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## Do political connections spur technology transfer? Evidence from India from a governance perspective

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## **ADBI Working Paper Series**

### **DO POLITICAL CONNECTIONS SPUR TECHNOLOGY TRANSFER? EVIDENCE FROM INDIA FROM A GOVERNANCE PERSPECTIVE**

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No. 1362  
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**Abstract**

Corporate governance is vital in the effective implementation of domestic and foreign economic policies. In this context, this study examines the role of political connections in the Indian context to understand their impact on firms' productivity and technology transfer. We ask the following research questions: First, what is the nature of the relationship between political connection and productivity, and does this relationship explain firms' productivity and innovation efforts? Second, do political connections explain the extent of technology transfer through backward, forward, and horizontal technology spillovers? The study uses hand-picked data on political donations made by Indian firms to contribute to the political connections literature in the emerging markets context. It is the first to study technology transfer and political connections explicitly. The political donations also reveal that there are strong and weak political connections in India depending on whether a firm donates to a single party or to parties. The empirical inference is that politically connected firms experience negative effects on their total factor productivity and research and development expenditure from their political connections. The negative impact implies that a political connection is a non-productive resource for the firm's productivity and innovation. However, for strongly politically connected firms only we find a positive backward spillover effect, suggesting a need to improve corporate governance regulations. Overall, the study offers new insights into corporate governance and technology transfer.

**Keywords:** political connections, horizontal spillover, technology transfer, multinational firms, total factor productivity, productivity spillover

**JEL Classification:** D72, O14, O47, F23, C23

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# 1. INTRODUCTION

Firms compete to acquire new resources to sustain their competitiveness. One of the critical resources is technology—an essential resource for better productivity and competitiveness. The catching-up process has made technology transfer one of the frontier research areas in developing countries, where firms compete to get new technology through foreign collaborations, acquisitions, innovation systems in universities, and academia. Studies have examined three dimensions so far when it comes to technology transfer. *First*, they have considered how technology transfer from developed countries has boosted domestic firms' productivity and expansion in developing economies. In this regard, Lin, Qin, and Xie (2021) examine the high-speed railway in the People's Republic of China (PRC). *Second*, they have looked at how governments have promoted the internationalization of firms through market exploration and technology acquisition, which has increased local firms' productivity and follow-up innovation. Zhang, Zhang, and Huang (2020) examine the internationalization of firms in the PRC. The *third* dimension is the way in which large firms acquire small firms for better technology and competitiveness (Garcia-Quevedo, Mas-Verdu, and Montolio 2013). These dimensions have one thing in common: technology transfer positively affects the innovation eco-system and productivity of local firms, enhancing the competitiveness of the firms and the economy. Theoretically, technology transfer may help firms sustain their competitive advantage and may act as a rare and non-substitutable resource, which is a similar idea to the Resource-Based View (RBV) of Barney (1991). The terms "knowledge spillover" and "technology spillover" have been used interchangeably in the literature that focuses on the endogenous growth capabilities of an economy. Economic liberalization has made technology and knowledge sharing easier at the inter-industry and intra-industry levels. Technology spillover emanates from multinational enterprises (MNEs) to their local affiliates and overseas subsidiaries and then to local firms (Urata and Kawai 2000). The 1960s and 1980s saw the emergence of theories linked to knowledge spillover and how knowledge transfer between firms ensures better growth, innovation, and productivity (Jacob 1969; Romer 1987).

While there is a growing body of literature on knowledge acquisition and technology transfer, the dimensions of corporate governance and the interdependence between local firms and politicians remain unexplored. These dimensions directly affect whether foreign firms have better research and development spillovers than local firms. The debate about knowledge transfers between foreign and local firms is not new. Over the years, it has become more relevant because of the opening-up of the markets for foreign firms in emerging economies. Knowledge spillover is a general phenomenon for MNEs because of their size and market operations. Forward and backward spillovers are another common feature of MNEs. One of the critical questions is how the total factor productivity (TFP) of foreign and local firms is impacted by knowledge spillover, especially when the institutional dimension, such as firms' political connections, is added. This study is a new contribution to the Indian context. Its main aim is to examine whether political connections spur productivity and technology transfer. By technology transfer, we imply research and development (R&D) spillover in the presence of MNEs, and focus on the horizontal, forward, and backward spillovers between foreign and domestic industries. Our approach examines how the TFP of sectors that are open to foreign firms and have many politically connected firms is impacted by technology transfer/spillover. In the literature, MNEs determine the knowledge spillover that helps augment TFP through horizontal spillovers (within the same industry), forward spillovers (MNEs selling to domestic industries), and backward

spillovers (MNEs buying from domestic industries) (Bournakis 2021). Through these spillover processes, the common understanding is that investigation is needed into whether institutional factors play a role, and especially into what happens to these spillovers when the country does not perform well on corporate governance and ease of doing business parameters (Coe and Helpman 1995; Coe, Helpman, and Hoffmaister 2009; Malerba, Mancusi, and Montobbio 2013). In other words, does weak governance impact the knowledge spillover that benefits the TFP of domestic and foreign firms? We measure weak governance through a political variable to answer this question. We argue that politically connected firms (PCFs) use their political connections as a scarce and non-imitable resource to seek favorable technology transfer. Political connections can help local firms seek direct technology transfer through the following channels. *First*, PCFs may seek the withdrawal of certain norms to ease technology transfer through direct transfer or foreign collaboration. *Second*, PCFs may seek financing benefits to acquire new technology, set up operations, or buy patents. *Third*, PCFs may acquire smaller firms and seek help through rent-seeking activities. These dimensions seem critical in developing/emerging economies struggling with various socio-economic and governance parameters.

As an emerging economy, India has been making efforts to make its local firms globally competitive through easing technology transfer. However, over the years, the political space has given more opportunities to some firms and not to others. The consecutive governments in India have devised new norms and laws that assist firms with certain political or ideological affiliations to compete in the international market or seek technology transfer. This study uses unique and hand-picked data on Indian firms based on their corporate donations and whether they have politicians and retired bureaucrats as their board members to define PCFs. Chahal and Ahmad (2020) examine the impact of firms' political connections on investment inefficiency during the recent banking sector upheavals. The study mainly examines how PCFs enjoyed rent-seeking opportunities in seeking extra benefits from banks, which later turned into a twin-balance sheet (TBS) crisis. Some other studies have also used board data to identify political connections and their impact on firms' investment and performance (Komera and Tiwari 2021; Ganguly, Mishra, and Parikh 2022).

An overview suggests that corporate–political connections are well-known in many countries (Faccio 2006). Lack of institutional independence and opacity of regulation have made corporate–political connections one of the frontier research areas in emerging economies. Some of the crucial studies have covered developed and developing economies. For instance, the studies of Fisman (2001), Johnson and Mitton (2003), Cooper, Gulen, and Ovtchinnikov (2010), and Cingano and Pinotti (2013) examine the role of politically connected firms in Indonesia, Malaysia, the US, and Italy, respectively. The political connections literature in the PRC is growing and has added several dimensions, such as: political connections and corporate financing (Li et al. 2008); corporate governance (Fan, Wong, and Zhang 2007); and export performance (Sharma, Cheng, and Leung 2020). However, imperfect market support institutions are common in developing economies, with continuous government interventions. These connections provide a competitive advantage to some firms over others in the form of easy access to credit (Dinç 2005; Khwaja and Mian 2005), access to favorable institutional benefits (Hillman 2005), and innovation benefits (Tsai, Zhang, and Zhao 2019). Further, firms' innovation performance and investment in R&D also depend strongly on their ability or opportunities to gain funding.

## 2. RELATED LITERATURE

It is apparent from the above discussion that technology transfer has a positive impact on firms' growth and competitiveness in developing countries. However, a significant factor of variation in countries' incomes is their firms' productivity, for which technology is an important determinant (Fagerberg 1994). A firm's competitiveness can be enhanced by efficiently creating and utilizing knowledge (Lahiri and Narayanan 2013). Two different schools of thought exist on firms' productivity advantage: the factor reallocation and the innovation-based endogenous growth models. The former emphasizes the substitution of resources from less productive to more productive firms (Bartelsman and Doms 2000; Foster, Haltiwanger, and Krizan 2001), whereas the latter asserts that new innovative entrants can replace unproductive incumbents (Aghion and Howitt 1990; Grossman and Helpman 1991) as a key factor for economic growth. Thus, these studies indicate that, for a firm to become a market leader and rule the market, it must focus on innovating the most advanced product or production technology and then replacing the existing leader. However, the reality lies beyond that, especially in developing economies with weak market institutions. The growing literature indicates that the quality of a state's institutions can strongly affect technology transfer, especially in host countries. Hochman et al. (2020) find that political connections impact domestic sales, and that the impact is different for more productive firms. Diwan, Keefer, and Schiffbauer (2015) also find that political connections create inefficiencies concerning employment growth, and encourage inefficient firms. However, firms with high TFP are not impacted by their corporate–political connections, indicating that competitive firms do not pay attention to political affiliation (Harris, Hashimzade, and Ding 2016).

According to Fagerberg and Verspagen (2002), “technological catch-up is not a question of replacing an outdated technological set up with a more modern one, but continually transforming technological, economic and institutional structures.” Institutional gaps between countries significantly shape the intensity and technological patterns of innovation (Barbosa and Faria 2011). Focusing specifically on technology transfer, Lin, Qin, and Xie (2021) examine the spillover effect of technology transfer on local firms and localized innovation systems by considering foreign technology transfer in the PRC. Their study examines the case of high-speed rail in the PRC. Feng et al. (2019) discuss the way in which globalization impacts the innovation capabilities of Chinese firms. They find that globalization has helped to improve the innovation eco-systems of Chinese firms. Song, Ai, and Li (2015) examine the role of political connections in the innovation efficiency of Chinese companies, and find that enterprises with political connections face fewer financing constraints than those without. Gutiérrez and Philippon (2016) find that the political economy has an influence on business dynamism. Their study uses a political support model and argues that European institutions are more independent than their American counterparts. The study also highlights the high expenditure of American firms on lobbying to increase their market power by influencing policies.

Similarly, Tsai, Zhang, and Zhao (2019) show how politically connected firms enjoy higher innovation benefits through two mechanisms, higher government subsidies and more intellectual capital.



Thus, the present study contributes to two different strands of literature: the implications of corporate–political connections and the business dynamism of market power. Coe, Helpman, and Hoffmaister (2009) find that domestic and foreign capital stocks have a role in influencing TFP even after controlling for human capital and institutional differences.

Technology transfer requires developing countries to have considerable technological capabilities for technology imitation and spillover benefits (Lall 1992; Kumar, Kumar, and Persaud 1999; Fu, Pietrobelli, and Soete 2011). Thus, the conditions of technological innovations, institutions, and human capital are essential for economic growth in globalization. Osabutey and Croucher (2018) show that intermediate institutions (human resource-linked skills) have a role in technology transfer in Ghana's construction sector. Strong intermediate institutions (senior managers, professionals, and lobbying associations) can improve technology transfers in the country. As mentioned above, MNEs facilitate horizontal, forward, and backward spillovers. Bournakis (2021) reports evidence of horizontal spillovers in European countries. The way in which political connections affect horizontal spillovers and the transfer of technology from foreign to local firms has not yet been explored in the case of emerging markets.

In the light of the above studies and the dimensions discussed above, we want to answer the following research questions: *First*, what is the impact of political connections on firms' total factor productivity and R&D spillovers? *Second*, to what extent do firms' political connections determine their R&D spillovers? *Third*, what is the role of political connections in determining technology transfer between foreign and domestic firms?

### 3. DATA

The analysis is based on four different sources of data: corporate–political donations data from the Election Commission of India (ECI) for 2003–2016; firm-level data from DataStream; production function inputs including raw material, labor, and capital from the Center for Monitoring Indian Economy (CMIE) Prowess; and input–output data from the Organisation for Economic Co-operation and Development (OECD) database. The sample firms used in this study comprise the Standard and Poor's Bombay Stock Exchange (S&P-BSE) 500 index constituent firms. Our sample excludes financial firms, to avoid bias in our results, so we consider 422 firms for analysis. The sample consists of large, middle-sized, and small firms, which allows us to conduct robust analysis. We use panel data for firm-years, with 422 firms and 14 years of data (2003–2016, as mentioned above), giving 5,908 firm-year observations. Some variables are missing for certain firms; thus, we have an unbalanced panel (see Table A1 for the summary statistics). We can see that, because data are unavailable for some variables, especially R&D, there is a discrepancy in the number of observations in the subsequent empirical results. Further, the study includes 25 sectors in total and data covering 14 years, indicating that we have 350 sector-year observations. Table 1 shows the composition of the sample into domestic firms and MNEs across various sectors.

**Table 1: Distribution of Domestic and Foreign Firms**

Sectors	Domestic	Foreign	Sample	Foreign Share (%)
Aerospace and Defense	4	0	4	0.000
Automobile and Parts	19	4	23	17.391
Chemical	38	3	41	7.317
Construction and Materials	38	5	43	11.628
Electricity Generation and Equipment	23	1	24	4.167
Fixed Line Telecommunications	4	0	4	0.000
Food Producers	16	1	17	5.882
Forest and Paper	3	0	3	0.000
Gas, Water and Multiutilities	4	0	4	0.000
Gems and Jewelry	1	0	1	0.000
General Industries	11	2	13	15.385
General Retailers	10	0	10	0.000
Household Goods and Home Construction	10	1	11	9.091
Industrial Engineering and Mining	42	4	46	8.696
Industrial Transportation	13	1	14	7.143
Travel and Leisure Goods	14	0	14	0.000
Media	9	0	9	0.000
Oil Equipment and Services	8	0	8	0.000
Personal Goods	18	5	23	21.739
Pharmaceuticals and Biotech	45	5	50	10.000
Software and Computer Services	26	1	27	0.037
Support Services	8	0	8	0.000
Technology Hardware and Equipment	5	2	7	28.571
Tobacco	3	0	3	0.000
Unclassified	10	1	11	10.000
Total	382	36	417	8.633

Note: These sectors follow the DataStream (Refinitiv) classification.

### 3.1 Identifying Political Connections

The literature broadly divides corporate–political connections into two different channels. *First*, there may be politicians on the board of directors (BOD) of the firm, including directors and chairpersons; the chief executive officer (CEO), senior officials, company secretary, and shareholders with holdings of more than 10% may also be politicians (Faccio 2006). *Second*, firms form connections by donating to political parties (Jayachandran 2006; Cooper, Gulen, and Ovtchinnikov 2010; Aggarwal, Meschke, and Wang 2012). We construct the variable for politically connected firms based on both forms of corporate–political connection to avoid any bias in the analysis. To find the politicians on board, the name of all the members of parliament (MPs) of India since 1952 was taken from their website and the first, middle and last names of the MPs were matched with the BOD members of the sample firms. However, we observed a limited number of firms with political connections using the variable for politicians being involved in the company, so we overlapped the data with data for whether the firms made political donations. Following Chahal and Ahmad (2020), we define a firm as politically connected if it donates to one of the National Political

Parties.<sup>1</sup> The binary variable of political connections based on politicians may need special attention before using the findings for policy decisions.

However, according to a report of the Association for Democratic Reforms (ADR 2013–14), around 75% of campaign donations in India are from unknown sources. It would not be easy to know whether the sample firms are donating to political parties. Thus, this limits us from using the firm donation data and the year of donation. This forces us to define a broad definition for having a corporate political connection. Following Chahal and Ahmad (2020), we define a variable POL, which takes the value 1 if the firm or any of its subsidiaries donated at least once to a national party (BJP or INC) in any year, and 0 otherwise. This method provides a measure for the effect of a persistent corporate–political connection. The study further uses the variable DPOL, which stands for dynamic corporate–political connections, for the robustness of our results. DPOL takes the value 1 if the firm donates to any political party in a particular year, 0 otherwise.

Further, we measure the strength of these corporate–political connections. When matching the contributors' data to political parties, we find that some firms contributed to both major national parties and hedged against them losing. From 2003 to 2016, power changed twice between the two major parties (the BJP and the INC). Thus, we define a strongly connected firm (represented by POL\_BOTH) as one that donates or remains connected to both major political parties, whereas a firm donating to a single party is weakly connected (represented by POL\_ONE). The persistent and dynamic definitions are further defined accordingly. Table 2 exhibits the sample's composition based on the strength of the firms' connections, and shows an almost equivalent distribution (as per mean) of strong and weakly connected firms, which minimizes the sample bias. A sectoral distribution of political connections is also shown in Table A2 to further indicate the sample balance which is not biased to a specific sector.

**Table 2: Descriptive Statistics of Strong and Weak Corporate–Political Connections**

Variable	Obs.	Mean	Std. Dev.	Min	Max
POL	5,838	0.2973	0.4571	0	1
POL_ONE	5,838	0.1318	0.3384	0	1
POL_BOTH	5,838	0.1655	0.3716	0	1

Note: POL represents persistent corporate–political connections, POL\_ONE represents weakly connected firms, and POL\_BOTH represents strongly connected firms. Table A1 (Appendix) shows the list of variables and their statistics.

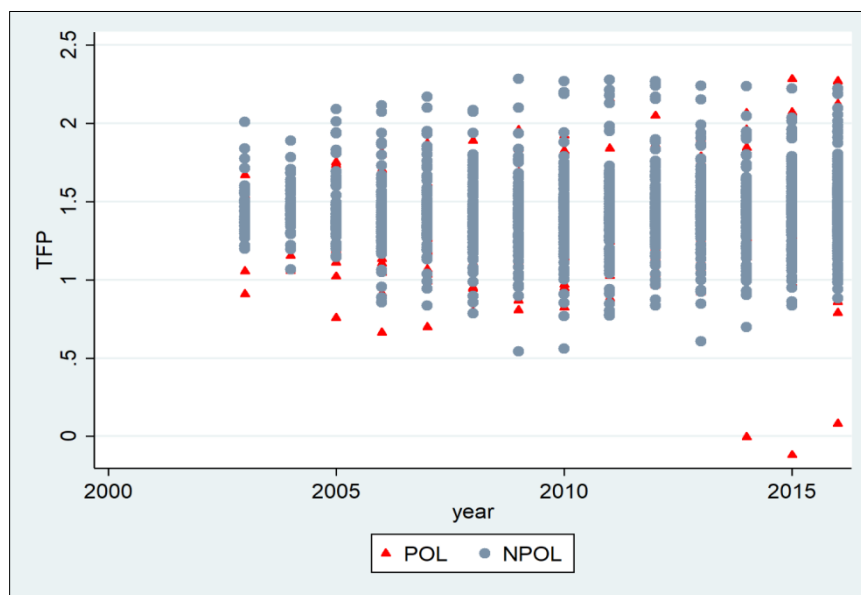
### 3.2 Total Factor Productivity

We follow the procedure of Akerberg, Caves, and Frazer (2015) to calculate the TFP. Their study uses capital and labor as less restrictive inputs, allowing them to have a dynamic role in productivity. The model represents revenue TFP, which we use in our analysis. Figure 1 shows the TFP among the politically connected and politically non-connected firms during the sample period. The factor productivity of the politically

<sup>1</sup> According to the ECI, there are seven National Political Parties in India: Indian National Congress (INC), Bharatiya Janata Party (BJP), Bahujan Samaj Party (BSP), Communist Party of India (CPI), Communist Party of India (Marxist) (CPI (M)), All India Trinamool Congress (TMC), and Nationalist Congress Party (NCP). Among these, only the INC (centre-left) and the BJP (rightist-nationalist) have been in power in the central or national government. Thus, to avoid measurement error and further compelled by the data availability we define corporate political connections on the basis of a firm's donations to either of these two major parties.

connected firms is very dynamic, as it is too high and too low. The empirical analysis in the subsequent sections will show the effect of these connections on TFP.

**Figure 1: Dynamics of Total Factor Productivity (TFP) for Politically Connected and Non-connected Firms**



### 3.3 Technology

There are domestic and imported technological components in a firm's technology endowment for its production function. However, as we are working on results for a developing economy, we can still use the firms' overall technology endowment, on the assumption that developing countries make a small contribution to the production of global knowledge stock (Lall 2000). Thus, we use firm's real R&D expenditure, representing their investment in technology each year (RNDV).

### 3.4 Technology Transfer

The technology transfer literature identifies various channels through which technology is transferred. These include *foreign direct investment (FDI) spillovers* (Hale and Long (2011), *disembodied R&D spillovers* like international patenting, the diffusion of knowledge through international trade, mainly imports, as highlighted by Coe and Helpman (1995); Xu and Wang (1999); Coe, Helpman, and Hoffmaister (2009); Henry, Kneller, and Milner (2009); and *knowledge spillovers* through the presence of MNEs in the country, especially in developing countries (Feinberg and Majumdar 2001; Bournakis 2021). The presence of MNEs in today's globalized world is expected to have a significant effect on the TFP of domestic firms in developing economies like India. Thus, following the recent study by Bournakis (2021), we estimate *horizontal*, *forward*, and *backward spillovers* among the industries that are open to foreign investment. In India, most large firms are government undertakings, and these firms enjoy greater market control and have limited foreign investment because of regulation. MNEs are expected to create knowledge spillovers through the latest technologies, advanced managerial skills, and sophisticated distribution networks, which further affect the TFP of domestic firms. This additionally signifies that institutions have a role

when estimating the effect of MNEs on domestic firms or considering whether MNEs benefit only a few politically connected firms. MNEs can provide *horizontal* spillovers, that is, spillovers within the same industry, *forward* spillovers, when they act as input sellers to downstream industries, and *backward* spillovers, when they act as input purchasers in upstream industries. These indices are constructed as follows:

*Horizontal (H):*

$$H_{jt} = \frac{\sum_{F \in j} S_{Fjt}}{\sum_{i \in j} S_{ijt}}$$

where  $S$  is the sales revenue of MNEs (or foreign enterprises (F)) in industry  $j$  in year  $t$ .  $t$  ranges from 2003 to 2016 and  $i$  represents the firms in industry  $j$ .

*Forward (F):*

$$F_{jt} = \sum_{j \neq h}^{j-1} \theta_{jh} H_{jt}$$

where  $\theta_{jh}$  is estimated from the coefficient of an input–output matrix for India that captures the amount of intermediate output from the upstream industry  $h$  used in industry  $j$  to produce one unit of output.

*Backward (B):*

$$B_{jt} = \sum_{j \neq w}^{j-1} \theta_{jw} H_{jt}$$

where  $\theta_{jw}$  is estimated from the coefficient of an input–output matrix which captures the amount of intermediate output supplied by the upstream industry  $j$  and used by the downstream industry  $w$  to produce one unit of output. Our analysis uses the sample of S&P BSE500 firms that involves a mix of industries and not a single-digit or unit of industry.

## 4. EMPIRICAL DESIGN AND RESULTS

The study first calculates the effect of political connections ( $POL_i$ ) and the technology investment of firms on their TFP with the following respective specifications:

$$TFP_{ijt} = \gamma_0 + \gamma_1 RNDV_{ijt} + \gamma_2 POL_{ij} + X'_{ijt} \Gamma + \pi_i + \delta_j + \mu_t + \varepsilon_{ijt} \quad (1)$$

$$TFP_{ijt} = \gamma_0 + \gamma_1 RNDV_{ijt} + \gamma_2 POL_{ij} + \gamma_3 POL_{ij} \times RNDV_{ijt} + X'_{ijt} \Gamma + \pi_i + \delta_j + \mu_t + \varepsilon_{ijt} \quad (2)$$

where  $TFP_{ijt}$  represents the logarithm of the total factor productivity for firm  $i$  operating in industry  $j$  at time  $t$ .  $POL_{ij}$  measures the political connection of firm  $i$  operating in industry  $j$ .  $RNDV_{ijt}$  measures the logarithm of real R&D expenditure, measured by dividing R&D expenditure by the gross domestic product (GDP) deflator.  $X'_{ijt}$  is a matrix of all firm-level controls including board characteristics and firm characteristics (size and debt situation). Table A1 in the Appendix shows the list of variables.  $\pi_i$

measures the firm fixed effects,  $\delta_j$  measures the industry fixed effects,  $\mu_t$  measures the year effects, and  $\varepsilon_{ijt}$  is the error term. Firm and industry fixed effects further help to resolve the endogeneity issue, as more productive firms and industries tend to have higher R&D investment and thus attract lower political involvement. For strength analysis, the study also replaces  $POL_{ij}$  with  $POL\_ONE_{ij}$  and  $POL\_BOTH_{ij}$  in Equation 2 to estimate the impact of the strength of corporate–political connections on the firm’s TFP.

#### 4.1 Overall Analysis

We measure the effect of political connections on the total factor productivity of firms using the Generalized Method of Moments (GMM) to address the bias due to omitted variables and the heteroscedasticity issues that may arise from the firm-level characteristics in the model. The seminal paper of Hansen (1982) made the GMM estimation popular in economics, especially in Instrumental Variable (IV) estimations. In our analysis, we further use an IV for  $POL\_BOTH$  ( $DPOL\_BOTH$ ) to improve our estimation efficiency.  $DPOL\_BOTH$  represents strong and dynamic political connections, where a firm is declared to be strongly politically connected if it has donated to both parties (the BJP and the INC) in a particular year. It is expected that there exists a key relationship between strong persistent connections ( $POL\_BOTH$ ) and strong dynamic connections ( $DPOL\_BOTH$ ) and the sectors with the highest connections (Forest and Paper and Construction and Materials).

Table 3 shows the GMM results. We find that political connection has both negative and positive effects on the total factor productivity, but only the coefficient with a negative sign is statistically significant. Model 1 shows the inverse relationship between political connections and firms’ total factor productivity. Thus, we do not find a significant impact of the strength of political connections on the firm’s productivity with either weak ( $POL\_ONE$ ) or strong ( $POL\_BOTH$ ) political connections, as the coefficients are statistically insignificant. Based on the significance of the results, we can say that political connections have an inverse impact on total factor productivity. We will outline the implications later. However, when we interact the weak and strong political connections with the R&D expenditure variable, the estimated coefficients exhibit a negative and statistically significant relationship that implies that political connections reduce firms’ productivity and decrease their R&D expenditure. These results suggest that political connections do not augment productivity, and that they harm the R&D efforts of firms. Although the body of research suggests that there is a positive impact of political connections on firm performance, our findings do not support this and instead provide a new framework to understand the relationship between political connections and firms’ productivity.

Overall, political connections do not play a significant role in a firm’s productivity. However, the findings need further examination using different measures for political connections. Still, our binary variable based on political donations reveals the significant role of political connections in total factor productivity and R&D expenditure. The empirical findings support the results of Coe, Helpman, and Hoffmaister (2009). Their study shows that firms operating in countries with a low ease of doing business benefit less from their R&D efforts than firms operating in countries with a high ease of doing business. We find that R&D expenditure positively drives the productivity of firms.

For India, the empirical analysis supports the findings of Chahal and Ahmad (2020), who show there is a significant role of political connections in the inefficiency of the banking sector.

**Table 3: Research and Development, Political Connections and Total Factor Productivity: Generalized Method of Moments Analysis**

TFP	Model 1	Model 2	Model 3
POL	−0.0536** (0.0217)	0.0361 (0.0598)	
POL*RNDV		−0.0164* (0.0086)	
POL_ONE			0.0737 (0.112)
POL_BOTH			0.0621 (0.0580)
POL_ONE*RNDV			−0.0187 (0.0135)
POL_BOTH*RNDV			−0.0213** (0.0087)
RNDV	0.0025 (0.0039)	0.0082# (0.0053)	0.0089* (0.0047)
<i>Firm Attributes</i>			
Foreign	0.0126 (0.0138)	0.0061 (0.0130)	0.0066 (0.0130)
Board Size	−0.0378*** (0.0135)	−0.0408*** (0.0135)	−0.0418*** (0.0138)
Debt	0.0120 (0.0150)	0.0116 (0.0150)	0.0101 (0.0147)
Size	−0.0228 (0.0178)	−0.0209 (0.0171)	−0.0196 (0.0173)
Constant	1.444*** (0.0273)	1.412*** (0.0344)	1.408*** (0.0314)
Observations	1,014	1,014	1,014
Instrumented	POL	POL	POL_BOTH
Instruments	DPOL, Sectoral effect of Forest and Paper and Construction and Materials, respectively.	DPOL, Sectoral effect of Forest and Paper and Construction and Materials, respectively.	DPOL_BOTH, Sectoral effect of Forest and Paper and Construction and Materials, respectively.
Hansen's J statistic	0.3861	0.7842	0.7685

Notes: Heteroscedasticity corrected robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, #p<0.15. Hansen's test is a test for overidentifying restrictions. The statistical values remain insignificant at the 0.05 level of significance. Sectoral dummies are added for sectors with the highest average political connections. *POL* represents a dummy variable taking the value 1 if a firm has donated at least once to any of the two major political parties (BJP and INC) and 0 otherwise. *RNDV* is the research and development (R&D) expenditure valued at purchasing power parity to avoid price effects. Following Coe, Helpman, and Hoffmaister (2009) we divide the R&D by the GDP deflator to estimate the real value. Further we take the logarithm of the variable. *POL\_ONE* is the dummy variable taking the value 1 if firm has donated at least once to one of the two major political parties (BJP and INC) and 0 otherwise. They are further termed as weakly connected firms. *POL\_BOTH* is a dummy variable taking the value 1 if a firm has donated at least once to both the political parties (BJP and INC) and 0 otherwise. They are further termed as strongly connected firms. Further, we added interaction variables i.e., *POL\*RNDV* representing those firms with political connections are undertaking R&D efforts. *POL\_ONE\*RNDV* indicates interaction variable of a firm that has weak political connections and undertakes R&D efforts. *POL\_BOTH\*RNDV* represents interaction variable of firms that has strong political connections and undertakes R&D efforts.

## 5. POLITICAL CONNECTIONS AND TECHNOLOGY TRANSFER

We include horizontal, forward, and backward spillovers arising from the presence of MNEs in the TFP of domestic firms. Table 4 shows the results. We find that the coefficient of horizontal spillovers is not statistically significant and the same is true with the coefficients of the interaction variable with both forms of political connection (weak and strong). The backward spillover has a negative impact on the TFP, implying that the presence of MNEs and their technology transfer does not create enough downstream opportunities for domestic firms. The interaction coefficients for backward spillovers and political connections (weak and strong) show mixed results. Firms with strong political connections appear to have a stronger backward spillover effect, with a positive coefficient sign. Economically, the coefficient ( $B_{jt} * POL\_BOTH = 0.192$ ) is interpreted as meaning that a 10% increase in the number of MNEs in downstream industries results in the TFP of strongly connected domestic firms in upstream industries increasing by 1.92%. A significant source of learning is backward spillovers from MNE buyers (downstream industries), which exhibit a positive relationship only for strongly connected firms while remaining significantly negative for weakly connected firms. Backward (vertical) spillovers are possible when MNEs buy from domestic firms. This is inter-industry spillover, as MNEs buy from domestic firms, and the knowledge transfer happens through stringent purchase agreements and the quality of delivery by the domestic firms. For domestic firms, backward spillover creates opportunities, and knowledge spillover directly impacts the TFP and technology transfer. In other words, there are linkages of MNEs with domestic firms in different industries. These results suggest that political connections play a role in the seeking of backward spillover advantage, and highlight the weak governance structure in India. Forward spillovers from MNE suppliers are significantly negative for strongly connected domestic firms. It should be noted that forward spillovers depend on the number of domestic firms purchasing inputs from MNE suppliers (upstream industries). The result implies that the fair-trade practices of MNEs discourage politically connected firms from seeking advantage, and, instead, have negative impacts. Another possible explanation is that the stringent regulatory norms followed by MNEs in their respective countries limit the visible role of political connections. In the Indian context, Kathuria (1998) confirms the role of MNEs in technology transfer and productivity diffusion. Iyer (2009) also finds evidence of export spillovers from forward and backward spillovers with MNEs. However, from a technology transfer perspective, these results are important because they exhibit the role of institutions in synthesizing the benefits of MNEs in a weak institutional environment like that of India.

**Table 4: Horizontal, Forward, Backward Spillovers and Political Connections: Generalized Method of Moments Analysis**

TFP	Model 1	Model 2	Model 3
$H_{jt}$	0.0962 (0.0893)		
$H_{jt} * POL\_ONE$	-0.258 (0.207)		
$H_{jt} * POL\_BOTH$	0.188 (0.206)		
$B_{jt}$		-0.0722*** (0.0191)	

*continued on next page*



Table 4 continued

TFP	Model 1	Model 2	Model 3
$B_{jt} * POL\_ONE$		-0.0575* (0.0353)	
$B_{jt} * POL\_BOTH$		0.192*** (0.0447)	
$F_{jt}$			0.2752 (0.8465)
$F_{jt} * POL\_ONE$			-0.0131 (0.269)
$F_{jt} * POL\_BOTH$			-0.566*** (0.165)
POL_ONE	-0.0040 (0.0294)	-0.0117 (0.0212)	-0.0440** (0.0192)
POL_BOTH	-0.0786*** (0.0266)	-0.0969*** (0.0227)	-0.0843*** (0.0237)
<i>Firm Attributes</i>			
Board Size	-0.0358*** (0.0105)	-0.0417*** (0.0104)	-0.0269** (0.0108)
Debt	-0.0113 (0.0119)	-0.0128 (0.0119)	-0.0077 (0.0120)
Size	-0.0357*** (0.0118)	-0.0395*** (0.0119)	-0.0297** (0.0123)
CR	-0.0029* (0.0014)	-0.0018 (0.0015)	-0.0009 (0.0017)
R	0.0024 (0.0113)	0.00143 (0.0110)	0.0001 (0.0112)
Constant	1.494*** (0.0198)	1.517*** (0.0159)	1.494*** (0.0171)
Observations	1,948	1,948	1,948
Instrumented	POL_BOTH	POL_BOTH	POL_BOTH
Instruments	DPOL_BOTH, Sectoral effect of Forest and Paper and Construction and Materials, respectively.	DPOL_BOTH, Sectoral effect of Forest and Paper and Construction and Materials, respectively.	DPOL_BOTH, Sectoral effect of Forest and Paper and Construction and Materials, respectively.
Hansen's J statistics	0.156	2.319	3.523

Notes: Heteroscedasticity corrected robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, #p<0.15. We also included industry-year effects in the analysis. *POL\_ONE* is the dummy variable taking the value 1 if firm has donated at least once to one of the two major political parties (BJP and INC) and 0 otherwise. They are further termed as weakly connected firms. *POL\_BOTH* is the dummy variable taking the value 1 if a firm has donated at least once to both the political parties (BJP and INC) and 0 otherwise. They are further termed as strongly connected firms.  $H_{jt}$  is the index of horizontal spillovers which is the ratio of the sales revenue of MNEs in industry  $j$  at year  $t$  to the total sales revenue of all the firms in the industry at time  $t$ .  $H_{jt} * POL\_ONE$  is the interaction variable which shows the effect of firms' weak political connections on horizontal spillovers from MNEs' in industry  $j$  at year  $t$ .  $H_{jt} * POL\_BOTH$  is the interaction variable which shows the effect of firms' strong political connections on horizontal spillovers from MNEs' in industry  $j$  at year  $t$ .  $F_{jt}$  is the index of forward spillovers estimated from MNEs in the upstream industries supplying inputs to domestic firms. It is the summation of the interaction input-output matrix coefficient ( $\theta_{jh}$ ) with the horizontal spillover ( $H_{jt}$ ).  $\theta_{jh}$  is the input-output matrix coefficient that shows the amount of input from upstream industry  $h$  used to produce one unit of output by industry  $j$ .  $F_{jt} * POL\_ONE$  is the interaction variable which shows the role of firms' weak political connections on forward spillovers from MNEs' in industry  $j$  at time  $t$ .  $F_{jt} * POL\_BOTH$  is the interaction variable which shows the role of firms' strong political connections on forward spillovers from MNEs' in industry  $j$  at time  $t$ .  $B_{jt}$  is the index of backward spillovers estimated from MNEs located in downstream industries that are buying inputs from domestic firms. It is the summation of the interaction input-output matrix coefficient ( $\theta_{jw}$ ) with the horizontal spillover ( $H_{wt}$ ).  $\theta_{jw}$  is the input-output matrix coefficient that shows the amount of intermediate output used from industry  $j$  to produce one unit of output in downstream industry  $w$ .  $B_{jt} * POL\_ONE$  is the interaction variable which shows the role of firms' weak political connections on backward spillovers from MNEs' in industry  $j$  at time  $t$ .  $B_{jt} * POL\_BOTH$  is the interaction variable which shows the role of firms' strong political connections on backward spillovers from MNEs' in industry  $j$  at time  $t$ . DPOL\_BOTH (dynamic corporate-political connections with both the major national parties), a dummy variable taking the value 1 if a firm has donated to both the political parties (BJP and INC) in a particular year and 0 otherwise. It is used as an IV for the *POL\_BOTH* variable. *CR* represents the industry concentration ratio measured for each industry and each year for the S&P BSE500 following Herfindahl-Hirschman index. *R* represents the dummy variable taking the value 1 if the firm contributes to R&D expenditure and 0 otherwise. Hansen's test is a test for overidentifying restrictions. The statistical values remain insignificant at the 0.05 level of significance. Sectoral dummies are added for sectors with the highest average political connections.

## 5.1 Small and Large Firms

In this subsection, we further explore the results shown in Table 4 by dividing the firms into small and large firms (based on their leverage) and introducing the interaction terms for all the spillover variables using the GMM approach; the results are shown in Table 5. Table 5 shows that the effect of horizontal, forward, and backward spillovers remains similar to the effects displayed in Table 4, primarily through strong political connections, but that it differs with the firm's size. We find that small firms with strong political connections enjoy more positive and significant horizontal spillovers than large firms.

However, backward spillovers remain significant and positive for firms with strong political connections, irrespective of their size, whereas forward spillovers remain negative for strongly connected large firms. Thus, the firm's size affects its TFP through spillovers from strong political connections. The results for backward spillovers for weakly connected firms remain weak, indicating a negative effect of these connections on the TFP of weakly connected firms compared to firms with strong connections. The empirical findings for backward spillovers suggest that the weak governance structure, without regulatory checks and balances, allows politically connected firms to gain an advantage.

**Table 5: Horizontal, Forward, Backward Spillovers and Political Connections: Generalized Moments Method Analysis for Large and Small Firms**

TFP	Large Firms	Large Firms	Large Firms	Small Firms	Small Firms	Small Firms
$H_{jt}$	0.160 (0.146)			0.0012 (0.0992)		
$H_{jt} * POL\_ONE$	-0.298 (0.286)			-0.361 (0.311)		
$H_{jt} * POL\_BOTH$	-0.448 (0.324)			0.718*** (0.216)		
$B_{jt}$		-0.0251 (0.0332)			-0.0895*** (0.0211)	
$B_{jt} * POL\_ONE$		-0.136** (0.0558)			-0.0171 (0.0426)	
$B_{jt} * POL\_BOTH$		0.110* (0.0623)			0.296*** (0.0570)	
$F_{jt}$			0.268** (0.115)			-0.161 (0.124)
$F_{jt} * POL\_ONE$			0.199 (1.00)			0.0861 (0.160)
$F_{jt} * POL\_BOTH$			-1.131*** (0.219)			0.154 (0.249)
POL_ONE	-0.0288 (0.0350)	0.0074 (0.0341)	-0.0460 (0.0298)	0.0167 (0.0446)	0.0190 (0.0440)	-0.0374 (0.0280)
POL_BOTH	-0.0308 (0.0308)	-0.0375 (0.0331)	-0.0083 (0.0360)	-0.146*** (0.0304)	-0.158*** (0.0282)	-0.147*** (0.0278)

*continued on next page*

Table 5 continued

TFP	Large Firms	Large Firms	Large Firms	Small Firms	Small Firms	Small Firms
<i>Firm Attributes</i>						
Board Size	-0.0276 (0.0169)	-0.0360** (0.0166)	-0.0094 (0.0165)	-0.0536*** (0.0132)	-0.0467*** (0.0127)	-0.0549*** (0.0129)
Debt	-0.0419** (0.0190)	-0.0415** (0.0191)	-0.0367** (0.0187)	0.0104 (0.0149)	0.0092 (0.0148)	0.0118 (0.0150)
CR	-0.00004 (0.0022)	-0.0004 (0.0023)	0.0009 (0.0028)	-0.0060*** (0.0017)	-0.0041** (0.0019)	-0.00416** (0.0020)
R	0.0343* (0.0177)	0.0363** (0.0171)	0.0317* (0.0171)	-0.0350*** (0.0135)	-0.0302** (0.0136)	-0.0386 (0.0140)
Constant	1.436*** (0.0292)	1.449*** (0.0311)	1.421*** (0.0171)	1.554*** (0.0217)	1.556*** (0.0179)	1.557*** (0.0191)
Observations	1,012	1,012	1,012	936	936	936
Instrumented	POL_BOTH	POL_BOTH	POL_BOTH	POL_BOTH	POL_BOTH	POL_BOTH
Instruments	DPOL_BOTH, Sectoral effect of Forest and Paper sector	DPOL_BOTH, Sectoral effect of Forest and Paper sector	DPOL_BOTH, Sectoral effect of Forest and Paper sector	DPOL_BOTH, Sectoral effect of Forest and Paper sector	DPOL_BOTH, Sectoral effect of Forest and Paper sector	DPOL_BOTH, Sectoral effect of Forest and Paper sector
Hansen's J statistics	0.061	0.826	0.023	1.690	1.862	2.462

Notes: Heteroscedasticity corrected robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . *POL\_ONE* is the dummy variable taking the value 1 if firm has donated at least once to one of the two major political parties (BJP and INC) and 0 otherwise. They are further termed as weakly connected firms. *POL\_BOTH* is the dummy variable taking the value 1 if a firm has donated at least once to both the political parties (BJP and INC) and 0 otherwise. They are further termed as strongly connected firms.  $H_{jt}$  is the index of horizontal spillovers which is the ratio of the sales revenue of MNEs in industry  $j$  at year  $t$  to the total sales revenue of all the firms in the industry at time  $t$ .  $H_{jt} * POL_ONE$  is the interaction variable which shows the effect of firms' weak political connections on horizontal spillovers from MNEs' in industry  $j$  at year  $t$ .  $H_{jt} * POL_BOTH$  is the interaction variable which shows the effect of firms' strong political connections on horizontal spillovers from MNEs' in industry  $j$  at year  $t$ .  $F_{jt}$  is the index of forward spillovers estimated from MNEs in the upstream industries supplying inputs to domestic firms. It is the summation of the interaction input-output matrix coefficient ( $\theta_{jh}$ ) with the horizontal spillover ( $H_{jt}$ ).  $\theta_{jh}$  is the input-output matrix coefficient that shows the amount of input from upstream industry  $h$  used to produce one unit of output by industry  $j$ .  $F_{jt} * POL_ONE$  is the interaction variable which shows the role of firms' weak political connections on forward spillovers from MNEs' in industry  $j$  at time  $t$ .  $F_{jt} * POL_BOTH$  is the interaction variable which shows the role of firms' strong political connections on forward spillovers from MNEs' in industry  $j$  at time  $t$ .  $B_{jt}$  is the index of backward spillovers estimated from MNEs located in downstream industries that are buying inputs from domestic firms. It is the summation of the interaction input-output matrix coefficient ( $\theta_{jw}$ ) with the horizontal spillover ( $H_{wt}$ ).  $\theta_{jw}$  is the input-output matrix coefficient that shows the amount of intermediate output used from industry  $j$  to produce one unit of output in downstream industry  $w$ .  $B_{jt} * POL_ONE$  is the interaction variable which shows the role of firms' weak political connections on backward spillovers from MNEs' in industry  $j$  at time  $t$ .  $B_{jt} * POL_BOTH$  is the interaction variable which shows the role of firms' strong political connections on backward spillovers from MNEs' in industry  $j$  at time  $t$ . DPOL\_BOTH (dynamic corporate-political connections with both the major national parties), a dummy variable taking the value 1 if a firm has donated to both the political parties (BJP and INC) in a particular year and 0 otherwise. It is used as an IV for the *POL\_BOTH* variable. CR represents the industry concentration ratio measured for each industry and each year for the S&P BSE500 following Herfindahl-Hirschman index. *R* represents the dummy variable taking the value 1 if the firm contributes to R&D expenditure and 0 otherwise. Hansen's test is a test for overidentifying restrictions. The statistical values remain insignificant at the 0.05 level of significance. Sectoral dummies are added only for the Forest and Paper sector as this has the highest average political connections. The Construction and Material sector was not included in order to avoid the overidentification issue as there are fewer observations in each model.

These results further indicate that horizontal spillovers augment knowledge spillovers only for small firms. According to Newman et al. (2015), horizontal and intra-sectoral technology transfer is possible when the technology or capital is being transferred to competent firms in the same sector. In the context of small firms, horizontal spillover has two dimensions. First, small firms are often high-growth firms, and the intra-industry resource allocation in technology transfer and foreign direct investment will help small domestic firms to do better. Second, small firms rely on technical support to expand, and the efficiency of MNEs helps these firms. In the political connection

context, small firms have an advantage over large firms when seeking technology transfer benefits from MNEs.

In contrast, backward spillovers augment knowledge for both large and small firms when they have strong political connections, but the magnitude of the backward spillovers is higher for small firms than for large ones. A weak and relaxed governance structure could be one of the major reasons for the positive impact of strong political connections. High-growth firms seek higher benefits from buying and selling from MNEs. The dominance of horizontal spillover seems to be an important factor in driving the growth of small firms through backward spillover. This is a new finding and opens new avenues for studies on small firms and their technology transfer capabilities. These results suggest that technology transfer alone has a limited role in augmenting firms' productivity, and that institutions play a significant role in India. Thus, technology transfers exist, but their effect differs according to firms' connections, strength, and size.

## 6. CONCLUDING REMARKS

The political donations data allow us to understand the impact of political connections on firms' productivity, in the first stage, and then on technology transfer. To minimize possible endogeneity and other specification errors, we rely on GMM methods for the estimation. The empirical scheme suggests that political connections do not act as a rare resource as hypothesized by some management theories. Rather, political connections negatively impact the productivity of firms. This is a significant finding as it highlights the adverse impact of rent-seeking in emerging economies.

Furthermore, political connections also reduce a firm's R&D expenditure, suggesting that rent-seeking activities may not benefit strongly connected firms. This could be due to the preference for rent-seeking over technology development and transfer through R&D expenditure. For India, this is a significant empirical finding. The analysis of technology transfer based on horizontal, forward, and backward spillover measures suggests that political connections play a significant role in backward spillovers. We do not find significant evidence of horizontal and forward spillovers. The strongly politically connected firms exhibit a positive backward spillover effect, implying that they have an advantage, over firms that are not politically connected, in selling products to MNEs. This finding indicates there is a weak governance structure, and suggests the need for better regulatory checks. The most significant finding for large and small firms is the significant effect of horizontal and backward spillovers on small (high-growth) firms. The high growth attracts the intra-sectoral resource allocation that helps these firms establish backward spillover with MNEs. This finding reflects India's weak governance (institutions), in that only politically connected firms can benefit from technology spillover. There is a need to improve the governance structure to avoid the possibility of regulatory arbitrage and to limit the role of political connections. Komera and Tiwari (2021) find that political connections of firms operating in unregulated and concentrated industries have a significant role in gaining private benefits. These private benefits may also include technology transfer. Similarly, Ganguly, Mishra, and Parikh (2022) find that there are advantages for politically connected firms in lowering cash flow variations and being less dependent on internal cash for investments.

Overall, the empirical scheme of this study suggests, from the political donation data, a significant role for political connections, and the binary variable allows us to draw a picture of corporate governance in the Indian context. However, the above findings need careful analysis as the empirical evidence does not cover all the definitions of political connections used in the literature. This study covers only political donations made by firms; hence, the generalization of the above results may attract bias. However, the findings of this study may be compared with results for those economies where political donations play a critical role in creating political connections and allowing rent-seeking activities. In the case of India, the evidence is not new, as some studies have captured such trends using alternative dimensions of political nexus (Lehne, Shapiro, and Eynde 2018; Chahal and Ahmad 2020). For technology transfer, this study is a new contribution to our knowledge of India.

Despite these limitations, the study offers enormous policy implications for developing and underdeveloped countries where weak institutions cannot stop rent-seeking activities. Political connections do not create a surge in productivity, and they also reduce the long-term growth prospects by impacting the R&D expenditure. Therefore, countries should have sufficient checks and balances to avoid the corporate–political nexus playing a dominant role.

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## APPENDIX

**Table A1: Definitions of Variables and Summary Statistics**

Variables	Description	Obs.	Mean	Std. Dev.	Min	Max
TFP	Logarithm of the residual extracted from the production function estimation proposed by Akerberg, Caves, and Frazer (2015), where labor and capital remain quasi-fixed inputs. It is to be noted that the model signifies revenue.	1,972	1.4262	0.2423	-0.1196	2.2850
RNDV	Research and development (R&D) expenditure valued at purchasing power parity to avoid price effects. Following Coe, Helpman, and Hoffmaister (2009) we divide the R&D by the GDP deflator to estimate the real value. Further, we take the logarithm of this variable.	1,017	6.7827	2.1458	-1.9564	12.0313
POL	Dummy variable taking the value 1 if a firm has donated at least once to any of the two major political parties (BJP and INC) and 0 otherwise.	1,972	0.2870	0.4524	0	1
POL_ONE	Dummy variable taking the value 1 if a firm has donated at least once to just one of the two major political parties (BJP and INC) and 0 otherwise. Such firms are further termed weakly connected firms. This represents weak corporate–political connections.	1,972	0.1100	0.3130	0	1
POL_BOTH	Dummy variable taking the value 1 if a firm has donated at least once to both the political parties (BJP and INC) and 0 otherwise. This represents strong corporate–political connections.	1,972	0.1769	0.3817	0	1
POL_ONE*RNDV	Interaction variable of a firm that has weak political connections and undertakes R&D efforts.	1,017	0.6427	2.2509	0	12.0313
POL_BOTH*RNDV	Interaction variable of a firm that has strong political connections and undertakes R&D efforts.	1,972	1.0277	2.6460	0	11.6024
DPOL	Dummy variable taking the value 1 if a firm has donated to either of the two major political parties (BJP and INC) in a particular year and 0 otherwise.	1,972	0.0669	0.2499	0	1
DPOL_ONE	Dummy variable taking the value 1 if a firm has donated to a single political party (BJP and INC) in a particular year and 0 otherwise.	1,972	0.0400	0.1961	0	1
DPOL_BOTH	Dummy variable taking the value 1 if a firm has donated to both political parties (BJP or INC) in a particular year and 0 otherwise.	1,972	0.0268	0.1617	0	1
Foreign	Dummy variable taking the value 1 if the firm is foreign firm listed in S&P BSE500 and 0 otherwise.	1,972	0.1419	0.3491	0	1
Board Size	Logarithm of the total number of board members in a firm	1,972	0.5253	0.4994	0	1
Size	Dummy variable taking the value 1 if the total assets of a firm are higher than the average total assets of the sample and 0 otherwise.	1,972	0.5177	0.4998	0	1

*continued on next page*

**Table A1** *continued*

Variables	Description	Obs.	Mean	Std. Dev.	Min	Max
Debt	Dummy variable taking the value 1 if the total debt of a firm is higher than the average total debt of the sample and 0 otherwise.	1,972	0.5897	0.4920	0	1
CR	Industry concentration ratio, measured for each industry and each year for the S&P BSE500 following the Herfindahl–Hirschman index.	1,972	7.5256	3.9764	0	1
R	Dummy variable taking the value 1 if the firm contributes to R&D expenditure and 0 otherwise.	1,972	0.5654	0.4958	0	1
$H_{jt}$	Index of horizontal spillovers, which is the ratio of the sales revenue of MNEs in industry $j$ at year $t$ to the total sales revenue of all the firms in the industry at time $t$ .	1,972	0.1024	0.0724	0	0.4013
$H_{jt} * POL\_ONE$	Interaction variable which shows the effect of firms' weak political connections on horizontal spillovers from MNEs in industry $j$ at time $t$ .	1,972	0.0124	0.0420	0	0.3015
$H_{jt} * POL\_BOTH$	Interaction variable which shows the effect of firms' strong political connections on the horizontal spillovers from MNEs in industry $j$ at time $t$ .	1,972	0.0166	0.0460	0	0.4013
$F_{jt}$	Index of forward spillovers, estimated from MNEs in upstream industries supplying inputs to domestic firms. It is the summation of the interaction input–output matrix coefficient ( $\theta_{jh}$ ) with the horizontal spillover ( $H_{jt}$ ). $\theta_{jh}$ is the input–output matrix coefficient that shows the amount of input from upstream industry $h$ used to produce one unit of output by industry $j$ (Bournakis 2021).	1,972	0.0549	0.0909	0	0.2960
$F_{jt} * POL\_ONE$	Interaction variable which shows the role of firms' weak political connections on forward spillovers from MNEs in industry $j$ at time $t$ .	1,972	0.0039	0.0277	0	0.2960
$F_{jt} * POL\_BOTH$	Interaction variable which shows the effect of firms' strong political connections on the forward spillovers from MNEs in industry $j$ at time $t$ .	1,972	0.0114	0.0466	0	0.2960
$B_{jt}$	Index of backward spillovers, estimated from MNEs located in downstream industries that are buying inputs from domestic firms. It is the summation of the interaction input–output matrix coefficient ( $\theta_{jw}$ ) with the horizontal spillover ( $H_{wt}$ ). $\theta_{jw}$ is the input–output matrix coefficient that shows the amount of intermediate output used from industry $j$ to produce one unit of output in downstream industry $w$ (Bournakis 2021).	1,972	0.2549	0.3480	0	1.4093
$B_{jt} * POL\_ONE$	Interaction variable which shows the role of firms' weak political connections on backward spillovers from MNEs in industry $j$ at time $t$ .	1,972	0.0246	0.1266	0	1.2236
$B_{jt} * POL\_BOTH$	Interaction variable which shows the effect of firms' strong political connections on the backward spillovers from MNEs in industry $j$ at time $t$ .	1,972	0.0545	0.1984	0	1.4093

**Table A2: Distribution of Political Connections across Sectors**

<b>Sectors</b>	<b>Obs.</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Domestic Connected Firms</b>	<b>Foreign Connected Firms</b>
Aerospace and Defense	56	0.0000	0.0000	0	0
Automobile and Parts	322	0.3509	0.4780	8	0
Chemical	574	0.3414	0.4746	14	0
Construction and Materials	588	0.3826	0.4864	15	1
Electricity Generation and Equipment	336	0.2917	0.4552	7	0
Fixed Line Telecommunications	56	0.7500	0.4369	3	0
Food Producers	238	0.2942	0.4566	5	0
Forest and Paper	42	0.6667	0.4771	2	0
Gas, Water and Multiutilities	56	0.0000	0.0000	0	0
Gems and Jewelry	14	0.0000	0.0000	0	0
General Industries	182	0.3076	0.4628	4	0
General Retailers	140	0.0000	0.0000	0	0
Household Goods and Home Construction	154	0.2727	0.4468	3	0
Industrial Engineering and Mining	644	0.3695	0.4830	17	0
Industrial Transportation	196	0.2142	0.4113	3	0
Travel and Leisure Goods	196	0.4285	0.4961	6	0
Media	126	0.3333	0.4732	3	0
Oil Equipment and Services	112	0.0000	0.0000	0	0
Personal Goods	322	0.3043	0.4608	7	0
Pharmaceuticals and Biotech	700	0.2214	0.4155	11	1
Software and Computer Services	378	0.1851	0.3889	5	0
Support Services	112	0.2500	0.4349	2	0
Technology Hardware and Equipment	98	0.2857	0.4540	2	0
Tobacco	42	0.3333	0.4771	1	0
Unclassified	154	0.1818	0.3869	2	0

Note: These sectors follow the DataStream (Rifinitiv) classification.