiated/accelerated 1 = non-open (e.g., direct contracting)	Non-open procedures create opportunities to limit the range of bids received and to exclude bids.
Length of advertisement period	Number of days between publication of call for tenders and submission deadline: 0 = from 12 to 183 days 0.5 = from 7 to 11 days 1 = from 1 to 6 days	A short submission period tends to limit access to information about the tender which reduces the number of bidders and thus competition. We find a strong negative correlation between the length of the submission period and the likelihood of single bidding.
Length of decision period	Number of calendar days between submission deadline and announcing of contract award: 0 = from 9 to 365 days 0.5 = from 5 to 8 days 1 = from 1 to 4 days	An overly lengthy decision period can signal that the issuer tried to award the contract to a specific firm. It can also reflect that the tender was legally challenged, suggesting that the issuer attempted to limit competition.
Buyer's dependence	The share of a contracting authority's total contracts' value in a given year awarded to the same firm.	A high share points to personal ties between the suppliers and the contracting authority, preventing the tenders to be contracted under fair competition.

Source: Fazekas, Poltoratskaia, and Tóth (2022). *Note*: 0 indicates open competition, 1 an uncompetitive practice.

Table A.2. Internal validity regression results for the red flags used for CRI calculation

	Dependent variable:				
	Single bidding				
	(1)	(2)	(3)	(4)	(5)
Procedure type (negotiated)	0.611***				0.534***
	(0.015)				(0.017)
Procedure type (non-open)	2.047***				1.059***
	(0.022)				(0.028)
Decision period (5 to 8 days)		0.447***			0.422***
		(0.023)			(0.023)
Decision period (1 to 4 days)		1.544***			1.263***
		(0.018)			(0.018)
No call for tenders			1.488***		0.758***
			(0.017)		(0.029)
Submission period (from 5 to 8 days)				0.258***	-0.014
				(0.016)	(0.018)
Submission period (missing)				1.105***	-0.095***
				(0.014)	(0.022)
Observations	193,980	193,980	193,980	193,980	193,980
Log Likelihood	-102,755.100	-102,283.300	-103,566.100	-104,590.800	-98,962.630
Akaike Inf. Crit.	206,210.200	205,266.600	207,830.200	209,881.700	198,635.300

Note: *p<0.1; **p<0.05; ***p<0.01

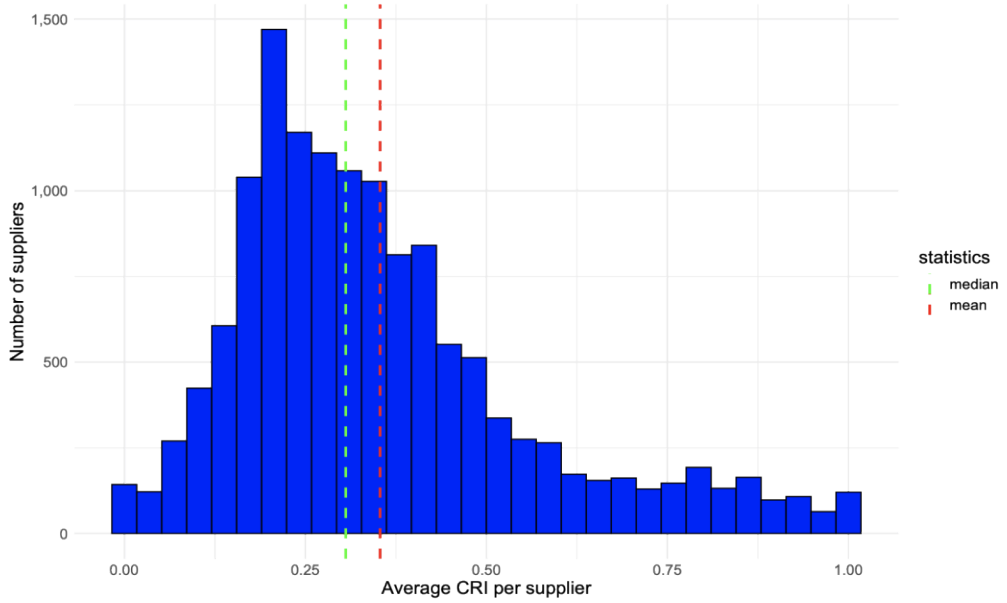
Included controls not shown are: Buyer location, Buyer type, Supl. location, Contract type, Year FE, Market FE, Contract value deciles

Table A.3: After controlling for firm productivity, politically connected firms are more likely to win state contracts, especially when the applied procurement procedures involve a high risk of corruption

	Public Procurement Contract awarded [Yes/No]					Among public procurement awarded firms contract with: *High* Corruption Risk (CRI>0.5) [Yes/No]					Among public procurement awarded firms contract with: *Low* Corruption Risk (CRI<0.25) [Yes/No]				
PC all	.228**					.202**					-.096				
	(4.87)					(2.27)					(1.56)				
PC 1st tier		.274*					.271					-.163			
		(1.86)					(1.05)					(-0.51)			
PC legislative			.155*					.005					.006		
			(1.80)					(0.03)					(0.04)		
PC local gov				.203**					.450**					-.289**	
				(2.93)					(4.04)					(-2.93)	
PC reg agency					.487**					.263					-.130
					(3.50)					(1.29)					(-1.16)
4-digit sec FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sales, Age, SOE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TFP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs total	762,969	752,370	754,797	756,760	753,513	21,654	21,024	21,137	21,245	21,128	21,815	21,201	21,314	21,419	21,295

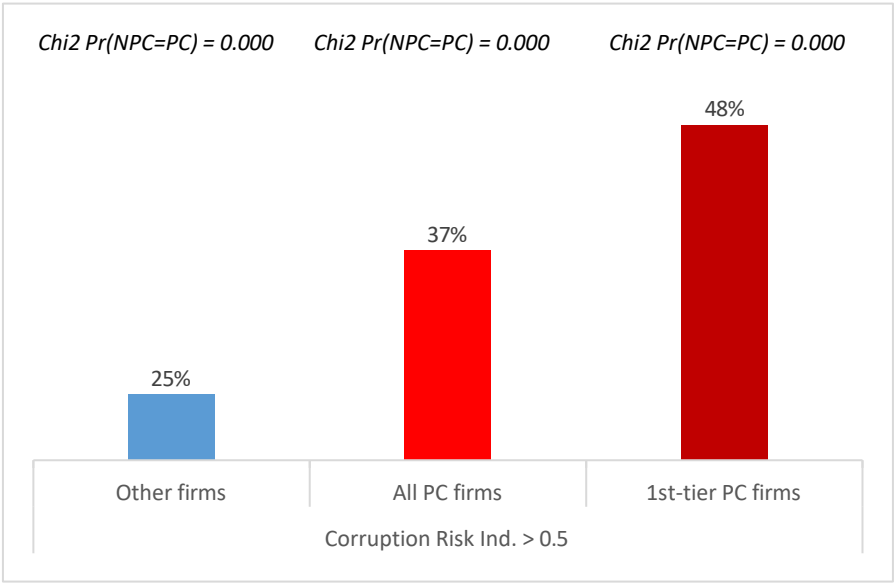
Source: Orbis firm data, e-procurement data, and data on politically connected firms. *Note*: PC is a dummy equal to 1 if the firm is politically connected (by type) and 0 if it is unconnected. Connection types: co-owned by person or one of her family members with 1st tier, high-level positions in national government, with legislative power in national government, with influential position in a local government, who is a director of a regulatory agency (see Section 4.3). The corruption risk index (CRI) is based on information extracted from public procurement contracts and tenders (see Sections 4.2 and 5.2). All regressions control for 4-digit sector and year fixed effects, firm size (log-sales), log-age, and a dummy for (partially) public owned firms. Standard errors are clustered at the 4-digit sector level, t-statistics in parenthesis; *,** significance at 10, 5 percent level.

Figure A.1. CRI distribution across awarded firms (number of contracts>2), Bulgaria, 2011–2019



Source: e-procurement data. *Note:* The Corruption Risk Indicator (CRI) is a composite of six risk indicators that are strong predictors of a process that favored a single firm: single bidding, not publishing tenders, openness of the procurement procedure type, short advertisement periods, lengthy decision periods, and a high dependence rate on the same supplier for contracting authorities. Indicators are normalized between 0 and 1. A CRI of 0.5 indicates that 3 of the 6 uncompetitive practices signaling corruption risk were applied for a single contract.

Figure A.2: Up to half of all state contracts won by politically connected firms have a high risk of corruption (CRI>0.5) compared to only one-fourth among unconnected firms



Source: Orbis firm data, e-procurement data, and data on politically connected firms.