Political activism and firm innovation*

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Abstract

We hypothesize that political activism is valuable because it helps reduce political uncertainty, which, in turn, fosters firm innovation. We find that firms that support more politicians, winning politicians, politicians on Congressional committees with jurisdictional authority over the firms' industries, and politicians who join those committees innovate more. We employ a natural experiment to show a causal effect of political activism on innovation. We also show evidence of intra-industry and geographical political activism spillovers.

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Abstract

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1. Introduction

A considerable body of research finds that firms are politically active and engage in building long-term connections with politicians. These connections are typically broken into explicit connections that arise when a politician joins the firm or its board of directors (or vice versa) and implicit connections that arise when a firm makes political contributions to the politician's (re)election campaign. There is also a growing consensus in the literature that political activism is valuable to shareholders of the contributing firms.[1] Although the relation between political activism and firm value appears well established, our understanding of the exact mechanisms through which political activism creates value and affects real economic outcomes is far from complete.[2] In this paper, we contribute to this literature by analyzing the effect of political activism on firm investment decisions, specifically investment in innovation.

Our analysis is motivated by a long string of theoretical work on irreversible investment under uncertainty (see, e.g., Bernanke (1983), Bertola and Caballero (1994), Abel and Eberly (1996), Hassler (1996), Caballero and Engel (1999), Bloom, Bond, and Van Reenen (2007)). One of the central tenets in these models is that when investment is at least partially irreversible, uncertainty depresses investment because uncertainty increases the value of the firms' option to wait. Importantly, the negative relation between uncertainty and investment, while present for all types of investment, should be especially strong for investment in innovation because innovation is a long-term investment (Davis (2016)), it is costly (Holmstrom (1989), Aghion and Tirole (1994)), and its cost is highly uncertain (Dixit and Pindyck (1994), Bhattacharya, et al. (2017)).

Bhattacharya, et al. (2017) show that policy uncertainty, defined as uncertainty about future government economic policy, significantly reduces firm innovation. This is consistent with the intuition that politics is important for firm innovation because political decision making significantly affects the operating environment of innovating firms. Furthermore, the negative correlation between policy uncertainty and innovation implies that firms' actions that reduce policy uncertainty should stimulate investment in innovation.

In this paper, we propose that firm political activism, defined as a strategy of making recurrent political contributions to build long-term connections with politicians, facilitates investment in innovation

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[1] For studies of explicit and implicit political connections see, e.g., Masters and Keim (1985), Zardkoohi (1985), Grier, Munger, and Roberts (1994), Kroszner and Stratmann (1998, 2005), Faccio (2006), Goldman, Rocholl, and So (2009), Cooper, Gulen and Ovtchinnikov (2010), Akey (2015). For studies documenting that political activism is valuable see, e.g., Fisman (2001), Faccio (2006), Ferguson and Voth (2008), Faccio and Parsley (2009), Goldman, Rocholl, and So (2009), Cooper, Gulen and Ovtchinnikov (2010), Ovtchinnikov and Pantaleoni (2012), Amore and Bennedsen (2013), Akey (2015). Aggarwal, Meschke and Wang (2012) and Coates (2012) present evidence that political connections may be value destroying.

[2] Previous research finds that politically connected firms enjoy preferential access to external financing (Claessens, Feijen and Laeven (2008)) and are more likely to receive government bailouts in financial distress (Faccio, Masulis and McConnell (2006), Duchin and Sosyura (2012)). Politically connected firms are also more likely to receive government procurement contracts (Tahoun (2014), Goldman, Rocholl and So (2013), Brogaard, Denes, and Duchin (2016)) as well as government subsidies and other support (Johnson and Mitton (2003)).

because it helps reduce policy uncertainty. We argue that political contributions purchase access to politicians who trade policy information for contributions (Stratmann (1998, 2002), Coate (2004)). Restated in the framework of Pastor and Veronesi (2012), political activism reduces political uncertainty, i.e. the uncertainty about whether government policy will change in the future.[3] In Pastor and Veronesi (2012), political uncertainty arises because the political cost of changing government policy is unobservable to outsiders. We argue that politically active firms are better informed about the policymakers' political cost and, therefore, face lower political uncertainty. Lower political uncertainty decreases the volatility of expected future cash flows from innovation, which, in turn, lowers the value of the option to wait and stimulates investment in innovation. The main testable implication of this hypothesis, which we term the information acquisition hypothesis, is that political activism positively affects firm innovation.

In our empirical tests, we analyze the relation between political activism and firm innovation and find strong support for the information acquisition hypothesis. Using a comprehensive sample of firms at the intersection of the NBER patent citations file and the FEC detailed political contributions file for the period 1979 – 2004, we show that firm innovation is strongly positively related to political activism. The results are robust to the inclusion of industry, state, time, industry-time, state-time, and firm fixed effects. The results are also robust to alternative sample construction methodologies. We first estimate regressions on the entire cross-section of CRSP/Compustat firms treating firms that are not politically active as firms with zero political contributions. However, also recognizing that zero contributions for politically inactive firms may not accurately capture the choice not to contribute, we re-estimate our baseline regressions on the subsample of firms with observed political contributions. In the second set of regressions, we control for the resulting self-selection bias with a two-stage Heckman (1979) approach. Regardless of which sample we use, we find a strong positive correlation between firm political activism and future innovation.

To gain a better understanding of which political contributions to which politicians are associated with more innovation, we next conduct a wide range of subsample analyses. We show that the positive relation between political activism and innovation is stronger for contributions made to winning politicians and politicians who sit on or join Congressional committees with jurisdictional authority over a firm's industry. Moreover, the effect is completely concentrated in non-election years when Congressional committee appointments are unexpected.

Next, we move from simple correlations toward establishing that political activism *causally* affects firm innovation by exploiting an exogenous shock to the value of political contributions that occurred during our sample period. We use the surprise Republican win in the 1994 mid-term election and the consequent surprise Newt Gingrich's decision to appoint four junior Congressmen to committee chairman

[3] Consistent with this conjecture, a growing body of research in law and finance on political intelligence shows that access to politicians is valuable to investors and other interested parties because it provides access to relevant political information (Jerke (2010), Bainbridge (2012), Nagy and Painter (2012)).

positions as an exogenous shock to the value of political contributions for those firms that supported the four new chairmen prior to the 1994 election. Because the chairman appointments were unexpected, firms could not have adjusted their contribution strategies prior to the election. Thus, if political contributions to committee chairmen are valuable (Cooper, Gulen and Ovtchinnikov (2010)) and affect firm innovation, firm patent activity should increase following the election. Consistent with this, we show that patent activity of the treatment group of firms increased significantly following the election compared to that of the control group. Specifically, the number of patent applications for the treatment firms grew steadily from an average of 4.8 applications in 1994 to 8.4 applications in 1999, a 75% increase, while the patent activity of the control group stayed essentially flat over the same period. We replicate these results in univariate and multivariate tests and show that the results are statistically and economically significant.

Taken together, the evidence shows that political activism is positively associated with firm innovation. The natural experiment results are also consistent with political activism causally affecting firm innovation, so our results are consistent with the information acquisition hypothesis. We present further evidence for the information acquisition hypothesis by documenting that changes in politically active firms' innovation predict future legislative changes. We discuss two possible alternative explanations for our results. It is possible that the positive relation between political activism and innovation arises because firms lobby for favorable legislation or because firms use political contributions to obtain lucrative government procurement contracts. In our empirical tests, we show that industries that lobbied for (against) deregulation (our measure for legislative changes) actually decreased (increased) their innovation efforts just prior to deregulation, which is inconsistent with the lobbying explanation. Regarding the procurement explanation, we show that firms with government sales innovate no differently from other firms. We also find that politically active firms innovate more compared to inactive firms but the difference is significant only for firms with no government sales. These results are inconsistent with the procurement explanation.

In the last series of tests, we analyze industry and geographical political activism spillovers. We show that political activism of politically active firms spills over into higher innovation of the same industry and geographically proximate firms. The economic magnitudes of those spillovers are naturally smaller compared to the effects documented for politically active firms, representing about a fifth to a third of the magnitude for politically active firms. We find no evidence of negative spillovers, so aggregate industry and local innovation is positively affected by political activism of politically active firms. The positive relation between political activism and aggregate innovation is particularly strong during periods of high political uncertainty, which is consistent with the hypothesis that knowledge spillovers within industries and within geographic locales are important for firm innovation efforts, especially when political uncertainty is high. These results have important policy implications and show that policies targeting improved government transparency of legislative decision making are likely to promote industrial

innovation and economic growth. The call for improved government transparency echoes recent calls in the academic and the popular press for the government providing more clarity on its legislative intentions (see, Davis (2016), for example).

The analysis in this paper is important for three reasons. First, the results in this paper contribute to our understanding of the sources of value from firm political activism. We show that political activism, in addition to its impact on firm financing decisions (Claessens, Feijen and Laeven (2008)) and operating performance (Cooper, Gulen and Ovtchinnikov (2010), Ovtchinnikov and Pantaleoni (2012), Goldman, Rocholl and So (2013)), also significantly affects firm real investment decisions, such as investment in innovation. The industry and local spillover results also show that firm political activism improves aggregate industry and local geographic innovation. These results have important policy implications and are essential for building a complete picture of firm political activism and its impact on firm decisions and value.

Second, our results add to the growing literature exploring the drivers of innovation across firms. Previous research finds that innovation is related to the firm's organizational form (see, e.g., Spiegel and Tookes (2008), Ferreira, Manso, and Silva (2012), Seru (2014)), corporate governance characteristics (see, e.g., Atanassov (2013)), CEO characteristics (see, e.g., Hirshleifer, Low, and Teoh (2012)), VC characteristics (Kortum and Lerner (2000), Tian and Wang (2014)), legal systems (see, e.g., Acharya and Subramanian (2009), Fan and White (2003), Armour and Cumming (2008), Acharya, Baghai, and Subramanian (2013)) and institutional and market settings (see, e.g., Aghion, Van Reenen and Zingales (2013), Acharya and Subramanian (2009), He and Tian (2013), Fang, Tian, and Tice (2014)). We show that firm political activism is an important determinant of innovation that adds considerable explanatory power to traditional cross-sectional models of firm innovation. The results are especially important considering a critical role of innovation in driving competitive advantage and long-term economic growth (Solow (1957), Romer (1987, 1990)).

Third, our results add to the growing literature on political intelligence (see, e.g., Jerke (2010), Bainbridge (2012), Nagy and Painter (2012)). We show that political intelligence is valuable not only to investors in their external investment decisions but also to firms in their internal investment decisions. Our results are consistent with the hypothesis that politically active firms face lower political uncertainty because they are better informed about lawmakers' political cost. This information allows firms to make better investment decisions, including investment in innovation.

The rest of the paper is organized as follows. Section 2 formally develops our information acquisition hypothesis. The sample is presented in section 3. Section 4 analyzes the relation between political activism and firm innovation. Section 5 presents industry and geographical spillover results. Section 6 presents our discussion and conclusions.

2. Information acquisition hypothesis

Our argument centers on the theoretical framework of Pastor and Veronesi (2012) whereby firms operate in an environment characterized by general government policy uncertainty. Firms face two types of policy uncertainty – political uncertainty, defined as uncertainty about whether the current government policy will change in the future, and impact uncertainty, defined as uncertainty about the impact of government policy changes on the profitability of the private sector. We focus on political uncertainty, which in the Pastor and Veronesi model arises because the political cost of changing government policy is unobservable to outsiders so they cannot anticipate whether policy change will occur. We hypothesize that firms that engage in political activism do so in part to acquire information about the lawmakers' political cost, which, in turn, reduces political uncertainty. This conjecture is rooted in law and finance literature on political intelligence showing that access to politicians is valuable to investors and other interested parties because it provides access to political information (Jerke (2010), Bainbridge (2012), Nagy and Painter (2012)).[4] The extant literature presents numerous case studies of political intelligence consultants, usually former congressional staffers and administration officials, mining private political information including climate control legislation, foreign trade, tax, and energy policy, the federal budget (including healthcare, defense, and research funding) and patent legislation and selling it to interested parties, typically investors such as hedge funds and other investment companies (Gao and Huang (2016)). This practice originated in the 1970s and is currently so prevalent that some congressional staffers report receiving nearly as many contacts asking about the status of legislation as they do seeking to influence legislation (Mullins and Scannell (2006)). This evidence is consistent with the view that political intelligence helps reduce political uncertainty.

2.1. Acquisition of policy information

We propose that, much in the same way that outside investors invest in political intelligence concerning the future regulatory landscape, firms also find it valuable to invest in information regarding future legislative changes. Put differently, we argue that firms engage in political activism (at least in some part) to lower political uncertainty. This argument is not new and dates back in the Strategy literature to at least Weidenbaum (1980) who analyzes how firms respond to changes in government policy. One strategy, which Weidenbaum terms "positive anticipation", is to invest in forecasting business regulations (including

[4] Political intelligence refers to the practice of gathering and disseminating nonpublic government information to select outside parties and is made possible because government officials are legally permitted to selectively disclose such information to any interested party. The practice is often referred to as "tipping" and does not constitute fraudulent activity under the federal securities laws. Even the 2012 passage of the Stop Trading on Congressional Knowledge Act (the STOCK Act), which prohibited government officials from *personally* trading on inside information, did not ban those officials from supplying market-moving information to *other* interested parties.

making political contributions to politicians) and to adjust to those regulations before they go into effect.[5] Similarly, Meznar and Nigh (1995) and Blumentritt (2003) differentiate between two sets of firm political behavior: (i) "buffering", defined as taking proactive political actions such as contributing to politician agenda or lobbying to influence the regulatory process and (ii) "bridging", defined as a reactive form of political behavior of simply tracking the development of regulation so as to have compliance already in place when regulation is adopted.

While it is not possible to provide systematic empirical evidence that political activism, as measured by political contributions, lowers political uncertainty, there is anecdotal evidence that corroborates this argument. For example, Nocera (2011) provides a detailed account of a 1993 dinner at the Pentagon (which became known as the Last Supper) organized by Bill Clinton's defense secretary Les Aspin. Dinner invitees comprised 15 CEOs of the prime military contractors and top political contributors, including Boeing, General Electric, McDonnell Douglas and Northrop. The dinner's purpose was for top-ranking Pentagon officials to send a message to defense contractors that, "with Berlin Wall gone, the Soviet Union dissolved – and the Pentagon budget flat-lining – the Defense Department was no longer willing to pay the ballooning overhead of all those contractors." The message was clear – defense contractors had to improve operational efficiency and invest in smarter, more efficient projects. In subsequent interactions with defense contractors, Pentagon officials would often privately communicate what type of investment decisions would be welcomed by the Defense Department. For example, in one private meeting, Ashton Carter, then the Defense Department's undersecretary for acquisitions, technology, and logistics stated that the Department will be "attentive" to innovative smaller companies that provide services (as opposed to weapons systems) to the Pentagon. This evidence is consistent with the view that firms with political access face lower political uncertainty.

2.2. Information acquisition, political uncertainty, and innovation

If "positive anticipation" " strategies are successful, the resulting lower political uncertainty can stimulate investment in innovation. The result is best seen in the context of the literature on irreversible investment under uncertainty (see, e.g., Bernanke (1983), Bertola and Caballero (1994), Dixit and Pindyck (1994), Abel and Eberly (1996), Hassler (1996), Caballero and Engel (1999), Bloom, Bond and Van Reenen (2007)). Dixit and Pindyck (1994) show that when investment is at least partially irreversible, uncertainty

[5] The following quote from Rodney Smith of SBC Communications is an excellent example of how firms use political contributions to purchase access to politicians: "We always prefer to give the money directly to the guy, or the woman, that you're going to support. You like to walk in, you like to give them the check, you like to look in their eye and say 'I'm here to help you.' You always do." Consistent with this sentiment, Kalla and Broockman (2016) report the results of a randomized field study in which a political organization attempted to schedule meetings between almost 200 congressional offices and campaign donors. The organization randomly assigned whether it revealed to congressional offices that the attendees were campaign donors. As a result, those attendees who were identified as campaign donors were three times more likely to be granted a meeting with the lawmakers.

over the future value of the project or over the cost of project investment depresses investment because uncertainty increases the value of the option to wait.[6] It is clear that political uncertainty affects the project's future cash inflows and the investment cost because both are sensitive to future government policy (see Davis (2016) for examples of how changes in government policy affect the projects' future cash flows). Therefore, higher political uncertainty increases the value of the option to wait, so firms respond with lower investment. Note that the negative relation between political uncertainty and investment, while present for all types of investment, should be especially strong for investment in innovation because innovation is a long-term investment (Davis (2016)), it is costly (Holmstrom (1989), Aghion and Tirole (1994)) and its cost is highly uncertain (Dixit and Pindyck (1994), Bhattacharya, et al. (2017)). The negative correlation between political uncertainty and innovation implies that firm strategies that reduce political uncertainty, such as "positive anticipation" / "bridging", should stimulate investment in innovation.

There are several prominent examples of the negative effects of political uncertainty on firm innovation. Marcus (1981) provides several examples from the 1970s: (i) the development of composite fuels made by pulverized coal was delayed because of uncertainty over the status and interpretation of clean air laws, (ii) the same uncertainty about clean air laws also resulted in a delayed conversion of industrial boilers from oil to coal, (iii) uncertainty over state public utility commission rate and licensing regulations resulted in firms postponing investment in cogeneration technology, a process whereby industrial waste heat is used to generate electricity, and (iv) uncertainty over the regulators' interpretation of the 1970 National Environmental Policy Act resulted in delays of oil shale and pipeline developments. More recently, Davis (2016) analyzes current developments in U.S. fuel economy standard regulations and argues that the uncertainty about the Trump administration's desire to implement the 2012 mandate to raise fuel economy standard toward the 50+ miles per gallon level by 2025 depresses the value of investment in fuel efficient technologies.

In sum, we show that (i) political uncertainty depresses firm investment because it increases the value of the firms' option to wait and (ii) politically active firms can lower political uncertainty by purchasing access to politicians with relevant political information. We hypothesize, therefore, that politically active firms should innovate more because they lower political uncertainty by purchasing access to relevant politicians.

3. Sample

3.1. Data sources

Our sample comprises the intersection of the NBER patent citations data file described in Hall, Jaffe, and Trajtenberg (2001) and the political contributions data file in Cooper, Gulen, and Ovtchinnikov

[6] Dixit and Pindyck (1994) show that uncertainty over the cost of investment leads firms to postpone investment if the resolution of uncertainty is independent of firm's actions.

(2010). The patent citations file consists of 3,279,509 patents granted to firms for the period January 1, 1963 – December 30, 2006 and 24,082,781 patent citations made by patents granted during the period January 1, 1975 – December 30, 2006. From this file, we extract data on the identity of the patent recipient, the patent application date, the patent technological category and sub-category, and the number of patent citations received. After deleting data for private firms and firms with no identification codes, we are left with 1,158,693 patents granted to 6,528 unique firms and 9,673,067 patent citations.

The political contributions data file is described in detail in Cooper, et al. (2010) and consists of 1,064,830 hard money political contributions made by firms through their political action committees (PACs) to politicians running for the President, the Senate, and the House of Representatives during the period January 1, 1979 – December 31, 2004. From this file, we extract data on the identity of the contributing firm, the date and the amount of each contribution, and the identity of the receiving candidate. For each receiving candidate, we collect data from the Federal Election Commission (FEC) on the sought after public office, the state and the district for which the candidate is running, the candidate's party affiliation, the election outcome, and the percentage of votes received. In addition, for all candidates already in office, we obtain data on their Congressional committee assignments and their party rankings on each serving committee. This data is from Charles Stewart's Congressional Data Page.[7] After deleting contributions from private firms, subsidiaries of foreign firms and firms with no data in the CRSP/Compustat merged file, we are left with 813,692 contributions made by 1,805 unique firms.

We focus on hard money political contributions as a measure of political activism for two reasons. First, by law, firms have to disclose the identity of the receiving politician when making hard money political contributions. This allows us to establish a direct connection between a firm and a receiving politician, which in turn, allows us to link firms to Congressional committees and other relevant Congressional data. This stands in contrast to other measures of political activism, such as lobbying, whereby firms rarely disclose the beneficiaries of their lobbying efforts. Rather firms typically only state that they lobby the legislative branch or "various" members of Congress.

Second, money spent on "informational" lobbying, i.e. for the purpose of purely extracting political information, is not required to be disclosed under the 1995 Lobbying Disclosure Act, since such practice does not meet the strict definition of lobbying (Jerke (2010)). In contrast, hard money political contributions are used by firms to gain access to politicians both to influence legislation and to extract political information. Given prior evidence that hard money political contributions are positively correlated with other measures of political activism (see, e.g., Wright (1990), Ansolabehere, Snyder, and Tripathi (2002), Akey (2015)), we view hard money political contributions as a valid instrument for firm political activism.

[7] We thank Charles Stewart III for generously providing this data on his website http://web.mit.edu/17.251/www/data_page.html.

After intersecting the patent citations and the political contributions files, our final sample includes all 1,805 politically active firms with 404,536 granted patents and 3,814,120 patent citations during the period January 1, 1979 – December 31, 2004. During this period, firms in our sample contribute a total of $933,002,309 in 2005 dollars to 5,584 unique political candidates. Our sample of political contributions covers 67.1% of the total dollar volume of all corporate contributions reported to the FEC and 27.2% of all political candidates running for office.

The firms at the intersection of the patent citations and the political contributions files represent 9.1% of all firms with available data on assets and book equity from CRSP/Compustat and 59.3% of the total market capitalization of those firms. It is clear that politically active firms are significantly larger than politically inactive firms. Indeed, the average market capitalization of politically active firms places them in the top 8th percentile of the NYSE market capitalization in 2004. We provide detailed descriptive statistics for various firm characteristics of politically active and inactive firms in the Online Appendix, Section 1.

3.2. Measures of political activism

We construct three separate sets of measures of firm political activism. Our first set of measures is similar to Cooper, et al. (2010) and is designed to capture the general level of firm political activism. Specifically, we rely on prior evidence that firms build long-term relationships with politicians by making frequent, roughly constant political contributions and define our first measure of political activism as the total number of political candidates supported by a firm over a five-year period:

$$Pcand_{it} = \sum_{j=1}^{J} Cand_{jt,t-4}, \tag{1}$$

where *i* and *t* index firms and years, respectively, and $Cand_{jt,t-4}$ is an indicator variable equal to one if firm *i* made at least one hard money political contribution to candidate *j* during the period *t* - 4 – *t* and zero otherwise. We use a five-year window in Eq. 1 to capture the firms' desire to develop long-term relationships with politicians (Snyder (1992)). To match the timing of political contributions to the timing of elections, which take place on the Tuesday following the first Monday of November of every even year, we use election cycle years spanning 12 consecutive months from November of year *t* - 1 to October of year *t*. Our first election cycle year starts in November 1979, and the number of supported candidates in Eq. 1 is updated once a year from October 1984 to October 2004.

Given prior evidence that hard money political contributions are correlated with other ways in which firms build relationships with politicians (see, e.g., Wright (1990), Milyo, Primo, and Groseclose (2000), Ansolabehere, Snyder, and Tripathi (2002), Bombardini and Trebbi (2011)), the number of supported candidates in Eq. 1 should be an accurate measure of firm political activism. For robustness, we

supplement this measure with the total dollar amount of political contributions made to political candidates by a firm over a five-year period:

$$Camount_{it} = \sum_{j=1}^{J} Amount_{jt,t-4}, \tag{2}$$

where $Amount_{jt,t-4}$ is the total amount of money that firm *i* contributed to candidate *j* during the period *t* - 4 – *t*. We use the same timing convention to construct this measure as in Eq. 1.

Our next set of measures of political activism is based on the results in Ovtchinnikov and Pantaleoni (2012) that show that politicians who sit on Congressional committees with jurisdictional authority over a firm's industry receive a greater level of political support from individuals who reside in a vicinity of the industry firms. Moreover, Ovtchinnikov and Pantaleoni (2012) show that the higher level of political support from those individuals is associated with better operating performance of local firms. These results imply that relationships with politicians who sit on Congressional committees with jurisdictional authority over a firm's industry are more valuable. We hypothesize that such relationships should be more relevant for firm innovation because they provide access to valuable legislative information, which typically originates in relevant Congressional committees. For brevity, we label Congressional committees with jurisdictional authority over a firm's industry as influential committees and politicians on those committees as influential politicians. We then build analogs to Eqs. 1 and 2 that include only the subset of influential politicians:

$$Pcand_{it}^{Committee} = \sum_{k=1}^{K} Cand_{kt,t-4}^{Committee}, \tag{3}$$

$$Camount_{it}^{Committee} = \sum_{k=1}^{K} Amount_{kt,t-4}^{Committee}, \tag{4}$$

where $Cand_{kt,t-4}^{Committee}$ is an indicator variable equal to one if firm *i* contributed to politician *k* who sits on an influential committee during the period *t* - 4 – *t* and zero otherwise, and $Amount_{kt,t-4}^{Committee}$ is the total amount of money that firm *i* contributed to politician *k* over the same period. The mappings between Congressional committees and their industry jurisdictions are from Ovtchinnikov and Pantaleoni (2012), Appendix B. We also build compliments to Eqs. 3 and 4, $Pcand_{it}^{Non-Committee}$ and $Camount_{it}^{Non-Committee}$, as the difference between Eqs. 1 and 3 and Eqs. 2 and 4, respectively. These variables track a firm's relationship with politicians outside of Congressional committees relevant to the firm. We label these committees as outside committees and politicians on those committees as outside politicians.

Our last set of measures of political activism is based on the argument in Kroszner and Stratmann (1998) that membership on specialized Congressional committees facilitates repeated interactions between special interest groups and politicians. It also fosters long-term relationships with politicians and supports a reputational equilibrium in which contributions-for-service, including contributions-for-information, contracts are enforceable. One implication of this argument is that contributions to politicians who join a committee become more valuable for those interest groups that operate under the jurisdiction of that committee. Consequently, politicians who join a particular committee should experience an increase in the level of contributions from the affected interest groups. Using this logic, we calculate the total number of politicians supported by a firm who join influential Congressional committees as well as the total amount of political contributions made to those politicians:

$$\Delta Pcand_{it}^{+} = \sum_{m=1}^{M} Cand_{mt,t-4}^{+}, \tag{5}$$

$$\Delta Camount_{it}^{+} = \sum_{m=1}^{M} Amount_{mt,t-4}^{+}, \tag{6}$$

where $Cand_{mt,t-4}^{+}$ is an indicator variable equal to one if firm *i* contributed to politician *m* during the period *t* - 4 – *t* who joined an influential Congressional committee in year *t* and zero otherwise, and $Amount_{mt,t-4}^{+}$ is the total amount of money that firm *i* contributed to politician *m* over the same period. Finally, $\Delta Pcand_{it}^{-}$ and $\Delta Camount_{it}^{-}$ are defined analogously by focusing on contributions made to politicians who change their Congressional committees from influential to outside committees. We provide detailed descriptive statistics for political activism measures in the Online Appendix, Section 2.

4. Political activism and firm innovation

4.1. Baseline results

Our first test is to establish a baseline correlation between proxies for political activism and firm innovation. We estimate the following panel OLS regression that relates political activism proxies to firm innovation:

$$Innovation_{it+\tau} = \beta_{ind} + \beta_t + \beta_1 Pactivism_{it} + \beta_2 X_{it} + \varepsilon_{it+\tau}, \tag{7}$$

where $Innovation_{it+\tau}$ is a measure of innovation of firm *i* during the period $t+\tau$ ($\tau \in \{1,3\}$), $Pactivism_{it}$ is a measure of firm political activism, X_{it} is a vector of control variables defined in Appendix A, and $\varepsilon_{it+\tau}$ is a random error term assumed to be possibly heteroskedastic and correlated within firms (Petersen (2009)). We follow the standard approach in the innovation literature (Cornaggia, Mao, Tian and Wolfe (2015), Gu, Mao and Tian (2017), Seru (2014), Tian and Wang (2014), Chemmanur, Loutskina and Tian (2014)) and first estimate Eq. 7 with industry (β_{ind}) and time fixed effects (β_t) to capture any average

effects in an industry or any macro effects in a given year. In the Online Appendix, Section 3, we confirm that our results are robust to the inclusion of additional controls for industry, state, time and interaction fixed effects as well as to the inclusion of firm fixed effects. Following the literature, X_{it} includes controls for firm size, age, profitability, asset tangibility, leverage, growth opportunities, and investment. We also include industry concentration (and its square) to control for a possibly non-linear relation between industry competition and innovation. All control variables are winsorized at the upper and lower one-percentiles.

In our baseline tests, we use two measures of firm political activism, $Pcand_{it}$ and $Camount_{it}$ defined in Eqs. (1) and (2), respectively, and estimate two separate models of firm innovation. Following extant literature (see, e.g., Hall, Jaffe, and Trajtenberg (2005), Atanassov (2013), He and Tian (2013), Seru (2014), Fang, Tian, and Tice (2014)), our first measure of firm innovation, $Effpatent_{it+\tau}$, is the natural logarithm of one plus the total number of successful patent applications for firm *i* during the period $t + \tau$. We use the patent application year because it is closer to the timing of actual innovation than the patent grant year (Griliches, Pakes, and Hall (1986)). Our second measure of innovation, $Cpatent_{it+\tau}$, is the natural logarithm of one plus the total number of future patent citations received by each patent. Compared to simple patent counts, this variable more accurately captures the significance and value of individual patents and, therefore, may serve as a better proxy for innovation "success" (Hall, Jaffe, and Trajtenberg (2005); Griliches, Pakes, and Hall (1986) report that patent value is highly skewed, with most of the value concentrated in a small number of patents). Because of the well-known truncation problem in the patent data file, we follow Hall, Jaffe, and Trajtenberg (2005), Atanassov (2013) and Seru (2014) and estimate effective patents and patent citation counts by dividing the annual number of patent applications and patent citations for a given firm in a given technology class by the average number of patent applications and patent citations received by all firms in the same technology class in the same year. Our results are robust to an alternative truncation adjustment used in He and Tian (2013) and Fang, Tian, and Tice (2014).

Table 1 reports the results of estimating Eq. 7. Panel A presents the results for the total number of patent applications; panel B presents the results for the total number of patent citations. Models 1 and 2 test whether political activism affects firm innovation during the year immediately following the year when political contributions are measured. Models 5 and 6 allow for a longer three-year lag between political contributions and their effect on subsequent innovation.

The results in panel A show that firm patent activity is strongly related to political activism. The β_1 coefficient is positive and significant at the 1% level in all models, which implies that firms that support more political candidates and firms that contribute more capital to political candidates innovate more. The results are significant at both the one- and three-year horizons. It is important to note that all models include firm size as a standard control variable, so our results do not simply reflect the firm size effect (Online Appendix, table 1.1). The inclusion of political activism variables improves the R^2 statistic in model 1 from 0.295 to 0.326 and from 0.337 to 0.361 in model 5. These figures represent a 10.1% and a 7.1%

improvement in R^2, respectively, and show that firm political activism adds significant explanatory power to the baseline model of innovation.[8] The results for *Camount* in models 2 and 6 are similar.

In the current estimation, we use all firms with available data on Compustat to estimate Eq. 7, irrespective of whether those firms have an established PAC. Firms without a PAC are assigned a value of zero for political activism variables, which may be problematic for two reasons. First, a zero political contribution implies a choice in the sense that a firm could have contributed money to a politician but decided not to do so. This is not the case for firms without a PAC that decided not to participate in the political process altogether. Second, firms do not randomly decide to get involved in politics, and this choice introduces a potential self-selection bias into our observed sample. To control for this bias, we use a two-stage Heckman (1979) approach in the remainder of table 1. In the first stage, we estimate a probit model of whether a firm has an established PAC on determinants of PAC participation from prior literature that analyzes the determinants of firm political involvement (see, e.g., Masters and Keim (1985), Zardkoohi (1985), Grier, Munger, and Roberts (1991), Grier, Munger, and Roberts (1994), Hart (2001)). The results are presented in Appendix B. Consistent with prior theoretical arguments, we find that larger and more levered firms, firms with more sales, more employees, and a higher percentage of unionized employees are more likely to be politically active. Also, the likelihood of political activism is positively related to the number of business segments and the firm's market share and negatively related to book-to-market and cash flows. Finally, the likelihood of political activism is positively related to government purchases and to the regulated industry indicator and negatively related to sales concentration, the number of geographic segments, and the number of politically active industry firms.

From the probit, we calculate the inverse Mills ratio (IMR) and include it in second-stage regressions in the rest of table 3. The inclusion of IMR in innovation regressions helps control for firm self-selection into the politically active group. Models 3 and 4 and models 7 and 8 present the results for one-year ahead and three-year ahead innovation measures, respectively, for the sample of politically active firms.

The results of the two-stage Heckman model show that firm innovation is strongly positively related to political activism after controlling for self-selection. The coefficient β_1 remains significant at the 1% level in both panels and at both time horizons despite the fact that our estimation utilizes only politically active firms. Put differently, our baseline results do not simply reflect differences in innovation between politically active and inactive firms. Rather, within politically active firms, those firms that support more political candidates and contribute more capital, also innovate more.

[8] The estimated coefficients on traditional control variables line up well with expectations and previous studies. In particular, firm innovation is positively related to firm size, age, profitability, investment, and Q and negatively related to firm leverage and the ratio of fixed assets to total assets. Firm innovation is higher in more concentrated industries as measured by the Herfindahl index, although the relation is non-linear. Similar results are reported in Atanassov (2013), Cornaggia, et al. (2015), He and Tian (2013), and Fang, Tian and Tice (2014).

To get a better sense of economic magnitudes of our political activism variables, note from table 2.1 in the Online Appendix, Section 2 that firms in the 25th percentile of the number of supported political candidates support 14 candidates, while firms in the 75th percentile of that distribution support 117 candidates. Thus, an interquartile increase in the number of supported candidates is associated with an additional 0.182 patent applications over the next year ($e^{([117-14]/100\times 0.162)} - 1 = 0.182$) and an additional 0.231 patent applications over the next three years. Compared to the unconditional mean number of patent applications by politically active firms (6.1 patents/year), the results may seem economically small at first. However, Hall, Jaffe and Trajtenberg (2005) show that even small changes in the number of patents and patent citations can lead to significant changes in firm value.[9] The results for *Camount* are also economically significant and indicate that an interquartile increase in the amount of political contributions is associated with an additional 0.067 patent applications over the next year and an additional 0.090 patent applications over the next three years.

The results in panel B similarly show a strong positive association between firm patent activity, as defined by patent citations, and political activism. The β_1 coefficient is positive and significant at the 1% level in both firm samples, for both measures of political contributions and at both time horizons. The results are also economically large. The magnitude of the β_1 coefficient implies that an interquartile increase in *Pcand* and *Camount* is associated with an additional 0.029 and 0.012 patent citations over the next year and an additional 0.064 and 0.026 patent citations over the next three years. Compared to the unconditional mean of patent citations by politically active firms (0.309 citations), the results are economically large. In the Online Appendix, Section 3, we subject our baseline tests to a battery of robustness checks. In section 3.1, we show that our baseline results are robust to the inclusion of industry, state, time, industry-time, state-time, and firm fixed effects. In further tests in section 3.2, we show that all of our baseline results are robust to replacing patents with R&D expenditures as a measure of firm innovation. We also show that firm political activism is significantly positively related to other measures of patent activity, such as patent originality and patent relevancy. Overall the results show that firms that are more politically active innovate more.

4.2. Subsample analysis

To gain a better understanding of which political contributions to which politicians are associated with more innovation, table 2 reports the results for various subsamples of political contributions. If

[9] Using Hall, et al. (2005) estimates, a 0.231 increase in patents over three years is associated with a 0.462% increase in firm value. The average market capitalization of politically active firms is $6.22 billion in our sample, which implies that supporting an extra 103 candidates (at an average additional cost of $276,844 to the firm) increases firm value by $28.7 million. The implied rate of return is absurdly high, which strongly suggests that there are additional costs to political participation. Even taking those costs into account, however (for example, by including an estimate of lobbying expenditures from Milyo, et al. (2000)), the economic effects appear substantial.

political contributions facilitate innovation because they grant access to politicians who, in turn, either supply valuable information, the relation between political contributions and firm innovation should be stronger for contributions made to politicians who go on to win their election races and to politicians who join influential committees. Because influential politicians sit on Congressional committees with jurisdictional authority over the firm's industry, they have possess valuable private information about future legislative changes.[10] Hence, under our hypothesis, contributions to winning and influential politicians are more significant in predicting future innovation compared to contributions to losing politicians and politicians outside of influential committees. To test this hypothesis, we estimate the following regressions:

$$Innovation_{it+\tau} = \beta_{ind} + \beta_t + \beta_1 Pcand_{it}^{Winner} + \beta_2 Pcand_{it}^{Loser} + \beta_3 X_{it} + \varepsilon_{it+\tau}, \quad (8a)$$

$$Innovation_{it+\tau} = \beta_{ind} + \beta_t + \beta_1 Pcand_{it}^{Committee} + \beta_2 Pcand_{it}^{Non-Committee} + \beta_3 X_{it} + \varepsilon_{it+\tau}, \quad (8b)$$

where $Pcand^{Winner}$ and $Pcand^{Loser}$ in Eq. 8a are the number of winning and losing politicians, and $Pcand^{Committee}$ and $Pcand^{Non\text{-}Committee}$ in Eq. 8b are the number of influential and outside politicians, respectively. We also estimate these regressions with $Camount^{Winner}$ and $Camount^{Loser}$ in Eq. 8a and $Camount^{Committee}$ and $Camount^{Non\text{-}committee}$ in Eq. 8b, respectively.

Table 2 presents the results. All models include the full set of control variables in table 1 and control for firm self-selection into the politically active group with IMR. The results in panel A show that contributions to politicians who go on to win their election races are indeed associated with higher subsequent innovation output. In all specifications, the number of supported winning politicians and the amount contributed to winning politicians is associated with higher subsequent innovation output. However, contributions to losing politicians do not predict higher future innovation. The point estimates in panel A, while positive, are not statistically significant.

In panel B, we focus on contributions made to members of influential and outside committees. Consistent with our hypothesis, the results show a much stronger relation between political contributions to influential politicians and firm innovation compared to the relation between political contributions to outside politicians and firm innovation. In panel A, the β_1 coefficient on $Pcand^{Committee}$ and $Camount^{Committee}$ is positive and statistically significant across all specifications, which implies that political contributions to influential politicians are significant predictors of future firm innovation. This result holds for firm innovation measured by patent applications and patent citations and at both the one- and three-year horizons. In contrast, the β_2 coefficient on $Pcand^{Non\text{-}Committee}$ and $Camount^{Non\text{-}Committee}$ is mostly negative and insignificant. The differences in results for contributions to influential and outside politicians are stark and

[10] We analyze the relation between a politician's status and firm contributions in detail. In unreported tests, we find that firms (i) are more likely to contribute to influential politicians, (ii) contribute more frequently to influential politicians, and (iii) contribute greater amounts to influential politicians. These results are available upon request.

provide further evidence that political contributions, especially to influential politicians, are strongly related to firm innovation.

In our next set of tests, we switch from levels to changes in firm political activism and focus on politicians who join or leave influential Congressional committees. Kroszner and Stratmann (1998) argue that membership on specialized Congressional committees facilitates a reputational equilibrium in which politicians trade services to special interest groups for their political contributions. Under our hypothesis, this argument implies that contributions to politicians who join (leave) influential committees become more (less) significant in predicting future firm innovation after the committee change. On average, 144 (123) politically active firms in table 4 make at least one political contribution over any five-year period to a politician who joins (leaves) an influential committee. These firms represent, respectively, 26.7% and 22.8% of an average annual number of politically active firms in our sample. In panel C, we estimate the following regression:

$$Innovation_{it+\tau} = \beta_{ind} + \beta_t + \beta_1 \Delta Pcand_{it}^{+} + \beta_2 \Delta Pcand_{it}^{-} + \beta_3 X_{it} + \varepsilon_{it+\tau}, \quad (9)$$

where $\Delta Pcand_{it}^{+}$ and $\Delta Pcand_{it}^{-}$ are the number of politicians joining and leaving influential Congressional committees defined in section 2.2 and the rest of the variables are as defined above.

Consistent with our hypothesis, the results show a significant positive relation between contributions to politicians who join influential committees and firm innovation while no relation between contributions to politicians who leave those committees and firm innovation. The β_1 coefficient on $\Delta Pcand_{it}^{+}$ is positive and significant in all specifications while the β_2 coefficient on $\Delta Pcand_{it}^{-}$ is either insignificant or marginally negative. We also estimate a variant of Eq. 9 that uses $\Delta Camount_{it}^{+}$ and $\Delta Camount_{it}^{-}$ in place of $\Delta Pcand_{it}^{+}$ and $\Delta Pcand_{it}^{-}$. The results are very similar, so we do not report them in the interest of space.

The variables $\Delta Pcand_{it}^{+}$ and $\Delta Pcand_{it}^{-}$ are clearly not mutually exclusive. In fact, 508 unique firms in our sample simultaneously support politicians who join influential committees and politicians who leave those committees. So, in the rest of panel B, we replace $\Delta Pcand_{it}^{+}$ and $\Delta Pcand_{it}^{-}$ with indicator variables that isolate firms that net gain or lose connections with influential politicians. Specifically, we define $I(\Delta Pcand^{+} > \Delta Pcand^{-})$ as an indicator variable set to one for firms that support a greater number of politicians joining influential committees than politicians leaving those committees. Analogously, we define $I(\Delta Pcand^{+} < \Delta Pcand^{-})$ as an indicator variable set to one for firms that support a lower number of politicians joining influential committees than politicians leaving those committees. As an illustration, AT&T supported seven politicians during the 1998 – 2002 period who joined influential committees following the 2002 election and one politician during that period who left an influential committee. So, $I(\Delta Pcand^{+} > \Delta Pcand^{-})$ takes a value of one for AT&T in 2002. During the same time period, Boeing

supported eight politicians who joined influential committees and 14 politicians who left influential committees in 2002. So, $I(\Delta Pcand^{+} < \Delta Pcand^{-})$ takes a value of one for Boeing in 2002.

Consistent with our hypothesis, the results show a strong positive effect of political contributions on firm innovation for firms that support a greater number of politicians joining relevant committees than politicians leaving those committees. The β_1 coefficient is positive and significant for both measures of innovation and at both the one- and three-year horizons. In contrast, there is no effect of political contributions on innovation for firms that support fewer politicians joining relevant committees than politicians leaving those committees. The β_2 coefficient is negative when innovation is measured by the number of patents and insignificant when innovation is measured by the number of patent citations. The results are very similar if the indicator variables are computed based on the total amount of political contributions to politicians joining and leaving influential committees. The results are available upon request.

In our last set of subsample tests, we interact $\Delta Pcand_{it}^{+}$, $\Delta Pcand_{it}^{-}$ and indicators $I(\Delta Pcand^{+} > \Delta Pcand^{-})$ and $I(\Delta Pcand^{+} < \Delta Pcand^{-})$ with election year and non-election year dummies. Election outcomes and, consequently, many upcoming Congressional committee changes are often predictable during election years, especially in weeks just prior to general elections. Mullins and Mundy (2010) suggest that firms exploit this predictability and strategically shift their contributions to politicians likely to gain influence in the upcoming elections. If political contributions are set optimally and firms redistribute contributions during election years to politicians expected to join influential Congressional committees, we expect a lower, if any, impact of those contributions on subsequent innovation. Conversely, if firms make political contributions to politicians who unexpectedly join influential committees during non-election years, we expect a stronger impact of those contributions on future innovation.[11]

Panel D presents the results. On average, 65 (39) out of 539 politically active firms in table 4 make at least one contribution to a politician who joins (leaves) an influential committee during a non-election year. In comparison, 217 (200) firms support at least one politician who joins (leaves) an influential committee during an election year. Naturally, committee changes in non-election years are rarer although far from infrequent. Consistent with our hypothesis, the entire effect of political contributions on firm innovation is concentrated among politicians who join influential committees during non-election years. The β_1 coefficient on $\Delta Pcand_{it}^{+}$ is positive and significant but only in non-election years. In contrast, the β_1 coefficient is insignificant in election years. The results hold for firm innovation measured by patent applications and patent citations and at both the one- and three-year horizons. The results are identical if

[11] Committee reassignments in non-election years take place because of a politician's death, resignation from Congress, or appointment to a different post.

$\Delta Pcand_{it}^{+}$ is replaced with $I(\Delta Pcand^{+} > \Delta Pcand^{-})$ in Eq. 9. Firms that support a greater number of politicians joining influential committees than politicians leaving those committees subsequently innovate more but only for committee changes that take place in non-election years. There is no effect of political support on firm innovation in election years. Also consistent with our hypothesis, the coefficient β_2 is insignificant in all years. Our results are robust if all variables are computed based on the total amount of political contributions to politicians joining and leaving influential committees.[12] The results are available upon request.

4.3. Natural experiment

In our next set of tests, we take a step toward establishing that political activism causally affects firm innovation by exploiting an exogenous change in the value of political contributions that occurred during our sample period. The 1994 midterm Congressional election was a dramatic and unexpected victory for Republicans that not only put them in a leadership position in the House of Representatives but also resulted in significant changes to the rules and practices of the House. Aldrich and Rohde (1997) detail the changes, the most important of which for us was Newt Gingrich's unexpected departure from the traditional Republican practice of assigning Congressional committee chairman positions based on committee seniority to that based on party loyalty. Within a week of the November 8 election, the new leadership in the House announced the appointment of four junior members of Congress to committee chairman positions, thereby bypassing the expected senior candidates for the posts.[13] Aldrich and Rohde (1997) note that this was the most significant departure from seniority in the selection of committee chairs since 1974, when four senior conservative Southern Democrats were stripped of their chairs following the election of the Democratic class of 1974 known as the "Watergate babies".

The 1994 event represents a particularly convenient setting for us to analyze the importance of political contributions, especially to powerful politicians with chairman roles, on firm innovation. First,

[12] One possible explanation for the results in table 4 is that political activism and innovation are both related to agency problems inside the firm and the managerial tendency to overinvest. Aggarwal, et al. (2012) show that worse corporate governance is associated with larger political contributions and politically active firms tend to overinvest. In unreported tests, we show that agency problems are unlikely to explain our results. We interact our political activism measures with proxies for corporate governance that include the Gompers, et al. (2003) G-Index, the Bebchuk, et al. (2009) E-Index, board independence, and CEO ownership and find that the effect of political activism on firm innovation is either no different or actually stronger for better governed firms. We also regress our political activism measures on firm operating and stock price performance variables and find a positive and generally significant relation. This result is also inconsistent with the agency explanation. The results are available upon request.

[13] During the week following the election, Robert Livinston (LA), ranked fifth in committee seniority, was promoted to the chairman position on the Appropriations committee, bypassing the second ranking John Myers (IN). Henry Hyde (IL) and Thomas Bliley (VA) were promoted to the chairman positions on the Judiciary and Energy committees, respectively, bypassing a higher ranking Carlos Moorhead (CA). David McIntosh (IN), a House freshman was appointed the chair of the National Economic Growth, Natural Resources, and Regulatory Affairs subcommittee of the Government Reform and Oversight committee.

the election results and the new procedures for assigning committee chairman positions were completely unexpected. Note Aldrich and Rohde (1997):

> "Well before the Republican Conference could meet, and before any formal change in the method of choosing committee chairs could be considered, Gingrich and his allies simply asserted the power to choose the chairs of the committees that were most important to them." (p. 550).

Second, the changes in committee chairmanships were clearly exogenous to firm innovation. Third, various firms were impacted differently by the event. So, our treatment group comprises 126 firms that supported the four junior politicians who unexpectedly became committee chairs in November 1994. To be included in the treatment group, a firm must have contributed to at least one of the four would-be committee chairs during the 1990-1994 period. We use two control groups to identify the treatment effect. The first group, firms with chair contributions, includes 475 firms that supported one or more existing committee chairs during the 1990-1994 and the 1995-1999 periods. The second control group, firms without chair contributions, includes 197 firms that supported no existing committee chairs during the 1990-1994 and the 1995-1999 periods. If political contributions to powerful politicians are important for firm innovation, we expect an increase in innovation for the treatment firms relative to the control firms without chair contributions following the 1994 election. We also expect the level of innovation of the treatment firms to converge to that of the control firms with chair contributions following the 1994 election.

Figure 1, panel A, presents the results. The solid line tracks the treatment firms. The dashed line tracks the control firms without chair contributions. The dashed line with a triangular marker tracks the control firms with chair contributions. The shaded area designates the November 1994 election. The first important result in figure 1 is the dynamics of patent activity of the treatment and control firms prior to the election. It is clear that the level of patent applications varies considerably across the three subsamples. However, no apparent differences in trends are evident across the groups.[14] To measure whether the differences in trends are statistically different from each other, we regress patent activity on the pre-1994 year indicator variables and interactions of those indicator variables with the treatment firm indicators. If the pre-event trends are different between the treatment and the control firms, we expect that the coefficients on the interaction terms will change systematically as we get closer to the event year. However, the coefficients on the interaction terms do not exhibit any systematic pattern prior to 1994 and we cannot reject the null hypothesis that they are statistically no different from each other. The results are not reported in the paper in the interest of space but are available upon request.

The post-election results in figure 1 show that the treatment firms significantly increase their patent activity following the 1994 election. The number of patent applications hovers at roughly five prior to 1994 but increases steadily to 5.3 applications in 1995, 5.8 in 1996, 7.1 in 1997, 7.5 in 1998 and 8.4 applications

[14] The differences in levels of patent activity is not a cause for concern as those will be differenced out in our formal difference-in-difference tests below.

in 1999. The almost two-fold increase in patent activity of the treatment firms is particularly striking given a relatively constant patent activity of the control firms without committee chair contributions. Those firms apply for slightly fewer than two patents per year on average throughout the event window. Thus, firms that supported politicians who were unexpectedly appointed committee chairmen in 1994 subsequently significantly increased their patent activity relative to firms that did not support committee chairs. The results in figure 1 also show that patent activity of the treatment firms converges to that of the control firms with chair contributions after the 1994 election. Indeed, while a large difference in patent applications exists between the two groups at the time of the election, it is completely wiped out by 1999. Firms that supported would-be committee chairs increased their innovation exactly to the level of innovation of firms that supported committee chairs.

Table 3, panel A, reports formal tests of the difference-in-difference estimates. Columns 1 – 3 analyze differences in levels of patent activity between the treatment and control firms; columns 4 – 6 analyze differences in changes in patent activity. The results show that both the level and the growth in patent applications is significantly higher for the treatment firms following the 1994 election compared to the pre-1994 period. The differences between the pre- and post-1994 estimates are positive and economically large for both measures of patent activity. This stands in sharp contrast to the dynamics of patent activity for the control firms, which shows no discernible trend in patent applications or patent application growth from before to after 1994. The bottom two rows show that the resulting difference-in-difference estimates are significantly positive in tests using both sets of the control firms and for patent activity measured in levels and changes.

Table 4 decomposes the post-1994 period by year. We estimate the following regression:

$$Innovation_{it+1} = \beta_i + \beta_1 I(Year)_t + \beta_2 I(Year)_t \times Treatment\ firm_i + \varepsilon_{it+1}, \quad (10)$$

where $Innovation_{it+1} \in \{Effpatent_{it+1}; \Delta Effpatent_{it+1}\}$ is a measure of patent activity of firm i during the year t+1, β_i is the firm fixed effect, $I(Year)_t$ is an indicator time variable that identifies post-1994 years, $Treatment\ firm_i$ is an indicator variable set to one for firms in the treatment group and zero otherwise and ε_{it+1} is an error term. Note that the indicator $Treatment\ firm_i$ by itself is not in Eq. 9 because it is perfectly collinear with the firm fixed effect β_i.

Panel A (panel B) presents the results comparing patent activity of the treatment firms with that of the control firms with committee chair contributions (without committee chair contributions). Models 1 and 3 corroborate our findings in figure 1 and table 6 and show a significant treatment effect in the post-1994 period. Models 2 and 4 show that when the post-event window is decomposed by year, the treatment effect is concentrated in the post-1996 period. The lag between the committee chair appointments and subsequent patent activity makes intuitive sense given that it takes considerable time and resources for firms

to adjust their innovation activity to new information (Atanassov (2013)). As a robustness test, we repeat the analysis in this section by measuring patent activity with patent citations rather than patent applications and obtain qualitatively similar results.

Our final set of tests in this section is a series of "placebo" difference-in-difference estimations. First, even though the pre-1994 election results in panel A of figure 1 show no clear differences in trends in patent activity between the treatment and the control firms, it is still possible that the treatment firms operate on a higher patent growth trajectory compared to the control firms, and the post-1994 results simply reflect the differences in those growth trajectories. To address this possibility, we "rewind" the timing of our experiment to coincide with the beginning of our sample period and create a placebo election in November 1987. We treat the 1984 – 1987 period as the pre-"election" period and the 1988 – 1992 period as the post-"election" period and report the results of the difference-in-difference estimation in panels B in figure 1 and table 3. It is clear from both panels that the treatment firms exhibit similar trends in patent activity before and after the placebo election. Moreover, the difference in trends of the treatment firms is not significantly different from the differences in trends of the control firms. None of the difference-in-difference results are statistically significant in table 3, which indicates that, absent the treatment, the treatment firms behave no differently than the control firms in our sample.

In the previous test, our choice of November 1987 as a "placebo" election is admittedly ad hoc. So, in the second "placebo" test, instead of fixing the election year in 1987, we randomly pick a year in our sample (except 1994) and then randomly pick treatment and control firms. Randomly picking treatment and control firms allows us to also test if there is something special about our actual treatment firms compared to control firms. We repeat the process 1,000 times and reestimate the difference-in-difference regressions in Eq. 9 for each simulation run. We then report the 95% confidence intervals from the bootstrap simulation in square brackets in table 4. The 95% confidence interval is calculated as the 2.5^{th} percentile of the 1,000 parameter estimates from the bootstrap and the 97.5^{th} percentile of the same distribution. The bootstrap results show that the actual treatment firms significantly increase their patent activity following the 1994 election compared to what is expected by random chance. The actual parameter estimates on the interaction between the treatment firm indicator and the post-1994 indicators are outside the 95% bootstrapped confidence intervals in all years except 1995. In the third "placebo" test, we keep 1994 as the event year and instead randomly pick treatment and control firms in that year. This allows us to further address the possibility that there is something special about our treatment firms in 1994 unrelated to the 1994 election. As before, we reestimate the difference-in-difference regressions in Eq. 9 1,000 times and record the 95% bootstrapped confidence interval. In this bootstrap simulation, we find that randomly chosen treatment firms exhibit similar patent activity compared to randomly chosen control firms in the post-1994 period. The full results of the bootstrap simulations are available upon request. Based on the

preponderance of evidence, we conclude that politically active treatment firms significantly increase their patent activity following the 1994 election compared to the control firms.

5. Political activism spillovers

The above results raise an important question of whether firm political activism spills over into innovation efforts of other firms. On the one hand, politically active firms may cannibalize on the innovation efforts of other industry firms due to the former's superior access to relevant political information. In this case, political activism simply redistributes innovation efforts from politically inactive to politically active firms, leaving aggregate innovation unchanged. On the other hand, superior political information of politically active firms may spill over to other (geographically proximate) firms, which may, in turn, increase aggregate innovation if innovation spillovers do not hurt other firms. The idea that knowledge spillovers benefit firms dates back at least to Marshall (1890):

> "When an industry has thus chosen a location for itself, it is likely to stay there long: so great are the advantages which people following the same skilled trade get from near neighborhood to one another. The mysteries of the trade become no mysteries; but are as it were in the air, and children learn many of them unconsciously. Good work is rightly appreciated, inventions and improvements in machinery, in processes and the general organization of the business have their merits promptly discussed: if one man starts a new idea, it is taken up by others and combined with suggestions of their own and thus it becomes the source of further new ideas".

Consistent with this quote, Jaffe, Trajtenberg, and Henderson (1993) and Thompson and Fox-Kean (2005) in studies of patent citations argue that proximity plays an important role in exchange of scientific ideas. Hence, political activism may increase innovation of not only politically active firms but also that of politically inactive firms, especially those that are geographically close to politically active firms.

Table 5 analyzes political activism spillovers into innovation of other industry and geographically proximate firms. Panel A presents the results for intra-industry spillovers. To minimize concerns of spurious intra-industry correlations (larger firms leading smaller firms in the same industry, for example), we employ a propensity-score matching methodology. Specifically, for each politically active firm in our sample, we select a propensity-score matched politically inactive firm that operates in the same Fama-French 48 industry. Propensity scores are calculated by matching on firm size, total sales, the number of employees, the number of business segments, the number of geographic segments, the book-to-market ratio, leverage, cash flow, market share, the industry Herfindahl index, government purchases, the number of politically active firms in the same industry, and the percent of employees unionized in the same industry. We then regress innovation of propensity-score matched politically inactive firms on political activism measures of politically active firms. The results in columns 1 and 2 show that political activism spills over into higher innovation of politically inactive firms. The coefficients on the number of supported candidates and the political contribution amount are positive and significant at the 5% level or higher. In terms of economic magnitudes, recall from table 2.1 in the Online Appendix that firms in the 25th percentile of the

number of supported political candidates support 14 candidates, while firms in the 75th percentile of that distribution support 117 candidates. Thus, an interquartile increase in the number of supported candidates is associated with an additional 0.034 – 0.085 patent applications for politically inactive firms over the next year. These economic magnitudes are naturally smaller than those of politically active firms and represent about a fifth to a third of the magnitude of the latter. We next split our sample period into years of high and low political uncertainty. Periods of high (low) political uncertainty are years when the annual economic policy uncertainty index of Baker, Bloom and Davis (2016) is above (below) the sample median. The results in columns 3 – 6 show greater spillover effects during periods of high political uncertainty, which is consistent with the idea that knowledge spillovers are particularly valuable during times of high uncertainty. The results imply that an interquartile increase in the number of supported candidates (the amount of political contributions) is associated with an additional 0.068 (0.165) patent application for politically inactive firms during periods of high political uncertainty, while the effects are negligible for periods of low political uncertainty.

Panel B presents the results for local spillovers. We follow a similar propensity-score matching methodology as in panel A and select for each politically active firm in our sample a propensity-score matched politically inactive firm that operates closest to the politically active firm. We then regress innovation of propensity-score matched local political inactive firms on political activism measures of politically active firms. The results show that political activism spills over into higher innovation of geographically proximate politically inactive firms. The coefficients on the political activism measures are positive and significant at the 5% level or higher and the economic magnitudes imply that an interquartile increase in firm political activism is associated with an additional 0.024 – 0.045 patent applications of local politically inactive firms. These effects are similar in magnitude to the effects in panel A. In columns 3 – 6, we find that the relation between political activism and innovation of local politically inactive firms is stronger during periods of high political uncertainty, which again is consistent with the idea that knowledge spillovers are valuable during periods of high uncertainty.

The results are thus far consistent with positive spillovers from firm political activism. It can still be the case, however, that the positive spillovers are confined to similar industry and local firms but come at the expense of other industry and geographically proximate firms. So, in table 6, we analyze the relation between aggregate industry and local political activism (defined at the MSA level) and aggregate industry and local innovation. Panel A presents the aggregate industry results; panel B presents the aggregate local results. Consistent with positive spillover effects, the results in both panels show that aggregate political activism is associated with higher aggregate innovation. All coefficients in panels A and B are positive and significant at the 1% level. The results also imply that an interquartile increase in aggregate political activism (1,636 supported candidates and $4,068,030 in total political contributions) is associated with an additional 0.402 – 0.661 patent applications at the industry level and an additional 1.318 – 1.360 patent

applications at the local level. Also consistent with the results in table 5, the results in table 6 show that the positive spillover effects on aggregate innovation are stronger during periods of high political uncertainty. In those years, an interquartile increase in the number of supported candidates and total contributions is associated with an additional 0.527 – 0.802 patent applications at the industry level and an additional 1.345 – 1.565 patent applications at the local level. We repeat our analysis using patent citations as a measure of innovation and found similar results. We also get similar results when innovation is measured over a 3-year period as in section 4. The results are available upon request.

The final test that we perform in this section is analyzing inter-industry political activism spillovers. It is possible, for example, that superior access to relevant political information forces politically active firms to incentivize firms in supplier and / or customer industries to innovate more. Using Compustat data on firm customer / supplier relations, we analyze whether political activism of politically active firms spills over into higher innovation of important customer / supplier firms. We find no evidence of inter-industry spillovers, either up or down the politically active firms' supply chain. The coefficients on political activism variables are mostly insignificant and do not exhibit a consistent pattern across our empirical tests. We do not report the results of these tests in the interest of space but they are available upon request. Overall, the results in this section are consistent with the hypothesis that political activism is associated with higher innovation of not only politically active firms but also that of politically inactive firms that operate in the same industry and the same location. As a result, firm political activism is associated with higher aggregate innovation.

6. Discussion and conclusions

In our analysis in sections 4 and 5, we have focused exclusively on the information acquisition hypothesis for the positive effect of political activism on firm innovation. There are, however, at least two other possibilities to consider. First, it is possible that the positive association between political activism and firm innovation arises because firms engage in "buffering" strategies (Meznar and Nigh (1995) and Blummentritt (2003)) and actively lobby for favorable legislation. Similar to information acquisition, "buffering" may also lower political uncertainty for politically active firms, thereby stimulating investment in innovation. Another possibility is that politically active firms lobby the government for procurement contracts which require higher levels of innovation. Under both alternatives, the positive association between political activism and innovation arises not because of politically active firms' superior access to private legislative information but because of their lobbying efforts.

We perform several tests in the Online Appendix to distinguish our information acquisition hypothesis from the lobbying and the procurement hypotheses. In the interest of space, we provide only a brief summary of these tests here and refer interested readers to the Online Appendix, Section 4 for full details. In the first test, we analyze whether politically active firms are better able to predict future

legislative changes (because they know the lawmakers' political cost) and, therefore, set their innovation strategies in expectation of upcoming legislative changes. We test and find that changes in innovation by politically active firms do indeed predict future legislative changes, which further reinforces our information acquisition hypothesis. To address the lobbying hypothesis in detail, we study the relation between political activism and innovation in two industries, trucking and telecommunications, around deregulation and find that trucking companies (which lobbied heavily against deregulation) actually increased their innovation efforts just prior to deregulation while telecommunication companies (which lobbied for deregulation) innovated less in the years prior to deregulation. The lobbying hypothesis would predict less innovation for trucking companies just prior to deregulation and more innovation for telecommunication companies during the regulated period. Our results show the opposite, which is consistent with the information acquisition hypothesis but inconsistent with the lobbying hypothesis.

To address the procurement hypothesis, we study whether the relation between political activism and innovation is stronger for industries that sell at least some of their output to the government but find no evidence of this behavior. We also compare the innovation activity of politically active and inactive firms across the government connected and non-connected industries. Under the procurement hypothesis, we should see higher level of innovation for politically active firms, but only in the government connected industries. The results show that politically active firms obtain more patents on average compared to inactive firms, but the difference is only significant for firms in non-connected industries. We also find that firms in government connected industries innovate less irrespective of their political activism status. Both results are inconsistent with the procurement hypothesis. In sum, the results in the Online Appendix provide further support for the information acquisition hypothesis while offer little support for the lobbying and the procurement hypotheses.

To conclude, in this paper, we present novel evidence of a positive relation between firm political activism and innovation. Our evidence is consistent with the information acquisition channel, whereby politically active firms use political contributions to obtain private legislative information, which allows them to lower political uncertainty and innovate more. We also document significant positive intra-industry and local spillovers from firm political activism, which translates into higher aggregate industry and local innovation. The results in this paper contribute to our understanding of the sources of value from political activism and suggest that political activism is an important determinant of firm innovation. Our results are consistent with the view that firms are not passive with respect to political uncertainty but actively engage in strategies that minimize political uncertainty. These results add to the policy uncertainty literature and to our understanding of its impact on corporate investment.

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Appendix A
Variables construction

Variable	Definition
Innovation measures	
$Cpatent_{[t+1, t+3]}$	Natural logarithm of one plus firm *i*'s total number of citations per patent applied for in years *t+1*, *t+2* and *t+3*. The citations of each patent are adjusted for truncation bias by scaling citations of a given patent by the mean number of citations received by all patents in that year in the same technological class as the patent.
$Cpatent_{t+1}$	Natural logarithm of one plus firm *i*'s total number of citations per patent applied for in year *t+1*, adjusted for truncation bias.
$Effpatent_{[t+1, t+3]}$	Natural logarithm of one plus firm *i*'s total number of patents in application years *t+1*, *t+2* and *t+3*. Each patent is adjusted for truncation bias, which is corrected by dividing each patent for each firm-year by the mean number of patents of all firms for that year in the same technology class as the patent.
$Effpatent_{t+1}$	Natural logarithm of one plus firm *i*'s total number of patents in application year *t+1*, adjusted for truncation bias.
Control variables	
R&DAssets	R&D expenditure (XRD) divided by book value of total assets (AT) measured at the end of fiscal year, set to 0 if missing. We adjust for inflation.
ROA	Operating income before depreciation (OIBDP) divided by book value of total assets (AT), measured at the end of fiscal year. We adjust for inflation.
PPEAssets	Property, Plant & Equip (PPENT) divided by book value of total assets (AT), measured at the end of fiscal year. We adjust for inflation.
Leverage	Book value of debt (DLTT+DLC) divided by book value of total assets (AT), measured at the end of fiscal year. We adjust for inflation.
CapexAssets	Capital expenditure (CAPX) divided by book value of total assets (AT), measured at the end of fiscal year. We adjust for inflation and set it to 0 if missing.
HI	Herfindahl index in year *t* constructed based on sales at the 4-digit SIC.
HISquare	HI x HI
TobinQ	A firm's market-to-book ratio at the end of fiscal year, calculated as book value of total assets plus market value of equity minus book value of equity minus balance sheet deferred taxes (txdb, set to 0 if missing) divided by book value of total assets, i.e. (AT+CSHOcPRCC_F-CEQ-txdb)/AT.
Size	Natural logarithm of book value of total assets (AT) measured at the end of fiscal year.
Age	Firm age. It equals the number of years since its first appearance on the CRSP database.

Appendix B
Determinants of firms' political activity, 1984–2004: First-stage probit model

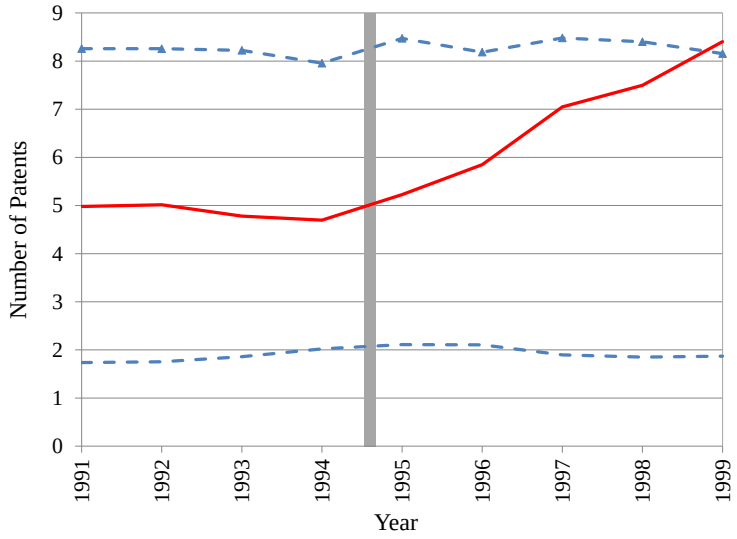
A firm's political activity status is regressed on the natural logarithm of firm size (Ln(size)), the natural logarithm of firm sales (Ln(sales)), the natural logarithm of the number of employees (Ln(employees)), the number of the firm's business segments (No. business segments), the number of the firm's geographic segments (No. geographic segments), the book-to-market ratio (BM), leverage (Leverage), cash flow (CF), the firm's market share in the industry (Market share), market share squared ((Market share)^2), the Herfindahl sales concentration index (Herfindahl index), the regulated industry indicator (Regulation indicator), the amount of industry output purchased by the government (Government purchases), the number of political active firms in the industry (No. politically active firms), and the percentage of industry employees that are unionized (Pct. Employees unionized). Political activity status is equal to one if a firm has a registered political action committee in November of year *t*, and zero otherwise. The probit model is estimated annually for all firms on the merged CRSP/Compustat database with non-missing values of independent variables. The sample has 143,274 firm-year observations. From the probit model, we calculate the inverse Mills ratio (IMR) from Heckman (1979) each year and include this ratio as a lagged independent variable in table 3, 4, and 5 regressions.

	Probit Model (1 = active; 0 = not active)
Variable	Coefficient
Ln(size)	0.187[a]
	(0.005)
Ln(sales)	0.136[a]
	(0.007)
Ln(employees)	0.215[a]
	(0.007)
No. business segments	0.029[a]
	(0.004)
No. geographic segments	-0.062[a]
	(0.005)
BM	-0.000[a]
	(0.000)
Leverage	0.274[a]
	(0.025)
CF	-0.026[b]
	(0.010)
Market share	1.840[a]
	(0.312)
(Market share)^2	-3.206[a]
	0.645
Herfindahl index	-0.342[a]
	(0.104)
Regulation indicator	0.773[a]
	(0.017)
Government purchases	0.848[a]
	(0.102)
No. politically active firms	-0.000[a]
	(0.000)
Pct. employees unionized	2.014[a]
	(0.062)
Log likelihood	-30,662
N	143,274

Figure 1
Corporate innovation surrounding the 1994 midterm Congressional election

The political contributions data are from the FEC detailed contribution files. We exclude all noncorporate contributions, contributions from private firms and subsidiaries of foreign firms, as well as contributions from firms with insufficient data on CRSP/Compustat. The final sample consists of 813,692 political contributions to 5,584 unique political candidates made by 1,805 unique firms. This figure presents the time-series dynamics of patent applications of different firms surrounding the 1994 midterm Congressional election and a 1987 "placebo" election. Panel A presents the results for the 1994 midterm Congressional election. Panel B presents the results for the 1987 "placebo" election. The solid line tracks the treatment firms. The dashed line tracks the control firms without chair contributions. The dashed line with a triangular marker tracks the control firms with chair contributions. The shaded area designates the November 1994 election. The portfolio of treatment firms comprises 126 firms that supported four junior politicians who unexpectedly became committee chairs in November 1994. The portfolio of control firms with chair contributions comprises 475 firms that supported one or more existing committee chairs during the 1990-1994 and the 1995-1999 periods. The portfolio of control firms without chair contributions comprises 197 firms that did not support existing committee chairs during the 1990-1994 and the 1995-1999 periods.

Panel A: 1994 midterm Congressional election



Panel B: 1987 "placebo" election

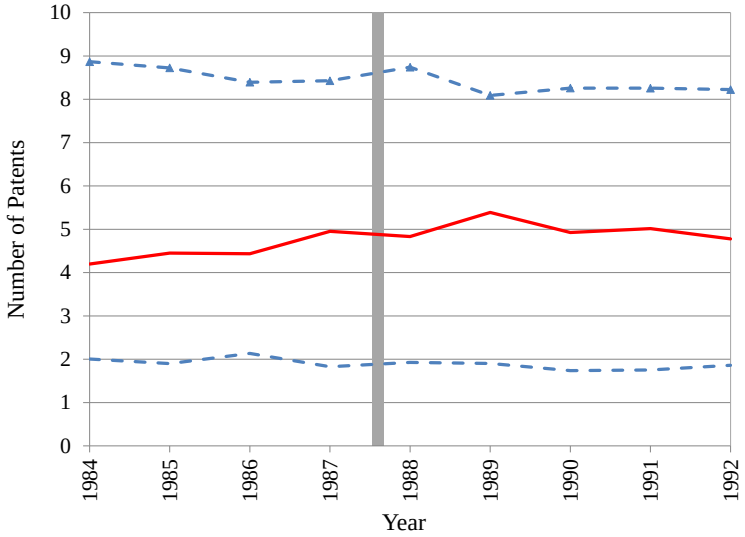


Table 1
Political contributions and corporate innovation, 1984 – 2004

The political contributions data are from the FEC detailed contribution files. We exclude all noncorporate contributions, contributions from private firms and subsidiaries of foreign firms, as well as contributions from firms with insufficient data on CRSP/Compustat. The final sample consists of 813,692 political contributions to 5,584 unique political candidates made by 1,805 unique firms. This table presents the results of estimating Eq. 7 on the sample of politically active and inactive firms for the period November 1984 – October 2004. Models 1, 2, 5, and 6 present the results for all firms with available data on CRSP/Compustat and include 123,531 firm-year observations. Models 3, 4, 7, and 8 present the results for politically active firms only and include 16,065 firm-year observations. We control for firm self-selection in models 3, 4, 7, and 8 by including the inverse Mills ratio (IMR) from the first-stage probit model of whether a firm has an established PAC on determinants of PAC participation. The first stage probit results are presented in Appendix B. Panel A presents the results for the total number of patent applications. Panel B presents the results for the total number of patent citations. All regressions include industry and year fixed effects. All variables are defined in section 2.2 and Appendix A. Standard errors are in parentheses and are adjusted for heteroskedasticity and correlated within firms. R^2 is the adjusted R-squared in the regression. *R^2 controls only* is the adjusted R-squared from the model that includes only the control variables but does not include measures of political activism. *N* is the total number of firm-year observations. [a], [b], [c], indicates significance at the 1%, 5%, and 10% level, respectively.

Panel A: Number of patents

	Effpatent$_{t+1}$				Effpatent$_{t+3}$			
Variable	1	2	3	4	5	6	7	8
Pcand/10^2	0.276[a]		0.162[a]		0.340[a]		0.202[a]	
	(0.036)		(0.038)		(0.043)		(0.046)	
Camount/10^6		0.602[a]		0.298[a]		0.771[a]		0.397[a]
		(0.099)		(0.093)		(0.122)		(0.115)
R&D / Assets	0.689[a]	0.692[a]	11.197[a]	11.226[a]	1.160[a]	1.163[a]	14.444[a]	14.464[a]
	(0.055)	(0.056)	(1.791)	(1.802)	(0.080)	(0.080)	(2.229)	(2.238)
ROA	0.120[a]	0.100[a]	0.711[a]	0.710[a]	0.248[a]	0.225[a]	1.118[a]	1.122[a]
	(0.019)	(0.019)	(0.266)	(0.270)	(0.027)	(0.027)	(0.355)	(0.359)
PPE / Assets	-0.054[b]	-0.042[c]	-0.283[b]	-0.242[c]	-0.070[b]	-0.055	-0.372[b]	-0.321[c]
	(0.026)	(0.026)	(0.128)	(0.127)	(0.035)	(0.035)	(0.166)	(0.166)
Leverage	-0.132[a]	-0.140[a]	-0.159[c]	-0.166[c]	-0.229[a]	-0.238[a]	-0.261[b]	-0.270[b]
	(0.017)	(0.017)	(0.086)	(0.087)	(0.023)	(0.023)	(0.110)	(0.111)
Capex / Assets	0.394[a]	0.382[a]	0.511[c]	0.475	0.552[a]	0.537[a]	0.522	0.475
	(0.045)	(0.046)	(0.292)	(0.291)	(0.061)	(0.062)	(0.370)	(0.370)
HI	0.342[a]	0.365[a]	0.212	0.333	0.548[a]	0.575[a]	0.486	0.630
	(0.098)	(0.099)	(0.391)	(0.391)	(0.128)	(0.129)	(0.486)	(0.485)
HI^2	-0.235[c]	-0.254[b]	0.208	0.081	-0.412[b]	-0.435[a]	0.008	-0.146
	(0.125)	(0.127)	(0.471)	(0.474)	(0.163)	(0.165)	(0.573)	(0.576)
Q	0.026[a]	0.027[a]	0.030	0.033	0.042[a]	0.043[a]	0.040	0.043
	(0.002)	(0.002)	(0.022)	(0.022)	(0.003)	(0.003)	(0.028)	(0.028)
Assets	0.098[a]	0.107[a]	0.127[a]	0.145[a]	0.142[a]	0.153[a]	0.146[a]	0.167[a]
	(0.006)	(0.005)	(0.027)	(0.027)	(0.007)	(0.007)	(0.035)	(0.035)
LnAge	0.050[a]	0.060[a]	0.088[a]	0.101[a]	0.070[a]	0.082[a]	0.107[a]	0.121[a]
	(0.006)	(0.006)	(0.023)	(0.023)	(0.008)	(0.009)	(0.031)	(0.031)
IMR			-0.127[c]	-0.149[b]			-0.210[b]	-0.236[a]
			(0.065)	(0.065)			(0.087)	(0.087)
R^2	0.326	0.316	0.574	0.570	0.361	0.354	0.604	0.601
R^2 controls only	0.296	0.296	0.563	0.563	0.337	0.337	0.594	0.594
N	123,531	123,531	16,065	16,065	118,122	118,122	15,271	15,271

Table 1 – continued

Panel B: Patent citations

	$Cpatent_{t+1}$				$Cpatent_{t+3}$			
Variable	1	2	3	4	5	6	7	8
Pcand/10²	0.035[a]		0.028[a]		0.072[a]		0.060[a]	
	(0.006)		(0.007)		(0.011)		(0.015)	
Camount/10⁶		0.075[a]		0.053[a]		0.163[a]		0.117[a]
		(0.016)		(0.017)		(0.032)		(0.035)
R&D / Assets	0.500[a]	0.500[a]	2.270[a]	2.274[a]	0.965[a]	0.966[a]	4.042[a]	4.048[a]
	(0.029)	(0.029)	(0.292)	(0.291)	(0.055)	(0.055)	(0.566)	(0.565)
ROA	0.097[a]	0.094[a]	0.169[a]	0.169[a]	0.213[a]	0.208[a]	0.320[b]	0.322[b]
	(0.008)	(0.008)	(0.062)	(0.063)	(0.016)	(0.016)	(0.133)	(0.134)
PPE / Assets	-0.022[a]	-0.021[b]	-0.063[b]	-0.056[c]	-0.040[b]	-0.037[b]	-0.111[c]	-0.096
	(0.008)	(0.008)	(0.032)	(0.032)	(0.017)	(0.017)	(0.067)	(0.067)
Leverage	-0.068[a]	-0.069[a]	-0.028	-0.030	-0.152[a]	-0.154[a]	-0.090[c]	-0.092[c]
	(0.006)	(0.006)	(0.025)	(0.025)	(0.012)	(0.012)	(0.049)	(0.050)
Capex / Assets	0.141[a]	0.140[a]	0.025	0.019	0.267[a]	0.264[a]	0.086	0.072
	(0.017)	(0.017)	(0.077)	(0.077)	(0.032)	(0.032)	(0.157)	(0.158)
HI	0.108[a]	0.111[a]	0.200[b]	0.220[a]	0.224[a]	0.230[a]	0.501[a]	0.544[a]
	(0.027)	(0.027)	(0.085)	(0.085)	(0.055)	(0.055)	(0.174)	(0.173)
HI²	-0.094[b]	-0.096[a]	-0.128	-0.149	-0.188[a]	-0.193[a]	-0.363[c]	-0.409[b]
	(0.033)	(0.033)	(0.098)	(0.098)	(0.066)	(0.067)	(0.200)	(0.199)
Q	0.014[a]	0.014[a]	0.007	0.007	0.028[a]	0.028[a]	0.020[c]	0.021[c]
	(0.001)	(0.001)	(0.005)	(0.005)	(0.002)	(0.002)	(0.011)	(0.011)
Assets	0.030[a]	0.032[a]	0.007	0.010	0.060[a]	0.062[a]	0.015	0.021[c]
	(0.001)	(0.001)	(0.006)	(0.006)	(0.002)	(0.002)	(0.013)	(0.013)
LnAge	0.011[a]	0.013[a]	0.019[a]	0.021[a]	0.024[a]	0.027[a]	0.031[b]	0.035[a]
	(0.002)	(0.002)	(0.006)	(0.006)	(0.004)	(0.004)	(0.013)	(0.013)
IMR			-0.057[a]	-0.061[a]			-0.111[a]	-0.119[a]
			(0.017)	(0.017)			(0.035)	(0.035)
R^2	0.203	0.202	0.385	0.384	0.279	0.278	0.469	0.468
R^2 *controls only*	0.201	0.201	0.381	0.381	0.275	0.275	0.464	0.464
N	123,531	123,531	16,065	16,065	118,122	118,122	15,271	15,271

Table 2
Political contributions to Congressional Committees and corporate innovation, 1984 – 2004

The political contributions data are from the FEC detailed contribution files. We exclude all noncorporate contributions, contributions from private firms and subsidiaries of foreign firms, as well as contributions from firms with insufficient data on CRSP/Compustat. The final sample consists of 813,692 political contributions to 5,584 unique political candidates made by 1,805 unique firms. This table presents the results of estimating Eq. 7 various subsamples of firms and political contributions measures. Models 1 – 4 present the results for the total number of patent applications. Models 5 – 8 present the results for the total number of patent citations. All regressions include industry and year fixed effects, all control variables from table 3 and control for firm self-selection into the politically active group with the inverse Mills ratio (IMR). Panel B presents the results for political contributions to members of influential and outside Congressional committees defined in section 2.2. Panel C presents the results for political contributions to members who join or leave influential committees. Panel D presents the results for political contributions to members who join or leave influential committees during election and non-election years. Standard errors are in parentheses and are adjusted for heteroskedasticity and correlated within firms. [a], [b], [c], indicates significance at the 1%, 5%, and 10% level, respectively.

	Effpatentt+1		Effpatentt+3		Cpatentt+1		Cpatentt+3	
Variable	1	2	3	4	5	6	7	8
Panel A: Contributions to winning and losing politicians								
$Pcand^{Winner}/10^2$	0.949[a]		1.110[a]		0.140[a]		0.283[a]	
	(0.225)		(0.267)		(0.043)		(0.084)	
$Camount^{Winner}/10^6$		5.351[a]		6.458[a]		0.764[c]		1.554[b]
		(1.973)		(2.468)		(0.397)		(0.768)
$Pcand^{Loser}/10^2$	10.445		11.333		1.612		2.234	
	(9.013)		(13.019)		(2.296)		(4.628)	
$Camount^{Loser}/10^6$		38.726		64.375		15.000		17.155
		(57.404)		(95.282)		(16.944)		(34.827)
R^2	0.573	0.566	0.604	0.599	0.383	0.382	0.470	0.467
N	16,065	16,065	15,271	15,271	16,065	16,065	15,271	15,271
Panel B: Contributions to influential and outside Congressional committees								
$Pcand^{Committee}/10^2$	0.774[a]		0.965[a]		0.083[a]		0.176[a]	
	(0.158)		(0.200)		(0.031)		(0.064)	
$Camount^{Committee}/10^6$		1.310[a]		1.786[a]		0.200[b]		0.439[a]
		(0.378)		(0.501)		(0.075)		(0.161)
$Pcand^{Non\text{-}Committee}/10^2$	-1.157[b]		-1.071		-0.112		-0.200	
	(0.528)		(0.748)		(0.190)		(0.370)	
$Camount^{Non\text{-}Committee}/10^6$		-1.629		-1.124		-0.035		0.064
		(1.300)		(1.722)		(0.493)		(0.838)
R^2	0.499	0.495	0.527	0.527	0.350	0.351	0.426	0.428
N	12,317	12,317	11,740	11,740	12,317	12,317	11,740	11,740
Panel C: Contributions to politicians joining/leaving influential committees								
$\Delta Pcand^{+}$	0.068[a]		0.122[a]		0.011[a]		0.045[a]	
	(0.014)		(0.035)		(0.004)		(0.015)	
$\Delta Pcand^{-}$	0.007		-0.063[c]		0.001		0.008	
	(0.013)		(0.036)		(0.004)		(0.016)	
$I(\Delta Pcand^{+} > \Delta Pcand^{-})$		0.086[a]		0.095[a]		0.023[a]		0.023[a]
		(0.027)		(0.019)		(0.009)		(0.006)
$I(\Delta Pcand^{+} < \Delta Pcand^{-})$		-0.049[c]		-0.005[b]		0.007		-0.002
		(0.027)		(0.016)		(0.009)		(0.007)
R^2	0.559	0.554	0.592	0.597	0.389	0.387	0.473	0.474
N	11,323	11,323	10,796	10,796	11,323	11,323	10,796	10,796

Table 2 – continued

Panel D: Contributions to politicians joining/leaving influential committees during election and off-election years								
				Election year coefficients				
$\Delta Pcand^{+}$	0.036		0.076		-0.001		0.029	
	(0.039)		(0.057)		(0.010)		(0.026)	
$\Delta Pcand^{-}$	0.041		-0.032		0.022		0.042	
	(0.037)		(0.061)		(0.015)		(0.029)	
$I(\Delta Pcand^{+} > \Delta Pcand^{-})$		0.040		0.057		0.013		0.009
		(0.046)		(0.046)		(0.015)		(0.014)
$I(\Delta Pcand^{+} < \Delta Pcand^{-})$		-0.050		0.003		0.030		0.014
		(0.053)		(0.042)		(0.021)		(0.020)
				Non-election year coefficients				
$\Delta Pcand^{+}$	0.071[a]		0.143[a]		0.012[a]		0.050[a]	
	(0.013)		(0.043)		(0.004)		(0.017)	
$\Delta Pcand^{-}$	0.004		-0.069		-0.000		-0.002	
	(0.013)		(0.042)		(0.004)		(0.018)	
$I(\Delta Pcand^{+} > \Delta Pcand^{-})$		0.107[a]		0.100[a]		0.027[a]		0.025[a]
		(0.031)		(0.019)		(0.010)		(0.006)
$I(\Delta Pcand^{+} < \Delta Pcand^{-})$		-0.043		-0.007		0.003		-0.004
		(0.031)		(0.016)		(0.010)		(0.007)
R^2	0.559	0.554	0.592	0.597	0.389	0.387	0.473	0.474
N	11,323	11,323	10,796	10,796	11,323	11,323	10,796	10,796

Table 3
Political contributions and corporate innovation: Difference-in-difference estimation surrounding the 1994 midterm Congressional election

The political contributions data are from the FEC detailed contribution files. We exclude all noncorporate contributions, contributions from private firms and subsidiaries of foreign firms, as well as contributions from firms with insufficient data on CRSP/Compustat. The final sample consists of 813,692 political contributions to 5,584 unique political candidates made by 1,805 unique firms. This table presents the results of the difference-in-difference estimation. Panel A presents the results for the 1994 midterm Congressional election. Panel B presents the results for the 1987 "placebo" election. The portfolio of treatment firms comprises 126 firms that supported four junior politicians who unexpectedly became committee chairs in November 1994. The portfolio of control firms with chair contributions comprises 475 firms that supported one or more existing committee chairs during the 1990-1994 and the 1995-1999 periods. The portfolio of control firms without chair contributions comprises 197 firms that did not support existing committee chairs during the 1990-1994 and the 1995-1999 periods. Columns 1 – 3 present the average number of patent applications submitted by the treatment and the control firms during the pre-1994 and post-1995 period. Columns 4 – 6 presents the average growth in patent applications submitted by the treatment and the control firms during the pre-1994 and post-1995 period. The bottom two rows present the difference-in-difference results. T-statistics for the difference-in-difference estimates are in parentheses.

Panel A: 1994 midterm Congressional election

	$Effpatent_{t+1}$			Δ $Effpatent_{t+1}$		
Firms	Pre-1994	Post-1995	Difference	Pre-1994	Post-1995	Difference
(1)Treatment firms	4.851	7.152	2.301	0.120	0.670	0.550
(2) Control firms with chair contributions	8.172	8.309	0.137	0.014	-0.287	-0.301
(3) Control firms w / o chair contributions	1.850	1.938	0.087	0.061	-0.024	-0.085
DiD (1 – 2)			2.164			0.851
			(2.21)			(4.06)
DiD (1 – 3)			2.214			0.635
			(2.39)			(3.21)

Panel B: 1987 "placebo" election

	$Effpatent_{t+1}$			Δ $Effpatent_{t+1}$		
Firms	Pre-1987	Post-1988	Difference	Pre-1987	Post-1988	Difference
(1)Treatment firms	4.514	5.020	0.505	0.229	0.124	-0.105
(2) Control firms with chair contributions	8.596	8.208	-0.388	0.095	0.088	-0.007
(3) Control firms w / o chair contributions	1.966	1.813	-0.153	0.176	0.054	-0.122
DiD (1 – 2)			0.894			-0.098
			(0.96)			(-0.59)
DiD (1 – 3)			0.658			0.017
			(0.57)			(0.07)

Table 4
Difference-in-difference estimation surrounding the 1994 midterm Congressional election: Regression results

The political contributions data are from the FEC detailed contribution files. We exclude all noncorporate contributions, contributions from private firms and subsidiaries of foreign firms, as well as contributions from firms with insufficient data on CRSP/Compustat. The final sample consists of 813,692 political contributions to 5,584 unique political candidates made by 1,805 unique firms. This table presents the results of estimating Eq. 9. The portfolio of treatment firms comprises 126 firms that supported four junior politicians who unexpectedly became committee chairs in November 1994. The portfolio of control firms with chair contributions comprises 475 firms that supported one or more existing committee chairs during the 1990-1994 and the 1995-1999 periods. The portfolio of control firms without chair contributions comprises 197 firms that did not support existing committee chairs during the 1990-1994 and the 1995-1999 periods. Panel A presents the results for the treatment firms and the control firms with chair contributions. Panel B present the results for the treatment firms and the control firms without chair contribution. *I(post-1994)* is an indicator variable set to one for years 1995 – 1999 and zero otherwise. *I(Year 1995)* is an indicator variable set to one for 1995 and zero otherwise. *I(Year 1996)* is an indicator variable set to one for 1996 and zero otherwise. *I(Post-1996)* is an indicator variable set to one for years 1997-1999 and zero otherwise. We drop the year of 1995 in models 1 and 3. Standard errors are in parentheses and are adjusted for heteroskedasticity and correlated at the firm-post-event level. [a], [b], [c], indicates significance at the 1%, 5%, and 10% level, respectively.

Variable	$Effpatent_{t+1}$	$Effpatent_{t+1}$	Δ $Effpatent_{t+1}$	Δ $Effpatent_{t+1}$
Panel A: Treatment vs. control firms with chair contributions				
I(Post-1994)	-5.491[a]	-5.387[a]	-1.594[a]	-1.585[a]
	(1.116)	(1.117)	(0.471)	(0.489)
	[-2.407; -2.089]	[-2.107; -1.791]	[-0.545; -0.443]	[-0.494; -0.375]
Treatment firm × I(Post-1994)	2.342[b]		0.832[a]	
	(0.914)		(0.240)	
	[-0.088; 0.081]		[-0.001; 0.063]	
Treatment firm × I(Year 1995)		0.036		0.066
		(0.818)		(0.459)
		[-0.041; 0.100]		[-0.014; 0.067]
Treatment firm × I(Year 1996)		1.044		0.413
		(0.844)		(0.433)
		[-0.015; 0.156]		[-0.081; 0.018]
Treatment firm × I(Post-1996)		2.905[a]		0.967[a]
		(1.021)		(0.364)
		[-0.065; 0.144]		[-0.070; 0.026]
N	4,354	4,935	4,354	4,935
R^2	0.917	0.919	0.169	0.167

Table 4 – continued

Variable	$Effpatent_{t+1}$	$Effpatent_{t+1}$	Δ $Effpatent_{t+1}$	Δ $Effpatent_{t+1}$
Panel B: Treatment vs. control firms w / o chair contributions				
I(Post-1994)	-1.221	-1.382[b]	-0.641[b]	-0.663[a]
	(0.741)	(0.764)	(0.317)	(0.337)
	[-0.554; -0.310]	[-0.556; -0.326]	[-0.406; -0.309]	[-0.366; -0.275]
Treatment firm × I(Post-1994)	1.672[b]		0.540[a]	
	(0.761)		(0.162)	
	[-0.102; 0.016]		[-0.025; 0.020]	
Treatment firm × I(Year 1995)		0.089		0.299
		(0.691)		(0.414)
		[-0.011; 0.078]		[-0.007; 0.053]
Treatment firm × I(Year 1996)		0.518		0.463
		(0.765)		(0.373)
		[-0.031; 0.083]		[-0.049; 0.013]
Treatment firm × I(Post-1996)		2.203[a]		0.560[b]
		(0.840)		(0.261)
		[-0.085; 0.062]		[-0.018; 0.047]
N	2,245	2,560	2,245	2,886
R^2	0.890	0.906	0.173	0.189

Table 5
Firm-level political activism spillovers, 1984 – 2004

The political contributions data are from the FEC detailed contribution files. We exclude all noncorporate contributions, contributions from private firms and subsidiaries of foreign firms, as well as contributions from firms with insufficient data on CRSP/Compustat. The final sample consists of 813,692 political contributions to 5,584 unique political candidates made by 1,805 unique firms. This table presents results on firm-level political activism spillovers. Specifically, panel A presents regression results of political inactive firm innovation on political connections of Fama-French 48 industry- and propensity-score matched firms. Panel B presents regression results of political inactive firm innovation on political connections of Metropolitan Statistical Area- and propensity-score matched firms. High (low) uncertainty period is the year when economic policy uncertainty (Baker, Bloom, and Davis (2016)) is greater (smaller) than the sample median. Standard errors are in parentheses and are adjusted for heteroskedasticity and correlated at the firm-post-event level. [a], [b], [c], indicates significance at the 1%, 5%, and 10% level, respectively.

	Whole sample period		High uncertainty period		Low uncertainty period	
Variable	1	2	3	4	5	6
Panel A: Results for industry and propensity-score matched firms						
Pcand/10²	0.032[a]		0.058[a]		0.010	
	(0.011)		(0.015)		(0.015)	
Camount/10⁶		0.072[b]		0.135[a]		0.013
		(0.030)		(0.040)		(0.046)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.465	0.465	0.466	0.466	0.469	0.469
N	11,297	11,297	5,319	5,319	5,587	5,587
Panel B: Results for location and propensity-score matched firms						
Pcand/10²	0.021[b]		0.022[a]		0.014[a]	
	(0.009)		(0.007)		(0.004)	
Camount/10⁶		0.039[b]		0.046[b]		0.029[a]
		(0.018)		(0.021)		(0.010)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.250	0.250	0.156	0.155	0.127	0.126
N	12,074	12,074	6,249	6,249	5,276	5,276

Table 6
Aggregate political activism spillovers, 1984 – 2004

The political contributions data are from the FEC detailed contribution files. We exclude all noncorporate contributions, contributions from private firms and subsidiaries of foreign firms, as well as contributions from firms with insufficient data on CRSP/Compustat. The final sample consists of 813,692 political contributions to 5,584 unique political candidates made by 1,805 unique firms. This table presents results of aggregate political activism spillovers. Specifically, panel A presents regression results of total innovation of political inactive firms on total political connections of industries, which are defined by Fama-French 48 classifications. Panel B presents regression results of total innovation of political inactive firms on total political connections at the MSA level. High (low) uncertainty period is the year when economic policy uncertainty (Baker, Bloom, and Davis (2016)) is greater (smaller) than the sample median. Standard errors are in parentheses and are adjusted for heteroskedasticity and correlated at the firm-post-event level. [a], [b], [c], indicates significance at the 1%, 5%, and 10% level, respectively.

	Whole sample period		High uncertainty period		Low uncertainty period	
Variable	1	2	3	4	5	6
Panel A: Results for aggregate industry innovation						
Pcand/10²	0.031[a]		0.036[a]		0.027[a]	
	(0.004)		(0.006)		(0.005)	
Camount/10⁶		0.083[a]		0.104[a]		0.074[a]
		(0.011)		(0.017)		(0.015)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.928	0.927	0.939	0.939	0.924	0.923
N	1,008	1,008	528	528	432	432
Panel B: Results for aggregate location innovation						
Pcand/10²	0.062[a]		0.068[a]		0.061[a]	
	(0.002)		(0.004)		(0.004)	
Camount/10⁶		0.219[a]		0.222[a]		0.207
		(0.009)		(0.013)		(0.0.13)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.672	0.657	0.665	0.650	0.681	0.666
N	6,114	6,114	3,064	3,064	2,753	2,753