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# Directors as Connectors: The Impact of the External Networks of Directors on Firms

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## ABSTRACT

The external networks of directors significantly impact firm value and decisions. Surrounding close gubernatorial elections, local firms with directors connected to winners increase value by 4.1% over firms connected to losers. Director network's value increases with network strength and activities, and is not due to network homophily. Connected firms are more likely to receive state subsidies, loans, and tax credits. They obtain better access to bank loans, borrow more, pay lower interest, invest and employ more, and enjoy better long-term performance. Network benefits are concentrated on connected firms, possibly through quid pro quo deals, and unlikely spread to industry competitors.

**Keywords**: External Networks of Directors, Board of Directors, Connectors, Regression Discontinuity Design, Close Gubernatorial Election.

**JEL Classifications**: G32, G34.

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*"The point about Connectors is that by having a foot in so many different worlds, they have the effect of bringing them all together."*
Malcolm Gladwell – *The Tipping Point*

## 1. INTRODUCTION

In their seminal paper, Fama and Jensen (1983, page 311) characterize the board of directors as "the common apex of the decision control system." As a crucial internal corporate governance device, the board's main tasks are to monitor the managers and to provide them with strategic advice. During the last three decades, the corporate governance literature has provided rich evidence on many aspects of internal board monitoring and advisory activities. Yet, relatively little is known on the impact of the board's interactions and connections with different outside economic agents on firm value and corporate decisions.[1]

Board members, who are typically experienced and powerful managers, businessmen, and successful professionals, are likely to be well connected people in the center of important business and social networks.[2] The scope of their activities and the depth of their relationship certainly lie beyond the boardroom. Do directors' external social networks impact firm value and corporate decisions such as financing and investments? If yes, what are the potential channels? In this paper, we attempt to answer these important questions, focusing on one aspect by which directors add value to firms: they serve as connectors to external environments.

The outside network of directors can be complex, extensive, and difficult to account for. They can take many forms, including, for example, the 'old boys' networks from former schools, connections through employment, ties from political affiliation, hobbies, and clubs, or memberships of religious and charitable organizations. Hence, our first challenge is to identify one broad and representative type of director networks for our study. For reasons similar to Cohen, Frazzini, and Malloy (2008), Fracassi and Tate (2012), Nguyen (2012), Engelberg, Gao, and Parsons (2013), Shue (2013), Do et al. (2014), and Ishii and Xuan (2014), among others, we study the external networks of board members based on their educational links. First, connections between alumni predate our sample's period for years, if not decades, are unambiguously defined based on publicly available information on all directors, and are less prone to network endogeneity issues. Second, educational links are broad enough to be

[1] See Adams, Hermalin, and Weisbach (2010) for a survey of literature on the board of directors.

[2] Among U.S. nonfinancial firms, Guner, Malmendier, and Tate (2008) show that 44% of board members are outside directors who are executives at a nonfinancial firm; 18% are executives at a financial firm; and 10% are from non-corporate backgrounds. See Allen and Babus (2009) and Jackson (2014) for a literature review on social networks in finance and economics.

representative of directors' social ties, making it possible to generalize the empirical results to other networks of directors. Third, alumni networks also play a particularly important role in the American society. Educational institutions received as much as $41.67 billion in 2010, or 14% of all charitable donations, second only to religious organizations (Giving USA Foundation, 2011.)[3]

As highlighted in the literature, network connections can impact firm value and decisions in a number of ways. They might provide the firm with information advantages that ultimately improve business decisions (e.g., Cohen, Frazzini, and Malloy, 2008). They can also help the firm via direct deals to obtain business contracts or better financing terms (e.g., Faccio, Masulis, and McConnell 2006; Goldman, Rocholl, and So, 2013; Engelberg, Gao, and Parsons, 2012). While our results are consistent with both channels, we focus on the latter. To identify the impact of director networks, our empirical approach relies on close gubernatorial elections that involve the alumni networks of local firms' directors and election candidates, for the following reasons.

First, we expect strong impacts of directors' connections within the world of state politics, commonly known as prone to illicit deals (as reported by Glaeser and Saks, 2006, among others.) Powerful local politicians such as governors are less likely placed under the intense scrutiny faced by federal politicians, thus can enjoy more leeway to provide support to local connected firms (see evidence for example in Do et al. 2014.) Second, with respect to the methodology, close elections can be considered a Regression Discontinuity Design (RDD), a natural experiment of near-randomized-trial internal validity (Lee 2008) that has recently gained popularity in corporate finance.[4] Accordingly, a corporate connection to a narrowly elected contender is at the limit identical to a connection to a narrowly defeated contender. The inclusion of highly visible candidates such as Janet Napolitano in our sample suggests that our estimate covers a broad share of the population of gubernatorial contenders and connected firms.

We build our sample from many data sources. We first obtain past education history for directors of public firms in the U.S. from BoardEx of Management Diagnostics Limited. Data on gubernatorial elections from 1999 to 2010 are downloaded from official state election websites. We compute the vote margin between the winner and the runner-up, and only retain

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[3] Alumni ties can be primordial in the development of professional relationships by providing mutual trust and common access to the same social network (e.g., Lerner and Malmendier 2013). Measurement errors of alumni links as friendships would produce an attenuation bias against finding positive and significant effects of friendships.

[4] Examples include Chava and Roberts (2008), Cuñat, Gine, and Guadalupe (2012), and Kerr, Lerner, and Schoar (2014). Roberts and Whited (2013) provides a review on the RDD and other solutions to endogeneity issues. We detail the methodology in section 2 and the appendix, and show that this cross-sectional identification method possesses several advantages over the traditional event study method.

observations in which this margin is less than 5% of their total votes (therefore less than 5% of the total vote turnout including all other candidates).

We manually collect details of all contenders' educational backgrounds from the web archives of their campaigns, a process made difficult by the search for less prominent defeated candidates. Following Cohen, Frazzini, and Malloy (2008), we classify the university degree programs into six categories that include Undergraduate, MBA, Masters, Medical, PhD, and Law. Using these degrees, we form all pairs between directors and a close gubernatorial election's top two contenders (elected or defeated) who graduated from the same university campus and the same degree program and within five years of each other. This matching process using common educational link provides us with a sample of connected firms.

To increase the likelihood of real network interactions between firms and their connected gubernatorial candidates, we further require connected firms be headquartered either in the election state or within 500 miles from the election state's capital. As a result, we obtain a sample of *local connected firms* defined as 1) having at least one director who graduates from the same university campus and the same university degree as one of the close election's top two contenders, within five years of difference; and 2) being headquartered either in the election state or within 500 miles from the election state's capital.[5]

We conduct our empirical analysis of the impact of director networks on the sample of local connected firms that includes 516 unique firms, 694 connected firm-years, and 483 unique directors from 1999 to 2010. We calculate stock price cumulated abnormal return (*CAR*) of each connected firm around the date of the related candidate's close election. Our main RDD nonparametric specification is implemented in a kernel-weighted regression of a connected firm's *CAR* on the treatment variable *Winner*, an indicator equal to one if a connected contender wins a close election, zero otherwise.

Our first finding is the positive and significant impact of the external networks of directors on firm value. Around the election day, local firms connected to the winner experience a positive and significant average cumulative abnormal return (CAR) of 4.1% above the CAR of local firms connected to a closely defeated contender. It is an increase in firm value of $211.7 million and $27.4 million for our sample's average and median firms, respectively. This result

[5] Our definition of local connected firms relies on an extensive finance literature on the impact of geographic distance. For example, Coval and Moskowitz (1999) find that an average investment manager is 1,654 km away from securities he holds and 1,814 km away from his benchmark portfolio. Ivkovic and Weisbenner (2005) define individual investors' local investments as the ones in firms that are 250 miles from their home. As reported in Table 3 and appendix table A5, our results remain robust to various geographic distance and winning vote margins.

remains robust to a battery of robustness tests, including RDD randomness checks, inclusion of various observable variables, alternative samples, different levels of standard error clustering, and alternative specifications in the event windows and in the market models. [6]

As surveyed by Adams, Hermalin, and Weisbach (2010), the corporate finance literature has paid most attention to the monitoring and advisory roles of corporate boards, which are limited to activities within the boardroom. In contrast, our paper examines the importance of directors as connectors to the world outside the board. It relates to the recent and growing literature on the board's external ties and their impact on corporate decisions. For example, Cohen, Frazzani, and Malloy (2008) show the impact of fund managers' connections to CEOs of portfolio companies on their investments. Butler and Gurun (2012) show that mutual fund managers' connections to CEOs affect executive pay policies. Engelberg, Gao, and Parsons (2012) find that firms connected to bank officers enjoy reduced interest rates, better credit ratings, and performance. Ishii and Xuan (2014) show that board connections negatively impact abnormal returns to acquirers and merged entities. Closest to our paper's spirit is Engelberg, Gao, and Parsons (2013) who find a positive impact of the size of CEOs' external networks on CEO compensation. Beyond the business world, our paper highlights directors' crucial, value-enhancing role in connecting firms with the broader society, and in our case the world of local politics. Our result thus adds to Goldman, Rocholl, and So's (2009, 2013) findings on the corporate benefits of directors who are former politicians and bureaucrats.[7]

In contribution to this literature, our empirical approach provides an identification solution, namely the RDD of close elections, to the endogeneity of directors' external connections. By relying on a near-randomized natural experiment, we also circumvent the shortcomings of typical event studies that cannot measure unobserved prior probabilities of events (Snowberg, Wolfers, and Zitzewitz 2011).

Our second finding is how the characteristics of the social networks of directors affect firm value. Consistent with network theories, stronger and more active connections between a director and an elected governor are more valuable. This evidence contributes to the growing

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[6] In event studies, a common concern is the potential cross-sectional correlation in abnormal returns. Our RDD specification guarantees the near-random nature of the winning status, thus the independence of all winners' identity. The potential bias in standard errors is further addressed by appropriate clustering at many levels. In addition, we restrict the sample on firms located in or close to each election state.

[7] Other than connections via directors, the value of political connections to firms has been studied in various contexts. See for example Fisman (2001), Faccio (2006), Faccio, Masulis, and McConnell (2006), Cooper, Gulen, and Ovtchinnikov (2010), among others. In section 6.5, we discuss one type of connections based on campaign contributions, and show that they do not affect our main results.

literature on the impact of social networks in finance, such as Cohen, Frazzini, and Malloy (2008), Hwang and Kim (2009), Hochberg, Ljungqvist, and Lu (2007, 2010), Kuhnen (2009), Fracassi and Tate (2012), Nguyen (2012), Engelberg, Gao, and Parsons (2012, 2013), Kramarz and Thesmar (2013), Ishii and Xuan (2014), Fracassi, forthcoming, and Schmidt, forthcoming, among others. Prior literature, with the exception of Lerner and Malmendier (2013) and Shue (2013), often considers social networks as exogenous, and does not address the homophily nature of social networks, by which connected people often share similar characteristics. Our results remain robust after controlling for this potential concern using an extensive set of fixed effects.

Our third finding relates to the concrete mechanisms by which firms directly benefit from the external networks of directors. When directors are connected to governors, their firms are 5.1% more likely to receive state subsidies, 4.4% more likely to receive state loans, and 5.6% more likely to receive state tax credits, and the tax credits received increase by $330,000 on average. The direct benefits are local: they are stronger in more corrupt, more regulated, and bigger-government states, while we find no evidence on federal subsidies. Connected firms enjoy better access to bank loans, borrow more, and pay lower interest rate. They also invest more in capital and in staff hiring and achieve better accounting and stock long term performance. Moreover, controlling for broad-based channels such as lobbying for industry-specific policies, we find that the connected firms' benefits are largely concentrated on the connected firms, possibly in quid pro quo deals.

Extant empirical evidence of the real corporate benefits of director networks remains scant. One exception is Goldman, Rocholl, and So (2013), who found the impact of former Republican/Democrat politicians on corporate boards on firms' government contracts. Our paper thus contributes to the literature by providing a wide range of real benefits firms can enjoy thanks to director networks.

Admittedly, firms are embedded in many complex networks, of which director networks are only one type. Our paper's findings contribute to the literature on social networks of firms in general, and calls for further theoretical and empirical research on how those various networks are formed, and influence corporate decisions and performance.

The remaining of the paper is organized as follows. Sections 2 and 3 detail the methodology and the data, respectively. Section 4 reports the empirical results. Section 5 explores possible interpretations and channels of the results. Section 6 reports robustness checks. Section 7 concludes.

## 2. IDENTIFICATION AND EMPIRICAL DESIGN

### 2.1 REGRESSION DISCONTINUITY DESIGN OF CLOSE ELECTIONS

In our election-based experiment, an estimation of the impact of director networks on firm value should overcome a reverse causation channel when a well-performing firm may be able to help its connected contender win an election, or an omitted variable bias when connected firms and contenders are affected by the same unobservable factor, such as a shift in public opinion. The reverse causation and endogeneity bias are best eliminated with a randomization of the assignment of would-be governors to office. If the contender is chosen randomly, no concern exists about either the reverse causation of firm value changes or the influence of some omitted variables. It is, however, extremely difficult to find a randomized experiment.

Lee's (2008) work on Regression Discontinuity Designs (RDD) proves that, when vote shares approach the threshold of 50%, the event of winning is practically randomized between the winner and the loser. Therefore, conditional on the election being close, the incidence of winning or losing is independent of all observable and unobservable characteristics of the contender before the election.[8] The RDD thus allows an estimation of the average treatment effect of connections to elected contenders versus defeated ones without reverse causation or omitted variable bias, ensuring the design's internal validity. Results from the RDD are also externally valid and generalizable. Lee and Lemieux (2010) shows that the RDD estimate is ex ante informative for all elections, as it can be interpreted as a Weighted Average Treatment Effect (WATE) of being connected to a winner, where each candidate's weight is her ex ante likelihood to be in a close gubernatorial election, thus nontrivial for most candidates. Even very powerful candidates can be subject to close gubernatorial elections, e.g., Arizona's Janet Napolitano in 2002.[9]

Our identification strategy has a key advantage in comparison with event studies. Traditional event studies rely on the event's exogeneity and the accuracy of the market's prior beliefs, unavailable except in prediction markets (see discussions in Fisman 2001, and Snowberg, Wolfers, and Zitzewitz 2011). In contrast, our design is always valid even if the market's prior

[8] Lee's (2008) interpretation of RDD with a very weak identification condition builds on earlier formal work by Hahn, Todd, and Vander Klauw (2001) and Thistlewaite and Campbell's (1960) intuition. The online econometric appendix presents more details on the method used in this paper.

[9] In response to Caughey and Sekhon's (2011) critique of possible non-randomness of winners in close election, Eggers et al. (2015) shows that overall there is no evidence of sorting in a large sample of close elections. Appendix tables A1 and A2 provide extensive robustness checks on randomness and RDD required conditions.

belief is largely incorrect. To illustrate this point, suppose that the market value of connection to a candidate P is $100 in case he wins, and zero otherwise. Prior to the election, if the market believes he already has a winning probability of 65%, pre-election connection must be priced by the market at $65. The post-event market reaction to a realized win is $100-$65=$35, and that to a realized loss is -$65. An event study of election wins would report an underestimated value of connection of only $35. The bias comes from pre-event expectation of election results. In contrast, RDD estimation always produces correctly the difference of $35-(-$65) = $100, exactly the right value of having a connection to an elected governor. Hence, while we still use CARs to improve estimation efficiency by reducing market noises, it is not essential to our results, thanks to the near-random nature of RDD assignments (see appendix for more details.)

Another key advantage of our cross-sectional identification comes from the aggregation of firm-relevant information during election day. Market reaction on election day may incorporate news that can be informative of a firm's future performance, such as potential changes in industrial regulations, macroeconomic policies, or government spending. An event study needs to assume that no other relevant news takes place on the same day. This assumption is untenable, because there are usually many other elections on the same day as a gubernatorial election, including potentially the presidential election (during a presidential election year). In contrast, interactions between concurrent elections cannot affect RDD's only necessary identification condition that the density of vote shares is continuous around the 50% threshold (details in appendix). Therefore, even in presence of concurrent elections, a candidate's winning status in RDD is always near-random and independent of all other same-day news. The correct identification of the value of connection is thus guaranteed. In addition, to reduce the noises that concurrent elections could create, we restrict the sample to firms located in or close to each election state. Finally, since firms connected to different candidates may experience correlated shocks on the election day, we perform extensive corrections for standard error clustering.

In our specification, each observation represents a connection between a local firm's director and a close-election's top-two candidate through a specific university program for a given election year. The dependent variable is a connected firm's cumulated abnormal return (*CAR*) in a window around the election day. We thus combine the strength of event studies with RDD to reduce market noise in stock returns. The treatment variable *Winner* is an indicator equal to one if a firm is connected to the winner and to zero if a firm is connected to the loser.

We estimate $\beta_{RDD}$ nonparametrically by local polynomial regression of the following equation, using Gaussian kernel function (details are described in Imbens and Lemieux 2008):

$$CAR_i = \alpha + \beta Winner_i + \boldsymbol{P_w}(VS_i - 50\%)\mathbf{1}_{\{VS_i \geq 50\%\}} + \boldsymbol{P_l}(VS_i - 50\%)\mathbf{1}_{\{VS_i < 50\%\}} + \varepsilon_i,$$

where $\boldsymbol{P_w}(.)$ and $\boldsymbol{P_l}(.)$ are two different second degree polynomials of vote share $VS_i$ to be estimated. The method is implemented by a Gaussian-kernel weighted OLS with the two polynomial controls, and a bandwidth equal 0.005. It is equivalent to estimating $CAR_i = F(VS_i) + \varepsilon_i$ separately on both sides of the threshold, and taking the difference of $\hat{F}_+(50\%) - \hat{F}_-(50\%)$. In robustness checks, we use different specifications of the polynomials, a wide range of bandwidths, and also check Calonico, Cattaneo, and Titiunik's (2014) correction.

For inferences, the regression directly yields $\widehat{\beta_{RDD}}$'s standard error (Imbens and Lemieux 2008), corrected for clustering at the state level to be most conservative, since the main regressor *Winner$_i$* varies by each politician-election year combination, and that one needs to take into account potential autocorrelation over time (see appendix and Cameron and Miller 2011). In particular, this strategy permits arbitrary correlation of the error terms related to each state's specific election, especially important under concurrent elections. In robustness checks, we use different levels of clustering and two-way clustering.

### 2.2 Identifying mechanisms: Narrow versus broad targeting, and homophily

Since corporate directors' links to elected governors are identified as an almost-random treatment in our context, their effects on firm outcomes are causal. It still remains to understand whether the potential benefits are targeted towards a specific director in a specific firm, or they also spread broadly among same-school alumni and same-industry firms in general. Narrowly-targeted benefits are common in cases of quid pro quo deals, but could also arise when a targeted firm takes advantage of privileged information thanks to its connection to the governor. Those benefits are likely linked to corruption, understood as the abuse of public office for private gains.[10] They are categorically different from broad-based benefits, which relate to several mechanisms, including lobbying by groups of firms for a specific policy that affects an industry, and pork-barrel politics of favoritism towards constituencies.[11] We will focus on identifying whether a large share of firms' benefits from director networks are narrowly targeted.

[10] For most recent economic studies on favoritism targeted towards specific regions, ethnic groups, or remote families, see Hodler and Raschky (2014), Burgess et al. (2015), and Do, Nguyen, and Tran (2016).

[11] See Grossman and Helpman (2002) for a survey on lobbying, and Harstad and Svensson (2011) for a theory of the consequences of the difference between lobbying and bribery. Pork barrel politics is surveyed in Golden and Min (2013).

Broad-based benefits are also related to the homophily nature of social networks, by which connected people often share similar characteristics. This mechanism, commonly present in most network studies,[12] works as follows. Would-be governors and directors sharing similar characteristics and preferences, say, ardent interests in military studies, may have been drawn together at the same university with strength in that discipline. Decades later, the director now sits on a military firm's board, and the elected governor may enact policies in favor of the defense industry, thus favorable to the director's firm. Similar to the lobbying mechanism, network homophily would typically produce a broad-based effect that should be detectable across all alumni from the same school, or all firms in the industry.

We use two sets of interacted fixed effects to control for broad-based benefits. First, according to lobbying and favors based on school-related interests (or school-based homophily), a director's firm should still expect the same benefits from an alumni governor, even if he is from a remote class. Hence, we control for a dummy variable $WinUniversity_{st}$ equal to one if and only if any alumnus from the director's university *s* wins an election at the same time *t*. Its coefficient captures the average effect of any winner among same-school alumni. To allow $WinUniversity_{st}$'s effect to vary across universities, we interact it with a set of university fixed effects $\theta_s$. Second, lobbying activities usually target policies that broadly affect an industry. We thus control for a dummy variable $WinIndustry_{kt}$ equal to one if and only if some firm in the same industry of the director's firm is connected to a winner in election year *t*, so that its coefficient captures the average effect of any winner connected to the firm's industry. To allow $WinIndustry_{kt}$'s effect to vary across industries, we interact it with a set of industry fixed effects $\zeta_k$.

The two sets of interacted fixed effects will capture broad-based benefits, and the remaining coefficient $\beta$ shows how much the effect is narrowly targeted to a specific firm:

$$CAR_{it} = \alpha + \beta Winner_{it} + \boldsymbol{P_w}(VS_{it} - 50\%)\mathbf{1}_{\{VS_{it} \geq 50\%\}} + \boldsymbol{P_l}(VS_{it} - 50\%)\mathbf{1}_{\{VS_{it} < 50\%\}} + WinUniversity_{st}\theta_s + WinIndustry_{kt}\zeta_k + \varepsilon_{it}.$$

In summary, our research design identifies and consistently estimates the WATE of being connected to a candidate in a gubernatorial election, where the effect is averaged with

[12] See review of the problem in McPherson, Smith-Lovin, and Cook (2001). Exceptions include studies with randomized and quasi-randomized group formation, such as Lerner and Malmendier (2013), Shue (2013), Carrell, Sacerdote, West (2013), and Algan et al. (2015).

weights over the sample of all candidates who stand a chance of experiencing a close election, and all listed firms. We can further separate narrowly targeted benefits for specific connected firms from broad-based benefits that are usually due to lobbying and homophily.

## 3. SAMPLE DESCRIPTION

Our sample is constructed using data from several sources. First, we obtain biographical information and past education history for directors and senior company officers from BoardEx of Management Diagnostics Limited. The data details the relational links among board directors and senior company officers for both active and inactive firms by cross-referencing these directors' and officers' employment histories, educational backgrounds, and professional qualifications. In particular, the data contain current and past roles of each official in a company, with start and end date (year), all undergraduate and graduate degrees attained, the year in which those degrees were awarded, and the awarding institution. We restrict our sample to board directors in U.S. publicly listed firms. Our sample starts in 1999 because Boardex starts providing data on director networks from 1999 and ends in 2010 because we need to track corporate outcomes a few years after 2010.

Next, we collect the gubernatorial election results from state official election websites from 1999 to 2010. For each election, we identify the candidate finishing first (the winner) and second (the loser) and calculate their margin of votes. A close election is specified by a winner-loser margin of vote shares of less than 5%, when their vote shares are calculated both as 1) a fraction of all-candidate total votes; and 2) a fraction of the top two candidates' total votes, respectively.[13] Although it is frequent that a close gubernatorial election has many candidates (with a maximum of 15 candidates in Tennessee's gubernatorial election in 2002, as reported in appendix table A1), the two top contenders across all close elections obtain the lion share of votes, totaling on average 94.22%, leaving only 5.78% for all other candidates.

We hand-collect the biographical record of these elections using Marquis *Who's Who* biographies, which contain active and inactive biographies from the *Who's Who* publications. Our scope of search includes biographies in (i) *Who's Who in American Politics*, (ii) *World Almanac of U.S. Politics*, and (iii) *The Almanac of American Politics*. For each candidate, *Who's Who* biographies provide a brief vita, including the candidate's employment history, all undergraduate and

[13] We drop three elections from our sample (New Hampshire in 2000, California in 2002, and Massachusetts in 2002) because their winner-loser margin of vote shares based on total vote turnout of all candidates is smaller than 5%, but greater than 5% when based on the total votes of the top-two contenders.

graduate degrees attained, the year in which those degrees were awarded, and the awarding institution. Most of the biographies for our sample are available in *Who's Who*. To complete our biographies, we use candidates' archived websites, and other sources on the World Wide Web. We retain entries for which we can positively identify the contender.

We construct our social network measure through educational institutions. We define a connection as a link between a local firm's director and a close gubernatorial election's contender who both graduate from the same university, the same campus, and the same degree (program) within five year. Our degree definition is based on Cohen, Frazzini, and Malloy (2008) who group all degrees into six categories: (i) business school (Master of Business Administration), (ii) medical school, (iii) general graduate (Master of Arts or Master of Science), (iv) Doctor of Philosophy, (v) law school, and (vi) general undergraduate.[14] We thereby match institutions and degrees on *Who's Who* biographies and BoardEx. Finally, we match our data to stock return data from the Center for Research in Security Prices (CRSP).

Table 1 reports the time series and details of all U.S. gubernatorial elections and the close ones between 1999 and 2010. The average annual number of gubernatorial elections is 13.08 (with a maximum of 37, median of 7, and minimum of 2). The average annual number of close elections is 2.83 (with a maximum of 11, median of 1, and minimum of 0). Out of 157 gubernatorial elections, we identify 34 close ones (20.5% of the total elections). No trend seems to appear in the relationship between the number of elections and the number of close elections. The average vote margin across all close elections is 2.6%. Appendix table A1 reports further details of all close elections in our sample that include the names the top two candidates, the number of candidates, the election state, and the party affiliation, the total vote turnout, the two contenders' vote shares and former schools and universities.

[*Insert Table 1 Here*]

Table 1 also provides the time-series distribution of firms in our sample. These *local connected firms* are defined as the ones that 1) have at least one director who graduates from the same university campus and the same university program within five years of difference as one of the close election's top two contenders; and 2) are headquartered either in the election state or

[14] Cohen, Frazzini, and Malloy (2008) also provide the backgrounds and rationale for the importance of educational links in the U.S. and of each degree in their classification. For example, although there might be more students in an undergraduate program, networks from undergraduate studies remain a powerful. Subsequently, the literature thus essentially uses the same education-based network measure.

within 500 miles from the election state's capital.[15] Our corporate geographic requirement aims at potential real network interactions between local firms and their connected gubernatorial candidates. However, as we show later, our results are robust to alternative geographic distance.

As reported in Table 1, our baseline sample includes 634 unique state-year firms, 535 unique state-year directors, and 694 firm-years in total. For 33 close elections, our sample includes 53 candidates and 28 unique states. This indicates that close elections are equally distributed among states with no close election cluster at state level.[16] Instead of 66 top two contenders in 33 close elections, there are only 53 in our sample because some contenders are not connected (matched) to any firm whose headquarter is either in the election state or within 500 miles from the state's capital or to any director who graduates within five years of difference. Our yearly average (median) annual sample includes 77 (31) firm-year observations, 70 (30) unique firms, 59 (27) unique directors, 6 (2) contenders, and 4 (2) states.[17]

Panel A of Table 2 reports firm, board, board network, election states, and candidate characteristics in our baseline sample. Firms in our sample has an average market capitalization of \$5.16 billion, a market to book ratio of 1.15, and 13,830 employees. Among the connected firms, 14 percent are located in the very election states, while the remaining are located 230 miles from the election state's capital on average. This average distance is comparable to the 250 miles requirement in Ivkovic and Weisbenner' (2005) definition of local firms. The average board includes 8.91 directors of which 75% are independent directors. Directors are in majority male (82%) and 56 years old on average. In a connected firm, 1.37 directors (15% of board members) are connected to an election top-two contender. 85% of contenders are male, aged of 55.80 years, graduated from their university 33 years before the election year. Their last class reunion is 3 years before their election.

The number of local connected firms in our sample is determined by the number of close elections (5% of winner-loser vote margin or less), our corporate geographic requirement (firms in the election state or within 500 miles from the election state's capital), and our

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[15] In Section 6.4 we discuss and test the case a firm is connected to a candidate by more than one director. Our main result is consistent.

[16] We do not include a few observations of firm that are connected to both the winner and the loser in a close election. In the sample's period, out of 28 unique states, 6 have more than one close gubernatorial election (Minnesota (2006, 2010), Missouri (2000, 2004), Montana (2000, 2004), Oregon (2002, 2010), Rhode Island (2006, 2010), and Vermont (2002, 2010)). The Montana 2000 close election is excluded as there are no firms connected to the two candidates based on our criteria. All states in our sample have a four-year gubernatorial term, except Vermont and New Hamphire with a two-year term. 38 states in the U.S. limit governors to two consecutive terms.

[17] As we do not include candidates that are not, by our definition, connected to any firms, the number of annual gubernatorial candidates reported in Table 1 can be an odd number, instead of an even number.

education linkage measure (directors and candidates graduated from the same school and the same degree within 5 years of difference). We note that the paper's main findings are consistent after we vary each of these three requirements in various tables (i.e. Tables 3, 4, 5) and appendices (i.e. Appendices IA3, IA4, IA5). This indicates that there is no particular concern on the distribution of observations across elections, states, connected directors, candidates.

[*Insert Table 2 Here*]

Panel B of Table 2 compares our sample's firm characteristics to firms in the BoardEx/Compustat universe in the same period. The sample firm's average (median) market capitalization is \$5.16 (\$0.669) billion, in comparison to \$2.856 (\$0.418) billion for an average Boardex/Compustat firm. Although our sample firms are larger in average size, they are quite comparable in median size. This is not surprising given that our sample includes five connected firms with a market capitalization greater than \$100 billion (General Electric Co. with \$242.8 billion, American International Group with \$186.4 billion, IBM with 180.2 billion, Johnson and Johnson with 169.4 billion, and Merck with 127.1 billion). In a robustness check, we exclude these five firms and find consistent results. Our average firm has a market-to-book ratio of 1.15 and age of 20.33 years, as compared to a market-to-book ratio of 1.90 and age of 18.08 years for an average Boardex/Compustat firm.

## 4. DIRECTORS' EXTERNAL NETWORKS AND FIRM VALUE: STOCK PRICE REACTIONS

In this section, we report our empirical results on the value of the external networks of directors as well as its variation with network, firm, and state characteristics. We also explore the value channels and the impact of director networks on major corporate decisions.

### 4.1 THE EXTERNAL NETWORKS OF DIRECTORS AND FIRM VALUE

To measure the impact of the external networks of directors on firm value, we rely on a regression discontinuity design of close gubernatorial elections in the U.S. The baseline regression is conducted on our sample of *local connected firms* (hence forth, connected firms) defined as 1) having at least one director who graduates from the same university campus and the same program within five years as one of the top two contenders in a close election; and 2) being headquartered in the election state or within 500 miles from the election state's capital.

Table 3 presents our estimation of the impact of the external networks of board members on firm value by relating stock price cumulated abnormal returns (CAR) of local connected firms around the election day to the winning status of the contenders (*Winner* dummy). We use a nonparametric local polynomial regression to obtain the discontinuity effect at the exact threshold of 50%, by weighting observations with a Gaussian kernel function and controlling for separate quadratic polynomials of the vote shares of winners and losers (see Section 2 and appendix for further details.) Each observation pairs a firm's director to one of the top two contenders in a close gubernatorial election, both of whom graduate from the same university campus and the same program (Cohen, Frazzini, and Malloy 2008) within five years. We calculate CAR for every connected firm during a standard 3-day event period, from day -1 to day +1. The event day (day 0) is the election day reported by the respective State Election Commission, which is always a trading day. We first follow a conventional event study method to calculate the CAR resulting from close elections by assuming a single-factor model with the beta estimated from the pre-event window, and later use other methods of CAR estimation as robustness checks. Average abnormal returns are estimated based on the market model around the election day (Day 0). The market model is estimated using daily data over a 255-day (-315, -61) window.

Results from Table 3 show an overall significantly positive average effect of network connection to a close election's winner on firm value. On our sample of *local connected firms*, column 1 reports a coefficient estimate of 4.1% on the *Winner* dummy, statistically significant at 1%. This indicates that firms with a director socially connected to the winning contender exhibit CARs that are 4.1% over CARs of firms connected to the defeated contender. This is equivalent to an increase in firm value of $211.7 million and $27.4 million for our sample's average and median firms, respectively. Connections through director networks are thus highly valuable for firms. Column 1's regression will be used as our baseline regression throughout the paper.

[*Insert Table 3 Here*]

In column 2, instead of clustering errors by election state as in column 1, we use two-way clustering of the standard errors to allow for error correlation across directors and across candidates.[18] We obtain the same coefficient estimate of 4.1% as in column 1, significant at 5%. In columns 3 and 4, we run our baseline regression on the restricted samples of firms headquartered in the same state (97 firm-year observations) and within 100 miles from the state capital (170 firm-year observations), respectively. We obtain coefficient estimates of 3.7% and 3.8%, significant at 5% and 1%, respectively, which are slightly lower that coefficient estimates in

[18] This is different from, and in theory a lot more conservative than clustering by the pair director-candidate (Cameron, Gelbach, and Miller, 2011). See section 6.7 and the appendix for additional tests and a discussion on inferences under RDD.

columns 1 and 2. We note that imposing more restrictive geographic conditions on our sample lead to a reduced number of observations and a more specific sample, reducing the power of our empirical tests and the generalizability of the results. This might explain the small difference in the magnitude of the estimates between columns 3 and 4 and columns 1 and 2.

In column 5, we remove our stringent requirement on the geographic location of connected firms, no longer requiring that they are from the election state or within 500 miles from the state capital. The networks of firms connected to the candidates through school ties become significantly larger, including 1,301 firm-year observations. As expected with a larger network (longer network distance), the director network's impact on firm value is smaller. The coefficient estimate on *Winner* is reduced to 0.8%, still significant at 5%.

In column 6, we keep the same requirement on the location of connected firms as in column 1, but no longer require that directors and top two candidates graduate within 5 years of difference. They are now only alumni who graduate from the same university campus and the same program. The director-gubernatorial candidate networks also become larger, including 1,995 firm-year observations, and are expected to be less valuable to firms. The finding in column 6 confirms this conjecture. The coefficient estimate on *Winner* is 3.0%, significant at 1%.

Regressions in columns 1 to 6 show the difference in CARs between firms connected to winners and firms connected to losers. We can further decompose the benchmark result in column 1 into the impact of a win and that of a loss at the vote share threshold of 50% on a connected director's firm. To do so, we apply the nonparametric regressions separately on subsamples of firms connected to winners and those connected to losers. Columns 7 and 8 respectively report the regression intercepts of +0.1%, statistically insignificant, and -4.0%, significant at 1%, the difference of which makes exactly the effect of 4.1% found in column 1. The market appears to react to firms connected to losers much more in magnitude.

If prior probabilities of winning are predicted at exactly 50% when vote shares tend to 50%, one should expect equal market reactions of opposite signs to winner-connected and loser-connected firms (see detailed analysis in the appendix). The large difference between the magnitude of reactions in columns 7 and 8 hints that the market may not have made a precise prediction of prior probabilities of winning, so the reactions are different between firms connected to winners and those connected to losers. It is reassuring that unlike event study methods, our RDD specification is robust to misperception of prior probabilities by the market, as shown in section 2 and the appendix.

As a check of robustness for our results in Table 3, we replicate our baseline regression, controlling for different degrees of polynomial of vote share, a large set of firm, director, and election characteristics, as well the number of connections. The results reported in appendix table A4 are comparable to those in Table 3 in the sign and magnitude of coefficient estimates (the only exception is perhaps column 7, when we control for various election characteristics.) This similarity in the magnitude of estimates is expected from the RDD framework in which the main estimate should not be affected by "irrelevant covariates" as the regression discontinuity accounts for all observable and unobservable characteristics. Indeed, when the treatment is comparable to a randomized experiment, any pre-treatment control variable must be independent of the treatment, thus its inclusion should not significantly alter the estimated magnitude of the treatment effect. Therefore, observed and unobservable characteristics of the elections, firms, and directors are irrelevant covariates and do not alter much our main estimate.

In summary, Table 3 provides evidence that director network connections increase firm value. In an experiment based on close gubernatorial elections in the U.S. from 1999 to 2010, we estimate that the value of local firms with at least one director connected to a narrowly elected governor increases by 4.1% over and above firms connected to the narrowly defeated candidate. Consistent with social network theories, network value is reduced when the distance between network members is larger. These results are robust and consistent to various levels of standard error clustering and control variables for candidate, director, election, and firm characteristics.

### 4.2 STRENGTH OF CONNECTIONS AND THE VALUE OF DIRECTOR NETWORKS

Following Granovetter (1974), the strength of a director's links is much relevant to the value the director could bring to the firm. Panel A in Table 4 reports results of the value of directors' links based on link strength and social distance.

[*Insert Table 4 Here*]

In columns 1 to 3 in Panel A, we vary the time gap between graduation years of the director and his connected gubernatorial candidate, considered as proxy for the strength of their connection. Column 2 replicate the baseline regression (from column 1 of Table 3), in which the sample is restricted to pairs of director and close-election contender who have graduated from the same university campus and the same program and within five years of difference. Column 1 strengthens this restriction by requiring each pair to have graduated in the same year. In contrast, column 3 relaxes the restriction to pairs that have graduated within 10 years of difference.

Directors' firms are still required to be from the election state, or headquartered within 500 miles from the state capital. (The sample size decreases with the tightened restriction of connections.)

As expected, the value of a director's connection increases with the connection's strength. As connection's strength decreases from column 1 to 3, the estimated coefficient of *Winner* decreases from 5.0% to 4.1% and then 3.8% (all coefficients significant at 1%). The difference between the coefficients in columns 1 and 3 is statistically significant at 1% (but differences between columns 1 and 2, and between columns 2 and 3, are not statistically significant.)

Another potential determinant of the strength and influence of alumni connections is the timing of alumni reunions (Shue 2013). We test the role of alumni reunions by running our baseline regression on two subsamples of firms based on whether their directors and connected election contenders belong to the same class cohort invited to annual alumni reunions.[19] Columns 4 and 5 show that a director's network value is significantly higher when directors and gubernatorial candidates belong to the same alumni reunion cohort, with a coefficient of 4.9% versus 2.0% when they do not. The difference between the two estimates is significant at 1%. When directors and election contenders' schools do not organize class-based alumni meetings, as the result in column 6 shows, the coefficient on *Winner* is not significant. Overall, Panel A shows that stronger and more active connections of directors bring greater value.

### 4.3 NARROW TARGETING AND THE VALUE OF DIRECTOR NETWORKS

In Panel B of Table 4, we test whether a director's external connection towards politicians are narrowly targeted towards his firm. As discussed in Section 2, we use a system of binary variables to control for broad-based benefits that a comparable firm may enjoy from a winning candidate. Columns 1 and 2 present results when we control for the overall effect of a winner's election on all firms with a director who is an alumnus from the winner's university with the dummy variable $WinUniversity_{st}$. While the specification in column 1 restricts this average effect to be equal across all school, column 2 relaxes the restriction to allow a heterogeneous effect for each school by interacting $WinUniversity_{st}$ with university fixed effects. This set of controls would also capture homophily effects that follow alumni who all chose a university based on its specific interests. The estimated coefficients of *Winner* remain

[19] We obtain the information on how alumni reunions are organized in each of the university and school in our sample. The class cohort reunion system varies across universities. For example, a university might invite all alumni graduated in classes from 1985 to 1990 for a common annual alumni meeting in 2010.

sizeable at 4.1% and 3.1%, both significant at 1%, and quite close to the benchmark estimate, implying that most of the benefits are narrowly targeted to the connected firm.

Columns 3 and 4 address broad targeting at the industry level, by controlling for the overall effect of a winner's election on all firms in the same Fama-French classified industry as the director's firm with the dummy variable $WinIndustry_{st}$. Column 3 restricts this average effect to be equal in all industries, and column 4 allows it to vary across industries by interacting $WinIndustry_{st}$ with industry fixed effects. The estimated coefficients of *Winner* remain strong at 4.1% and 3.3%, both significant at 1%. Finally, when we combine the two groups of control in column 5, in order to address all types of broad-based targeting and homophily effects, the estimated coefficient is still 2.9%, significant at 1%. It implies that a large part of the benefits are narrowly targeted to the connected firm.

In summary, Panel B of Table 4 indicates that the effect of director networks on firm value is by and large narrowly targeted towards only the director's firm. It is likely unaffected by homophily effects of shared characteristics among alumni.

### 4.4 FIRM CHARACTERISTICS AND THE VALUE OF DIRECTOR NETWORKS

In Table 5, we explore which local connected firms can best exploit the benefits from director networks by considering several firm characteristics.

[*Insert Table 5 Here*]

Since different categories of directors assume different roles, presumably the value of their networks is also different. In columns 1, 2, and 3 of Table 5, we run our baseline regression on subsamples of firms whose CEOs or board chairmen, independent directors, and executive directors, respectively, are connected to a top-two contender in close gubernatorial elections. We obtain coefficient estimates on *Winner* of 3.3%%, 3.4%, and 4.4%, significant at 5%, 1%, and 1%, respectively. The difference between coefficient estimates in columns 1 and 2 and in columns 1 and 3 is however insignificant. The external networks of directors are thus valuable across different categories of directors, with no significant value difference among them.

The value of director networks might depend on the size of their firm. We run our baseline regression on two subsamples of firms whose market capitalization is respectively above and below the median in our sample. Results reported in columns 4 and 5 show coefficient estimates of 5.7% and 3.6%, both significant at 1%, for small and large firms, respectively. The difference in coefficient estimates is significant at 1%. Director networks are thus valuable for both large and small firm, but significantly more valuable for smaller firms.

One of the most important tasks of a management team is to find the best financing solution to firm investments. We thus investigate whether the value of director networks is associated with a firm's dependence on external finance. We construct Rajan and Zingales's (1998) measure of dependence on external finance as (CapEx - Cashflow from Operations)/CapEx. Columns 6 and 7 of Table 5 report results on the two sub-samples of firms with above and below industry median scores. Firms more dependent on external finance exhibit a coefficient estimate of 6.7%, significant at 1%, while the estimate is 3.3%, also significant at 1%, for firms less financially dependent. The difference in coefficient estimates is significant at 1%. Director networks are thus valuable for financially dependent firms, and more valuable for them than for financially independent firms.[20]

In summary, the results from Table 5 show that network connections of directors are valuable for firms across different types of directors, more valuable for smaller than for larger firms and for financially dependent than financially independent firms. Certain firms thus benefit from the networks of directors more than others.

### 4.5 State characteristics and the value of director networks

Table 4 has shown that the benefits firms enjoy from director networks are narrowly targeted, which suggests the possibility of firms using their director's connection to strike deals with politicians in their states, rather than obtain legislations that could benefit many similar firms. To explore this mechanism, we investigate the value of director networks across different state characteristics and report results in Table 6.

[*Insert Table 6 Here*]

A high level of state regulations opens more room for targeted government intervention, therefore greater value for a firm to have social connections with the governor. Columns 1 and 2 distinguish between states that have more or less than the median level of regulations. We rely on the index of state regulation in 1999 in Clemson University's Report on Economic Freedom, available on http://freedom.clemson.edu (used in Glaeser and Saks 2006). It combines information on labor and environmental regulations and regulations in specific industries such as insurance. We find a positive estimate of 3.4%, significant at 1%, in states with high regulation. The estimate is negative and insignificant for states with low regulation. The difference in

[20] If we partition our sample into two subsamples based on the industry average level of dependence on external finance, using Fama-French 10-industry classifications, we obtain comparable coefficient estimates.

coefficient estimates is significant at the 1% level, indicating that the value of networks is significantly higher for local connected firms in a highly regulated state.

It follows that firms should benefit more from a director's connection with the governor in states that have traditionally witnessed more corruption. In columns 3 and 4, we use Glaeser and Saks's (2006) measure of corruption, computed from the number of convictions detailed in the Department of Justice's "Report to Congress on the Activities and Operations of the Public Integrity Section" divided by state population size, and averaged from 1976 to 2002 to remove periodical noises. (It is not correlated with the regulation index.) In states with low corruption, as column 3 shows, the coefficient estimate on *Winner* is negative and insignificant. The effect is clearly stronger in magnitude and statistically significant (3.2%, significant at 1%) in more corrupt states. The difference in coefficient estimates is however insignificant, probably due to noises in the low corruption states.

Finally, a local firm might draw more benefits from the connections of its directors to local politicians from powerful, large state governments. Columns 5 and 6 test this idea on the two subsamples of firms according to whether the share of state government employment over the state's total employment is above or below the median national level. We find a positive estimate of 4.0%, significant at 1%, and insignificant coefficient, respectively, for these two subsamples. The difference in coefficient estimates is however insignificant.

In sum, Table 6 provides evidence that the value of director connections is enhanced in states that are more regulated, more corrupt, and with a larger government. The evidence supports the concern that firms draw value from directors' connections with governors through specific deals that prosper under the lack of transparency.

## 5. LONG-TERM REAL OUTCOMES AND CHANNELS OF IMPACT

Last section has shown evidence of narrowly-targeted benefits of director networks. This section will further explore their channels. According to Karlan et al.'s (2009) theory of social collateral in social networks, director networks are valuable because of the trust-based deals and information-sharing roles of networks. Both types of channels have been empirically documented in the extant finance literature. The trust-based channel relates to, for instance, Engelberg, Gao, and Parsons' (2012) evidence that when a firm's directors are connected to its corporate lenders, the firm pays a significantly lower interest. The information channel is supported by, for instance, Cohen, Frazzani, and Malloy's (2008) evidence that when fund managers and CEOs of portfolio companies are connected, their investments enjoy better performance and better exit timing. In what follows we focus on the direct, deal-based channel of state subsidies to connected firms.

### 5.1 DIRECTOR NETWORKS AND STATE SUBSIDIES

Directors' networks may assist their firms in facilitating large investments (perhaps through outright financial help or cheap financing) or obtaining more and larger state financial and tax subsidies. Existing empirical support of this conjecture remains scant, with the exception of Goldman, Rocholl, and So's (2013) evidence that former Republican (Democrat) politicians's presence on corporate boards leads to a significant and large increase (decrease) in procurement contracts following the Republicans' capture of Congress in 1994. We systematically estimate the impact of director networks on a wide range of firm outcomes, including state subsidies, corporate long term performance, access to financing, and corporate investment.

We first investigate whether director networks help firms in winning state subsidies. We obtain data on state subsidies for firms in our sample from *Good Jobs First* website (http://www.goodjobsfirst.org).[21] This website provides extensive details of economic subsidies and other forms of governmental financial assistance to U.S. businesses at both the state and federal levels. Its database covers our entire sample period and 1,858 parent companies with 453,000 subsidy awards, of which 289,000 are either state or local and 164,000 are federal awards. Common subsidies include property tax abatements, investment tax credits, job creation tax credits, inventory tax exemption, sales, franchise, and use tax exemptions or reductions, lower utility rates, financial assistance through low interest loans and/or bond financing, and training grants. We use proxies for the probability of receiving state subsidies and subsidy dollar value as the dependent variable in our baseline RDD specification. Results are detailed in Table 7.

[*Insert Table 7 Here*]

In columns 1 and 2 in Panel A, the dependent variable is an indicator for whether a local connected firm receives at least one state subsidy grant during the period of four fiscal years after and before a close election, respectively. The coefficient estimates on the *Winner* dummy in column 1 is 5.1%, significant at 1%. This indicates that, in comparison to firms connected to the losing candidate, local firms connected to the narrowly elected governor are significantly more likely to obtain a state subsidy grant following the election. In contrast, column 2 shows that there is no significant difference in the probability of obtaining states subsidies among these two

[21] This website's data have been officially achieved by the U.S. Library of Congress since 2013 and used by a number of academic papers.

groups of firms during the period of four years before close elections. The difference in coefficient estimates between column 1 and column 2, reported in column 3, is significant at 1%. The findings in columns 1 to 3 show that a director's network connections significantly increase the likelihood that his/her firm receives a state subsidy grant.

We further perform placebo tests in columns 4 to 6 on federal subsides, instead of state subsidies. As expected, none of the coefficient estimates is statistically significant. Hence network connections of local firms' directors to local politicians do not affect the probability of obtaining federal subsidies.

Panel B of Table 7 then focuses on important types of state subsidies, including state loans and tax credits. In columns 1 and 2, the dependent variable is an indicator of whether a connected firm receives at least one state loan for the periods of four fiscal years after and four years before a close election, respectively. The coefficient estimates on the *Winner* dummy in column 1 is 4.4%, significant at 10%. By contrast, the estimate in column 2 is statistically insignificant. As reported in column 3, the difference in coefficient estimates between column 1 and column 2 is significant at 1%. The findings in columns 1 to 3 show that a director's networks significantly increase the likelihood that his/her firm receives state loans. Replicating the same regressions on the indicator of state tax credits in columns 4 to 6, we obtain qualitatively and quantitatively similar results. Director networks thus significantly increase the likelihood that firms receives state tax credits.

Columns 7 to 9 further replicate regressions in columns 4 to 6, using as dependent variable the dollar value of state tax credits a local connected firm receives during the period of four fiscal years after and before a close election. The coefficient estimate on the *Winner* dummy in column 7 is $330,974, significant at 1%. This result indicates that a firm connected to the narrowly winning contender receives an average of $330,974 of tax credits more than a firm connected to a narrowly losing contender in the period of four years after the election. In contrast, the estimate in column 8 is negative and statistically insignificant, suggesting that there is no difference in tax subsidies between the two types of firms before the election. The difference in the estimates between column 7 and column 8, reported in column 9, is $374,478, significant at 1%. To the extent that tax credits are just the tip of an iceberg among many subsidies and favors, the real magnitude of subsides may be significantly higher in dollar value.

We also check the sensitivity of our results in Table 7 with different proxies for state subsidies that differ in the forms and in the grant timing. Appendix table A7 reports consistent results on the positive impact of director networks on firms in terms of state subsidies.

## 5.2 DIRECTOR NETWORKS AND FIRM LONG TERM PERFORMANCE

Our empirical tests have shown that director external networks are valuable to firm, measured by short-term cumulative abnormal returns (CARs). We next investigate if director networks wield impact on firms with respect to long term performance, financing decisions, and investment policies. Empirically, we replace the main dependent variable CARs in our baseline regression by various proxies for corporate outcomes subsequent to close gubernatorial elections. Results are reported in Table 8.

[*Insert Table 8 Here*]

Columns 1 to 3 in Panel A of Table 8 report our result on the impact of director networks on change in return on assets (ROA), between the election year and year one to year three following the election. We obtain coefficient estimates of 1.7%, 2.8%, and 7.0%, significant at 5%, insignificant, and significant at 1%, respectively. This result indicates that local firms with directors connected to a close election's winner outperform to those connected to the loser in terms of ROA. The impact is statistically significant and economically important for the year following the election and for the period of three years after the election.

Columns 4 to 6 in Panel A replicate the same regressions in columns 1 to 3, but using the market-adjusted long term stock performance with the holding period of one to three years following the election, respectively, as the dependent variable. We find coefficient estimates on the *Winner* dummy of 13.3%, 10.9%, and 22.2%, significant at 10%, 1%, and 5%, respectively. This finding shows that local firms with directors connected to a narrowly elected governor significantly outperform to those connected to narrowly defeated candidate in long terms stock performance. The impact is both statistically significant and economically important.

## 5.3 DIRECTOR NETWORKS AND CORPORATE FINANCING POLICY

We next investigate director networks' impact on two of the most important corporate policies, namely corporate financing and investments. Panel B of Table 8 reports our results on financing policies. Columns 1 to 3 replicate our baseline RDD regression with post-election changes in access to bank loan as the dependent variable. Follow Almeida, Campello and Hackbarth (2009), we define access to bank loan as the number of loan facilities in DealScan dataset in which the loan primary purpose is "Corp. purposes", "Takeover", "Acquisition Line" or "Capital Expenditures." Our dependent variable is the difference in the number of bank loans between the election year and year one, year two, and year three after the election, respectively. The coefficient estimates on *Winner* dummy are 0.251, significant at 1%, 0.147%, insignificant, and -0.215%, insignificant, respectively. The effect of director connections on access to bank loan is thus only significant in the year following the election. On average, a winner-linked firm has 0.25 loan facilities more than a loser-linked firm.

Columns 4 to 6 of Panel B replicate the same regressions on the dollar value of loan facilities. We obtain coefficient estimates of 233.70, significant at 1%, 150.300, insignificant, and 32.899, insignificant, respectively. Again, the effect of director connections on access to bank loan is only significant in the year following the election. The average firm with directors connected to the narrowly winning contender obtains $233.70 million in loan facility above the average firm connected to the loser. Thus, while the impact of director networks in term of the number of loan facilities seems to be fairly small, the impact is large in dollar terms.

Next, columns 7 to 9 report results from our baseline RDD regression with post-election change in corporate loan spread as dependent variables. We rely on DealScan's definition of loan spread as the difference in basis points between the weighted average loan interest and the Libor rate. Our dependent variables are the difference in loan spreads between the election year and year one to year three after the election, respectively. We obtain coefficient estimates of -3.07, insignificant, -17.45, significant at 1%, and -40.98, significant at 1%. Director connections appear to help firms substantially reduce the cost of debt after two to three years following the election.

Finally, we investigate the impact of director networks on corporate borrowings. Columns 10 to 12 of Panel B replicate our baseline RDD regression with post-election changes in firm book leverage as the dependent variable. Book leverage ratio is calculated as (Debt in Current Liabilities + Long-Term Debt)/(Debt in Current Liabilities + Long-Term Debt + Common/Ordinary Equity), with all variables from Compustat. Our dependent variable is the difference in book leverage ratio between the election year, and year one, two, and three after the election, respectively. The coefficients on *Winner* are 2.6%, 6.3%, and 9.4%, all significant at 1%, respectively. This result indicates that following the election, winner-related local firms significantly increase their leverage, year by year, in comparison to loser-related local firms.

### 5.4 DIRECTOR NETWORKS AND CORPORATE INVESTMENTS AND EMPLOYMENT

We use a similar approach to investigate the impact of director networks on corporate investments by running our baseline regression using as dependent variable the difference in the Capex/Assets ratio between the election year, and year one, two, and three following the election, respectively. The Capex/Assets ratio in a given year is measured as the sum of a firm's capital expenditure and research and development expenditure normalized by start-of-the-year total assets. Results are reported in Panel C of Table 8. In columns 1 to 3, the coefficient estimates on *Winner* dummy are 1.1%, significant at 1%, 1.1%, insignificant, and 1.6%, significant at 1%, respectively. Winner-linked firms thus increase their investment in comparison to loser-linked firms, especially one year and three year after the election.

Changes in corporate investments may be accompanied by new hiring. Columns 4 to 6 of Panel C replicate the same regressions with changes in the numbers of employees in thousand as dependent variables. We obtain estimate coefficients of 1.723, 2.651, and 2.077, significant at 1%, 5%, and 10%, respectively. Winner-related local firms thus increase significantly their staff number in comparison to loser-related local firms following the election.

Overall, we find that winner-connected firms expand in investment and employment, perhaps partly due to the additional government subsidies and financing facilities mentioned above. The effect on employment could also reflect another type of quid pro quo deal, in which connected firms create more jobs to help the newly elected governor reduce local unemployment in their constituency (similar to Bertrand et al.'s 2008 finding among connected French firms.)

In sum, results from Table 8 provide further evidence that director connections affect major corporate policies, including corporate financing and investing activities. Connected firms to the winners are also more likely to obtain state subsidies and better financing conditions.

## 6. ROBUSTNESS CHECKS AND FALSIFICATION TESTS

In this section, we conduct various robustness checks, including placebo tests, alternative specifications of the event studies, and RDD randomness checks.

### 6.1 CHECKS OF RANDOMNESS

Lee and Lemieux (2010) emphasizes RDD's advantages in that one can check the near-randomness of winning or losing a close election by applying the baseline specification on all predetermined variables to verify that they do not exhibit any discontinuity at the threshold. We perform those tests on our sample, and report supporting results in appendix table A3.

Panel A of appendix table A3 reports RDD regressions using pre-event director characteristics as dependent variable, including age, gender, and board functions (chairman, CEO, executive, independent director). Panel B exhibits results of pre-event firm characteristics such as distance to the election state's capital, firm size, market to book ratio, ROA, dependence on external finance, contribution to connected candidate, and number of connections. Panel C reports regression on pre-event firm outcome variables used in the paper such as stock return, proxies for financing, ROA, Capex, and staff number. Panel D replicates the same regressions with pre-event candidate and state characteristics such as candidate age and gender, total donation, vote turnout, incumbent status, party, years since graduation, the degree of state regulation, state employment, and corruption conviction rate. None of the reported regressions produces a significant coefficient of the *Winner* dummy. Those tests thus confirm the RDD identification result that all predetermined variables do not exhibit discontinuities around the vote share threshold.

### 6.2 VISUALIZATION OF DISCONTINUITY

Following Lee and Lemieux's (2010) advice to illustrate our regression discontinuity, we plot in Figure 1 the outcome variable, CAR(-1,+1), against vote shares, in bins of observations over intervals of 0.05% vote shares and with markers of bins above and below the 50% cutoff. We plot nonparametric estimates of CAR(-1,+1) as functions of vote share (using the same benchmark specification), where each half of the graph represents the estimated function for vote shares greater or less than 50% (i.e., for elected or defeated politicians, respectively). The bands represent confidence intervals at 90%.

[*Insert Figures 1 Here*]

While the nonparametric curves exhibit complex patterns, we see a large gap at exactly the 50% threshold that confirms our RDD estimates.[22] The gap is driven mostly by observations on the losing side (below the 50% threshold), as also suggested in columns (7) and (8) of Table 3. As we will show in the next subsection, this pattern remains very stable over a broad range of bandwidths.

### 6.3 SENSITIVITY TO BANDWIDTH SELECTION

The RDD results can be sensitive to the choice of nonparametric specification, most importantly in terms of the bandwidth chosen in the nonparametric regression. Instead of picking Imbens and Kalyanaraman's (2012) suggested optimal bandwidth (which tends to be too large for desired level of confidence – see Calonico, Cattaneo, and Titiunik 2014), we choose a prudent approach in examining a wide range of bandwidths in our nonparametric estimation procedure. The results are shown in Figure 2.

[*Insert Figure 2 Here*]

[22] Since each bin may contain a different number of observations, some will have more importance in the nonparametric estimation, while others show up as outliers.

The estimated effect remains stable, and always significant at 10%, across all choices of bandwidth. Hence Figure 2 confirms the result that firms make significant gains in value following the elections of their connected governors.

As an alternative method of estimation, we also implement Calonico, Cattaneo, and Titiunik's (2014) correction for both the optimal bandwidth choice and the corresponding robust confidence intervals. Their approach yields an estimated coefficient on *Winner* of 3.6%, significant at 5%, and close to our baseline estimate of 4.1%. Our main result thus remains essentially unchanged.

### 6.4 ALTERNATIVE SPECIFICATIONS OF THE EVENT STUDY

The focus of our analysis is on the three-day event window, from -1 to +1. As this event window specification is simply one among several possibilities; we also consider our main specification using the (0,+1) alternative window. It produces sensibly similar results, which are available upon request. In our paper, cumulated abnormal returns are estimated based on the one-factor market model around the election day (Day 0). The market model is estimated using daily data over a 255-day (-315,-61) window. As a further check, we calculate the CARs using different methods, including the cumulative daily stock (raw) returns, Fama-French's three-factor model (Fama and French 1993), and the four-factor model (Carhart 1997). Using these CARs in our RDD regressions, we find estimates mostly similar to those reported in Table 3. Results are available upon request.

Earlier in section II, we have discussed the potential pitfall of event studies when there are concurrent events, and how our RDD cross-sectional identification addresses this problem, thanks to the near-randomness of the treatment variable in RDD. (We cannot use the very small sample of non-concurrent close elections, since they only take place under the rare case when the previous incumbent resigns or dies in office.)

### 6.5 CONTROLLING FOR OTHER OBSERVABLES

In an RDD, the event outcomes are near randomized at the threshold, so the inclusion of predetermined covariates should not affect the regression coefficients. We thus do not need to control for potential determinants of network value in our baseline regressions. In appendix table A4, we report robustness checks using various control variables in our baseline regressions.

We start by controlling for different degrees of polynomials of vote share of the two close election contenders, from the first to the fourth, respectively in columns 1 to 4. We find comparable coefficient estimates in magnitude and significance. In columns 5 and 6, we include all firm and director characteristics described in Panels A and B of appendix A3 as control variables, respectively. We obtain comparable coefficient estimates in terms of magnitude and statistical significance to our baseline regression.

One may worry that contributions to electoral campaigns correlate with alumni connections, and further predict election results, even among close elections (Caughey and Sekhon 2011). Column 9 of Panel B in appendix table A3 first ascertains that pre-election campaign contributions do not exhibit a discontinuity at the threshold, so at the threshold winners and losers are similar in this dimension (in agreement with Eggers et al.'s 2015 response to Caughey and Sekhon 2011). In addition, in column 7 of appendix table A4, we replicate our baseline RDD regression while controlling for extensive election characteristics described in Panel D of appendix table A3, including individual connected firm contributions to each candidate in a close election. While the estimate is smaller than in our baseline result, it remains highly significant. Taken together, campaign contributions of connected firms do not significantly affect our conclusion on the value of director networks.

In column 8 of appendix table A4 we control for another potential determinant of the value of director network, namely the number of directors from the same firm who are connected to a close election's candidate. The estimate is 4.0%, significant at 1%, and practically identical to our baseline estimation.

In brief, as expected in an RDD, the inclusion of many "irrelevant" covariates does not affect our results. This reassures the near-randomness of our design.

### 6.6 ALTERNATIVE SAMPLES

Firms in our sample must satisfy two conditions: 1) to have at least one director graduated from the same university campus and program with one of the two contenders in close gubernatorial elections, within five years of difference; 2) to be headquartered in the election state or within 500 miles from the election state's capital. To ascertain that our results are not specific to this choice of sample, we vary the two sampling conditions and replicate our baseline RDD regression. Results are reported in appendix table A5. Columns 1 and 2 report results when the sample's firms are headquartered in the election state or within 250 miles and 100 miles from the election state's capital, respectively. *Winner*'s coefficient estimates are 4.1% and 3.4%, both significant at 1%. Two remarks might arise here. First, the statistical significance of the results appears consistent to various geographic distance. Second, the magnitude of the results, however, varies a little. This variation might be caused by additional noises when sample size is reduced (indeed, the differences between the estimates are not statistically significant), or by the imperfection of geographic distance as a proxy for potential network interactions between directors of local firms and alumni candidates.

Columns 3 to 6 of appendix table A5 replicate our baseline regressions on samples of connected firms when vote margins are redefined as below 4%, 3%, 2%, and 1%, respectively. Because the nonparametric RDD specification estimates the effect at exactly the discontinuity point of 50% vote share, this choice of sample band should only affect the estimate's precision. Across those columns, the estimated coefficients are 4.1%, 4.1%, 4.2%, and 3.8%, all significant at 1%, indeed all very close to our baseline estimate, albeit with slightly decreasing precision.

Throughout our analysis, we use the most fundamental level of observation, each representing a connection between a firm, a director, and an election candidate around a specific election. We also examine more aggregated data at the level of director-election year and firm-election year. Using the same baseline specification, the resulting coefficient estimates are respectively 4.5% and 4.7%, all significant at 1%. These coefficients are close to the benchmark result of 4.1%; their slight difference coming from each observation having a different weight under a different level of aggregation.

### 6.7 Different levels of standard error clustering

Our regression results correct for standard error clustering at the level of election states, because the main regressor $Winner_i$ varies by each politician-election year combination, and that there can be potential autocorrelation over time. As the state is the most aggregated level possible, clustering by state is the most conservative (Cameron and Miller 2011).

We further test the paper's results under different possibilities of clustered standard errors. Column 2 of Table 3 shows that the result remains statistically significant at 5% even if the errors are allowed to be correlated across two dimensions, namely by directors and by candidates. As proposed by Cameron, Gelbach, and Miller, 2011, this is different from, and much more conservative than, clustering by the director-candidate pair (see implementation in appendix). Appendix table A6 further shows that the results are strongly robust to an extensive list of different levels of clustering, such as election year, school, candidate, director, firm, director-election year, and firm-election year.

## 7. Conclusions

Our paper provides evidence on the impact of the external networks of corporate directors on firm value and decisions. We focus on the alumni networks of directors and the top two contenders in close gubernatorial in the U.S. from 1999 to 2010 and use the Regression Discontinuity Design (RDD) of close elections to identify network value.

We find that the external networks of directors positively and significantly impact firm value and decisions. Local firms with directors connected to a narrowly elected governor increase their value by 4.1% surrounding elections, equivalent to $211.7 million and $27.4 million for our sample's average and median firms, respectively, over local firms connected to a closely defeated candidate. The benefits of connections are concentrated on the connected firms, possibly in quid pro quo deals, and not spread broadly to industry competitors, e.g., through industry-targeted policies. Consistent with social network theories, we find that the external networks of directors are more valuable to firms when connections are stronger and more active. Moreover, director networks wield real impact on firms. Subsequent to elections, firms connected to narrowly elected governors are more likely to receive state subsidies, loans, and tax credits. They receive more tax credits in dollar value, enjoy better access to bank loans, borrow more, and pay lower interest rate. They also invest more in capital and staff, and achieve better accounting and long term stock performance. Our results are robust to different specifications, to different measures of outcome variables, to different definitions of social network, and across many subsamples.

By examining the importance of directors as connectors to the world outside the board, we join a few papers (e.g., Cohen et al. 2008, Butler and Gurun 2012, Engelberg et al. 2012) in complementing an extensive strand of literature on the monitoring and advisory roles of corporate boards within the boardroom. This emerging research direction calls for further research on the role of external director networks in other unexplored areas of corporate decisions. For example, it remains an open question how directors' external connections interact with board nomination and composition, and directors' participation in boards. Finally, director networks are only a dimension among many of the complex networks firms are embedded in, e.g., supply and financing networks, and it remains a challenge to understand theoretically and empirically how the different network dimensions interact. Our methodological contribution could help answer some of those research questions.

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**Figure 1**

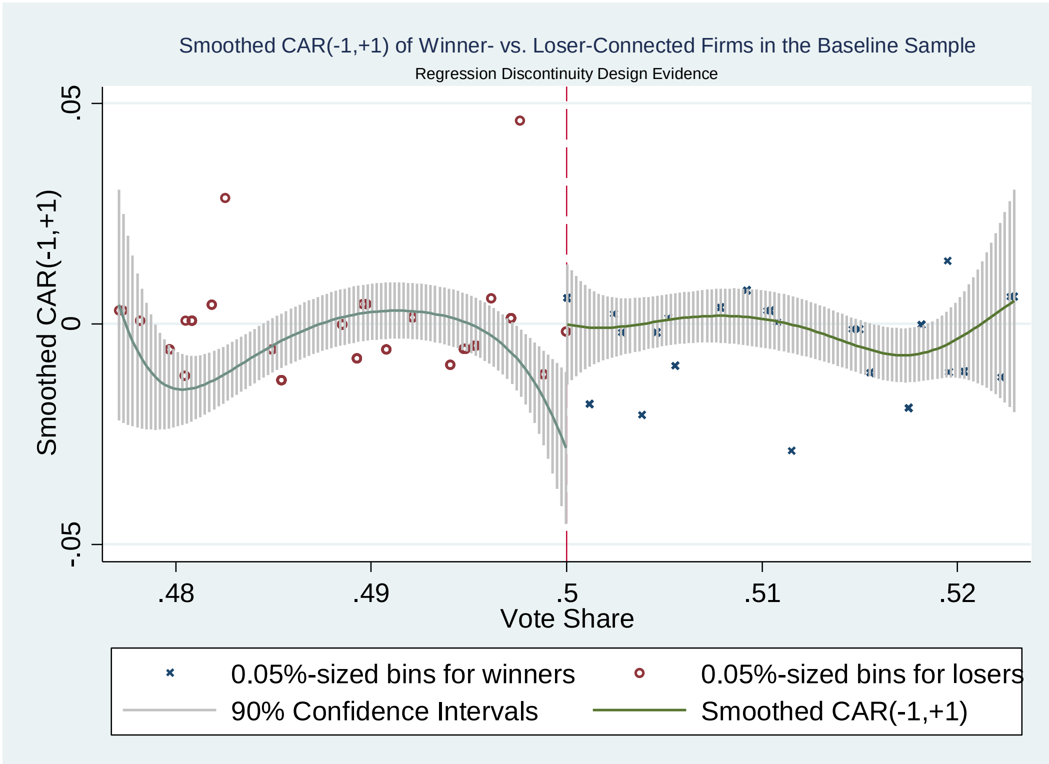


**Figure 2**

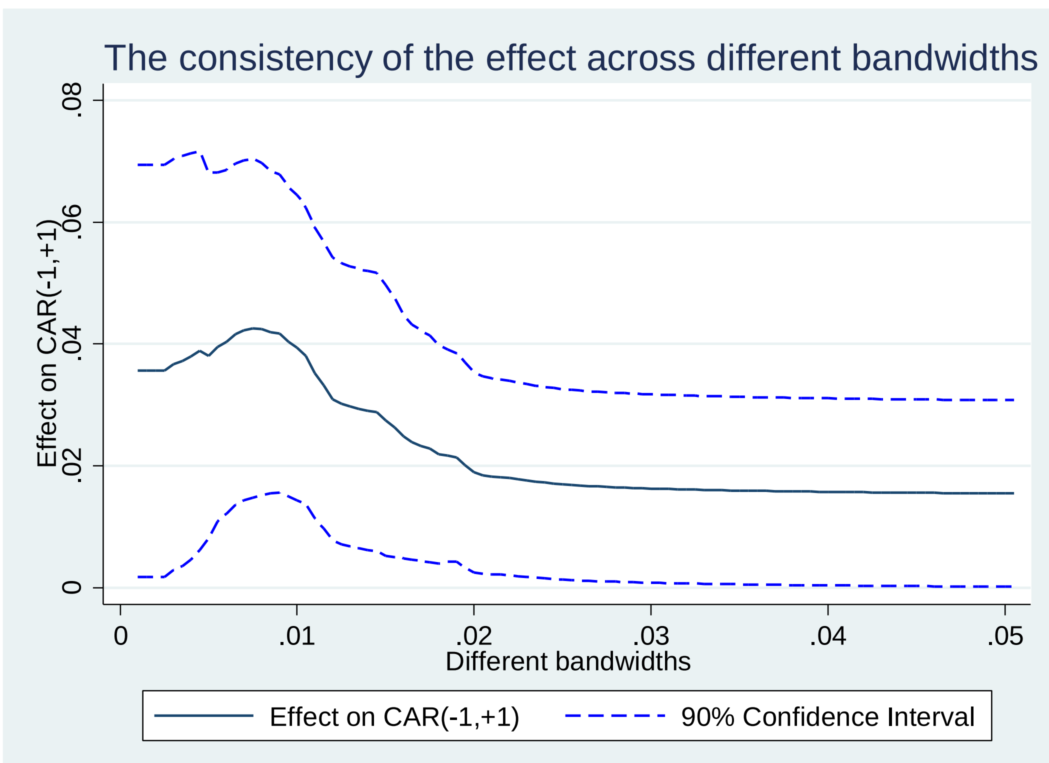

**Table 1: Close Gubernatorial Elections**

This table reports the details and distribution of U.S. gubernatorial and close gubernatorial elections at 5% vote margin between 1999 and 2010. Our baseline sample includes *local connected firms*, defined as the ones that 1) have at least one director who graduates from the same university campus and the same university degree within five years of difference as one of the close election's top two contenders; and 2) are headquartered either in the election state or within 500 miles from the election state's capital. Each observation pairs a local connected firm to a connected candidate in close election. In the alumni-based sample, a firm is defined as connected if one of its directors and a close election's candidate graduate from the same university program within five years (no geographic conditions are imposed). The last four rows present the time-series statistics.

| Election Year | Number of Elections | Number of Close Elections | Proportion of Close Election | Average Winning Margin in Close Election | Baseline Sample | | | | | Alumni-Based Sample | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Obs | Unique Firms | Unique Directors | Candidates | States | Obs | Unique Firms | Unique Directors | Candidates | States |
| 1999 | 3 | 1 | 0.333 | 0.011 | 7 | 7 | 6 | 1 | 1 | 9 | 9 | 8 | 1 | 1 |
| 2000 | 11 | 2 | 0.182 | 0.023 | 13 | 13 | 11 | 2 | 2 | 34 | 34 | 26 | 2 | 2 |
| 2001 | 2 | 0 | 0.000 | - | - | - | - | - | - | - | - | - | - | - |
| 2002 | 36 | 11 | 0.306 | 0.031 | 207 | 195 | 159 | 15 | 10 | 663 | 487 | 431 | 21 | 11 |
| 2003 | 3 | 1 | 0.333 | 0.039 | 2 | 2 | 2 | 2 | 1 | 12 | 12 | 9 | 2 | 1 |
| 2004 | 11 | 4 | 0.364 | 0.017 | 52 | 46 | 49 | 7 | 4 | 162 | 147 | 130 | 7 | 4 |
| 2005 | 2 | 0 | 0.000 | - | - | - | - | - | - | - | - | - | - | - |
| 2006 | 36 | 3 | 0.083 | 0.024 | 60 | 54 | 48 | 5 | 3 | 118 | 112 | 84 | 5 | 3 |
| 2007 | 3 | 0 | 0.000 | - | - | - | - | - | - | - | - | - | - | - |
| 2008 | 11 | 1 | 0.091 | 0.035 | 31 | 30 | 27 | 2 | 1 | 59 | 56 | 39 | 2 | 1 |
| 2009 | 2 | 1 | 0.500 | 0.038 | 16 | 16 | 10 | 1 | 1 | 47 | 45 | 27 | 1 | 1 |
| 2010 | 37 | 10 | 0.270 | 0.014 | 306 | 271 | 223 | 18 | 10 | 891 | 729 | 594 | 19 | 10 |
| Total | 157 | 34 | - | - | 694 | 634 | 535 | 53 | 33 | 1,995 | 1,631 | 1,348 | 60 | 34 |
| Mean | 13.083 | 2.833 | 0.205 | 0.026 | 77 | 70 | 59 | 6 | 4 | 222 | 181 | 150 | 7 | 4 |
| Median | 7 | 1 | 0.226 | 0.024 | 31 | 30 | 27 | 2 | 2 | 59 | 56 | 39 | 2 | 2 |
| Min | 2 | 0 | 0.000 | 0.011 | 2 | 2 | 2 | 1 | 1 | 9 | 9 | 8 | 1 | 1 |
| Max | 37 | 11 | 0.500 | 0.039 | 306 | 271 | 223 | 18 | 10 | 891 | 729 | 594 | 21 | 11 |

## Table 2: Summary Statistics of the Sample

This table reports descriptive statistics of our sample. Panel A reports summary statistics of firms, boards, director networks, states, and election candidates in our sample. The variable definitions are reported in Appendix B. Our baseline sample includes *local connected firms*, defined as the ones that 1) have at least one director who graduates from the same university campus and the same university degree within five years of difference as one of the close election's top two contenders; and 2) are headquartered either in the election state or within 500 miles from the election state's capital. Each observation pairs a firm's director to one of the top two contenders in a close gubernatorial election, both of whom graduate from the same university campus and the same degree (Cohen, Frazzini, and Malloy 2008) within five years of difference. Panel B shows descriptive statistics of firms in our sample and of firms in the BoardEx-Compustat merged database.

**Panel A: Summary Statistics**

| Variable | Mean | Median | SD |
|---|---|---|---|
| **Firm Characteristics** | | | |
| Market Capitalization (in Million) | 5,163.16 | 668.87 | 16,001.51 |
| Dependence on External Finance | -0.36 | -0.72 | 1.34 |
| Market-to-Book | 1.15 | 0.69 | 1.43 |
| Return on Asset | 0.00 | 0.02 | 0.18 |
| Access into Bank Loan | 0.60 | 0.00 | 1.26 |
| Facility Amount (in million) | 303.53 | 0.00 | 897.98 |
| Book Leverage | 0.40 | 0.36 | 0.34 |
| Loan Spread (in basis points) | 34.26 | 0.00 | 75.09 |
| Capital Expenditure | 0.04 | 0.02 | 0.05 |
| Number of Employee (in thousand) | 13.83 | 1.90 | 35.66 |
| Same HQ and Election State (0/1) | 0.14 | 0.00 | 0.35 |
| Distance from HQ to Election State Capital (in Miles) | 230.13 | 188.45 | 154.11 |
| Observations | | 694 | |
| **Board Characteristics and Director Networks** | | | |
| Number of Directors | 9.81 | 9.00 | 3.07 |
| Fraction of Independent Directors | 0.75 | 0.79 | 0.15 |
| Executive Directorship (0/1) | 0.21 | 0.00 | 0.41 |
| CEO (0/1) | 0.13 | 0.00 | 0.33 |
| Chairman (0/1) | 0.12 | 0.00 | 0.33 |
| Male Director (0/1) | 0.82 | 1.00 | 0.39 |
| Director's Age | 55.96 | 56.00 | 6.98 |
| Number of Directors Connected to Election Contenders | 1.37 | 1.00 | 0.59 |
| Fraction of Directors Connected to Election Contenders | 0.15 | 0.13 | 0.08 |
| Number of Directors Connected to Winning Contender | 0.74 | 1.00 | 0.62 |
| Fraction of Directors Connected to Winning Contender | 0.08 | 0.08 | 0.08 |
| Observations | | 694 | |
| **Contender and State Characteristics** | | | |
| Male Contender | 0.85 | 1.00 | 0.35 |
| Contender’s Age | 55.80 | 57.00 | 6.09 |
| Incumbent (0/1) | 0.15 | 0.00 | 0.36 |
| Time Since Graduation (in Years) | 32.94 | 34.50 | 6.08 |
| Time Since Reunion (in Years) | 3.06 | 1.00 | 7.08 |
| Regulation Index | 6.32 | 6.35 | 0.51 |
| Conviction Rate Per Capita | 0.30 | 0.27 | 0.17 |
| Fraction of State Government Employment | 0.14 | 0.13 | 0.02 |
| Total State Level Donation in a State Election (in Million) | 6.60 | 4.12 | 6.61 |
| Total State Level Donation by a Connected Firm | 246.69 | 0.00 | 3,129.17 |
| Observations | | 694 | |

**Panel B. Sample Representativeness**

| | Baseline Sample | | | BoardEx-Compustat | | |
|---|---|---|---|---|---|---|
| | Mean | Median | SD | Mean | Median | SD |
| Market Capitalization (in Million) | 5,163 | 669 | 16,002 | 2,856 | 418 | 7,651 |
| Dependence on External Finance | -0.358 | -0.720 | 1.339 | -0.162 | -0.653 | 1.523 |
| Market-to-Book | 1.152 | 0.690 | 1.428 | 1.897 | 0.872 | 5.853 |
| Return on Asset | -0.002 | 0.022 | 0.183 | -0.118 | 0.020 | 0.965 |
| Access into Bank Loan | 0.598 | 0.000 | 1.260 | 0.610 | 0.000 | 1.195 |
| Facility Amount (in million) | 303.529 | 0.000 | 897.984 | 184.938 | 0.000 | 493.339 |
| Book Leverage | 0.401 | 0.361 | 0.338 | 0.333 | 0.291 | 0.511 |
| Loan Spread (in basis points) | 34.258 | 0.000 | 75.088 | 44.801 | 0.000 | 93.203 |
| Capital Expenditure | 0.038 | 0.022 | 0.050 | 0.053 | 0.025 | 0.098 |
| Number of Employee (in thousand) | 13.832 | 1.900 | 35.663 | 7.917 | 0.975 | 20.280 |
| Firm Age | 20.330 | 15.000 | 16.452 | 18.084 | 13.000 | 14.621 |
| Payout | 177.711 | 14.559 | 342.659 | 110.127 | 2.467 | 344.962 |
| Cash Reserve Ratio | 0.162 | 0.078 | 0.207 | 0.196 | 0.095 | 0.232 |
| Tangibility | 0.198 | 0.109 | 0.219 | 0.222 | 0.125 | 0.243 |
| Sales and General Administration Ratio | 0.287 | 0.208 | 0.288 | 0.385 | 0.222 | 0.901 |
| Interest Coverage | 21.409 | 6.442 | 110.177 | 26.052 | 6.047 | 198.464 |
| Number of Directors | 9.814 | 9.000 | 3.074 | 8.377 | 8.000 | 2.866 |
| Fraction of Independent Directors | 0.749 | 0.786 | 0.151 | 0.692 | 0.714 | 0.185 |
| Total Number of Observations | | 694 | | | 31,880 | |

## Table 3: Directors' External Networks and Firm Value in a Regression Discontinuity Design

This table presents our RDD nonparametric estimation of the impact of the external networks of corporate directors on the value of their firm by relating stock price cumulated abnormal returns (CAR) of *local connected firms* around close gubernatorial elections in the U.S. between 1999 and 2010 to the winning status of their connected contenders. Each observation pairs a firm's director to one of the top two contenders in a close gubernatorial election, if the director and the contender both graduate from the same university campus and the same degree (Cohen, Frazzini, and Malloy 2008). Local connected firms are the ones that 1) have at least one such connected director; and 2) are headquartered either in the election state or within 500 miles from the election state's capital. CAR are estimated based on the market model around the election day (day 0), using daily data over a 255-day (-315, -61) window. *Winner* is a dummy variable equal to one (zero) if the candidate wins (loses) the close election. A close election is specified by a winner-loser margin of votes of less than 5% based on their vote shares as a fraction of top-two candidate total votes. All regressions are implemented as Gaussian-kernel weighted OLS, with bandwidth equal 0.005, controlling for the quadratic polynomials of vote shares of winners and vote shares of losers. Column 1 presents results of the baseline regression. Column 2 clusters the standard errors two ways by both director and candidate. Columns 3 and 4 focus on the samples of firms that are headquartered in the election state and within 100 miles from the state's capital, respectively. Column 5 uses the sample of firms that are headquartered neither in the election state nor within 500 miles from the election state's capital. Column 6 considers a larger sample of local firms whose directors and a close election's candidate graduate from the university campus and the same degree. Columns 7 and 8 report the results on the separate subsamples of winners and losers, respectively. Robust standard errors in square brackets are corrected for clustering by state. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

| | **Dependent Variables: CAR (-1,1)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Samples | Local Connected Firms | Local Connected Firms | Election State's Firms | Firms Within 100 Miles | Non-Local Connected Firms | Alumni Sample | Winners | Losers |
| Winner | 0.041<br>[0.002]*** | 0.041<br>[0.020]** | 0.037<br>[0.016]** | 0.038<br>[0.011]*** | 0.008<br>[0.003]** | 0.030<br>[0.005]*** | | |
| Intercept | | | | | | | 0.001<br>[0.011] | -0.040<br>[0.010]*** |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Standard Error Clustering | Election State | Two-Way Director-Candidate | Election State | Election State | Election State | Election State | Election State | Election State |
| R-squared | 0.041 | 0.041 | 0.122 | 0.083 | 0.007 | 0.015 | 0.001 | 0.071 |
| Observations | 694 | 694 | 97 | 170 | 1,301 | 1,995 | 393 | 301 |
| Unique Firms | 516 | 516 | 296 | 79 | 951 | 1,317 | 343 | 246 |
| Unique Directors | 483 | 483 | 343 | 80 | 901 | 1,249 | 312 | 207 |
| Unique Candidates | 53 | 53 | 45 | 26 | 52 | 60 | 25 | 28 |
| Unique State | 28 | 28 | 30 | 19 | 27 | 29 | 22 | 23 |

## Table 4: Director External Networks' Characteristics and Network Value

This table presents our RDD nonparametric estimation of the impact of the external networks of corporate directors on the value of their firm by relating stock price cumulated abnormal returns (CAR) of *local connected firms* around close gubernatorial elections in the U.S. between 1999 and 2010 to the winning status of their connected contenders. Each observation pairs a firm's director to one of the top two contenders in a close gubernatorial election, if the director and the contender both graduate from the same university campus and the same degree (Cohen, Frazzini, and Malloy 2008). Local connected firms are the ones that 1) have at least one such connected director; and 2) are headquartered either in the election state or within 500 miles from the election state's capital. CAR are estimated based on the market model around the election day (day 0), using daily data over a 255-day (-315, -61) window. *Winner* is a dummy variable equal to one (zero) if the candidate wins (loses) the close election. A close election is specified by a winner-loser margin of votes of less than 5% based on their vote shares as a fraction of top-two candidate total votes. All regressions are implemented as Gaussian-kernel weighted OLS, with bandwidth equal 0.005, controlling for quadratic polynomials of vote shares of winners and vote shares of losers. Panel A reports the effects of directors' connections by network strength. Columns 1 to 3 focus on firms whose directors and their connected candidates graduate in the same year, within 5 years, and within 10 years of difference, respectively. Columns 4 and 5 consider whether directors and candidates belong to the same class-based cohort invited to alumni reunions. Column 6 investigates directors' schools that do not organize class-based cohort alumni reunions. Coefficient differences are tested using Seemingly Unrelated Regressions. Panel B reports tests of narrow targeting versus broad targeting/potential homophily effect. *WinUniversity* is a dummy variable equal to one if and only if any alumnus from the director's university is elected on the same day. *WinIndustry* is a dummy variable equal to one if and only if a firm in the same industry (using Fama-French classification) is connected to a winner on the same election day. Columns 1 and 3 control for those variables separately, and columns 2 and 4 control for their respective interactions with university and industry fixed effects. Column 5 combines the two sets of controls. Robust standard errors in square brackets are corrected for clustering by state. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

### Panel A: Strength of Connections and Value of Director Networks

| | **Dependent Variables: CAR (-1,1)** | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Subsample | Within 0 years | Within 5 years | Within 10 years | Belong to the Class Cohort Invited to an Alumni Reunion | | No Class-Based Cohort Reunion |
| | | | | Yes | No | |
| Winner | 0.050 | 0.041 | 0.038 | 0.049 | 0.020 | -0.020 |
| | [0.004]*** | [0.002]*** | [0.002]*** | [0.008]*** | [0.005]*** | [0.047] |
| Diff1 | **(1) - (2):** 0.009 | | | **(7) - (8):** 0.029*** | | |
| $\chi^2$ | 1.83 | | | 6.88 | | |
| Diff2 | | **(2) - (3):** 0.003 | | | | |
| $\chi^2$ | | 1.89 | | | | |
| Diff3 | | **(1) - (3):** 0.012*** | | | | |
| $\chi^2$ | | 7.12 | | | | |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.503 | 0.041 | 0.040 | 0.197 | 0.009 | 0.013 |
| Observations | 84 | 694 | 1,261 | 164 | 409 | 121 |

**Panel B: Narrow Targeting and Network Homophily**

| | Dependent Variables: CAR (-1,1) | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Winner | 0.041 | 0.031 | 0.041 | 0.033 | 0.029 |
| | [0.009]*** | [0.002]*** | [0.002]*** | [0.003]*** | [0.002]*** |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes |
| Controls | *WinUniversity* | *WinUniversity* x University FEs | *WinIndustry* | *WinIndustry* x Industry FEs | *WinUniversit)* x University FEs & *WinIndustry* x Industry FEs |
| R-squared | 0.046 | 0.138 | 0.041 | 0.127 | 0.197 |
| Obs | 694 | 694 | 694 | 670 | 670 |

## Table 5: Firm Characteristics and Value of Director External Networks

This table presents our RDD nonparametric estimation of the impact of the external networks of corporate directors on the value of their firm by relating stock price cumulated abnormal returns (CAR) of *local connected firms* around close gubernatorial elections in the U.S. between 1999 and 2010 to the winning status of their connected contenders. Each observation pairs a firm's director to one of the top two contenders in a close gubernatorial election, if the director and the contender both graduate from the same university campus and the same degree (Cohen, Frazzini, and Malloy 2008). Local connected firms are the ones that 1) have at least one such connected director; and 2) are headquartered either in the election state or within 500 miles from the election state's capital. CAR are estimated based on the market model around the election day (day 0), using daily data over a 255-day (-315, -61) window. *Winner* is a dummy variable equal to one (zero) if the candidate wins (loses) the close election. A close election is specified by a winner-loser margin of votes of less than 5% based on their vote shares as a fraction of top-two candidate total votes. All regressions are implemented as Gaussian-kernel weighted OLS, with bandwidth equal 0.005, controlling for the quadratic polynomials of vote shares of winners and vote shares of losers. Columns 1 to 3 use firms in which the connected director is the CEO or chairman, an independent director, or an executive director, respectively. Columns 4 to 7 focus on firms whose market capitalization is below and above the median size, whose reliance on external finance (Rajan and Zingales 1998) is below or above the median reliance on external finance, respectively. Robust standard errors in square brackets are corrected for clustering by state. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

| | **Dependent Variables: CAR (-1,1)** | | | | | | |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Subsample | CEO and Chairman | Independent Director | Executive Director | Market Capitalization | | Dependence on External Finance | |
| | | | | Small | Large | High | Low |
| Winner | 0.033 | 0.034 | 0.044 | 0.057 | 0.036 | 0.067 | 0.033 |
| | [0.014]** | [0.006]*** | [0.008]*** | [0.006]*** | [0.006]*** | [0.018]*** | [0.002]*** |
| Diff1 | **(2) - (1):** 0.001 | | | 0.021*** | | 0.034** | |
| $\chi^2$ | 0.00 | | | 20.58 | | 5.20 | |
| Diff2 | **(3) - (1):** 0.011 | | | | | | |
| $\chi^2$ | 1.14 | | | | | | |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.074 | 0.029 | 0.122 | 0.067 | 0.084 | 0.051 | 0.078 |
| Observations | 128 | 491 | 144 | 331 | 339 | 347 | 347 |

## Table 6: State Characteristics and Value of Director External Networks

This table presents our RDD nonparametric estimation of the impact of the external networks of corporate directors on the value of their firm by relating stock price cumulated abnormal returns (CAR) of *local connected firms* around close gubernatorial elections in the U.S. between 1999 and 2010 to the winning status of their connected contenders. Each observation pairs a firm's director to one of the top two contenders in a close gubernatorial election, if the director and the contender both graduate from the same university campus and the same degree (Cohen, Frazzini, and Malloy 2008). Local connected firms are the ones that 1) have at least one such connected director; and 2) are headquartered either in the election state or within 500 miles from the election state's capital. CAR are estimated based on the market model around the election day (day 0), using daily data over a 255-day (-315, -61) window. *Winner* is a dummy variable equal to one (zero) if the candidate wins (loses) the close election. A close election is specified by a winner-loser margin of votes of less than 5% based on their vote shares as a fraction of top-two candidate total votes. All regressions are implemented as Gaussian-kernel weighted OLS, with bandwidth equal 0.005, controlling for the quadratic polynomials of vote shares of winners and vote shares of losers. Columns 1 to 6 focus on firms whose state regulation index (based on Clemson University's Report on Economic Freedom in 1999), corruption convictions per capita (number of convictions in corruption cases pursed by the Department of Justice over state population, by Glaeser and Saks 2006), and government share of state employment (number of state employees over total number of employees in the state) are below or above the median level, respectively. Robust standard errors in square brackets are corrected for clustering by state. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

| | **Dependent Variables: CAR (-1,1)** | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Subsample | Regulation | | Corruption Convictions Per Capita | | Government Share of State Employment | |
| | Low | High | Low | High | Low | High |
| Winner | -0.005 | 0.034 | -0.055 | 0.032 | -0.141 | 0.040 |
| | [0.006] | [0.003]*** | [0.136] | [0.004]*** | [0.135] | [0.004]*** |
| Diff | -0.039*** | | -0.087 | | -0.181 | |
| $\chi^2$ | 16.14 | | 0.33 | | 1.43 | |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.091 | 0.121 | 0.008 | 0.081 | 0.016 | 0.086 |
| Observations | 331 | 363 | 333 | 361 | 329 | 365 |

## Table 7: Director External Networks and State Subsidies

This table presents our RDD nonparametric estimation of the impact of the external networks of corporate directors on state subsidies of their firm by relating various proxies for state subsidies to *local connected firms* before and after close gubernatorial elections in the U.S. between 1999 and 2010 to the winning status of their connected contenders. Each observation pairs a firm's director to one of the top two contenders in a close gubernatorial election, if the director and the contender both graduate from the same university campus and the same degree (Cohen, Frazzini, and Malloy 2008). Local connected firms are the ones that 1) have at least one such connected director; and 2) are headquartered either in the election state or within 500 miles from the election state's capital. CAR are estimated based on the market model around the election day (day 0), using daily data over a 255-day (-315, -61) window. *Winner* is a dummy variable equal to one (zero) if the candidate wins (loses) the close election. A close election is specified by a winner-loser margin of votes of less than 5% based on their vote shares as a fraction of top-two candidate total votes. All regressions are implemented as Gaussian-kernel weighted OLS, with bandwidth equal 0.005, controlling for the quadratic polynomials of vote shares of winners and vote shares of losers. Panel A reports the probability of receiving any of the state and federal subsidies for the periods of four years around close gubernatorial elections. Panel B shows the probability of receiving state loans and tax credits, as well the dollar value of state tax credits received during the periods of four years before and after close gubernatorial elections, respectively. Robust standard errors in square brackets are corrected for clustering by state. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

### Panel A: State and Federal Subsidy

| | **Dependent Variables:** | | | | | |
|---|---|---|---|---|---|---|
| | State Subsidies (0/1) | | | Federal Subsidies (0/1) | | |
| | 4 Years After Election | 4 Years Before Election | Change | 4 Years After Election | 4 Years Before Election | Change |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Winner | 0.051 | -0.003 | 0.053 | -0.027 | -0.028 | 0.001 |
| | [0.015]*** | [0.003] | [0.014]*** | [0.056] | [0.056] | [0.002] |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.048 | 0.022 | 0.047 | 0.032 | 0.027 | 0.019 |
| Observations | 694 | 694 | 694 | 694 | 694 | 694 |

**Panel B: Types of State Subsidy**

| | Dependent Variables: | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | State Loans (0/1) | | | State Tax Credits (0/1) | | | State Tax Credits (Dollar Value) | | |
| | 4 Years After Election | 4 Years Before Election | Change | 4 Years After Election | 4 Years Before Election | Change | 4 Years After Election | 4 Years Before Election | Change |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Winner | 0.044 | -0.006 | 0.050 | 0.056 | -0.003 | 0.059 | 330,794 | -43,684 | 374,478 |
| | [0.021]* | [0.005] | [0.018]*** | [0.012]*** | [0.003] | [0.011]*** | [62,060]*** | [45,269] | [57,197]*** |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.027 | 0.030 | 0.025 | 0.048 | 0.021 | 0.048 | 0.049 | 0.023 | 0.047 |
| Observations | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 |

## Table 8: Director External Networks and Corporate Outcomes

This table presents our RDD nonparametric estimation of the impact of the external networks of corporate directors on firms by relating various proxies for *local connected firms'* performance, financing, and investments subsequent to close gubernatorial elections in the U.S. between 1999 and 2010 to the winning status of their connected contenders. Each observation pairs a firm's director to one of the top two contenders in a close gubernatorial election, if the director and the contender both graduate from the same university campus and the same degree (Cohen, Frazzini, and Malloy 2008). Local connected firms are the ones that 1) have at least one such connected director; and 2) are headquartered either in the election state or within 500 miles from the election state's capital. CAR are estimated based on the market model around the election day (day 0), using daily data over a 255-day (-315, -61) window. *Winner* is a dummy variable equal to one (zero) if the candidate wins (loses) the close election. A close election is specified by a winner-loser margin of votes of less than 5% based on their vote shares as a fraction of top-two candidate total votes. All regressions are implemented as Gaussian-kernel weighted OLS, with bandwidth equal 0.005, controlling for the quadratic polynomials of vote shares of winners and vote shares of losers. In Panel A, columns 1 to 3 present the impact of director networks on change in ROA between the election year and year one to year three after the election. Columns 4 to 6 present the impact of director networks on market-adjusted stock performance with holding periods of one to three years after the election. In Panel B, columns 1 to 3 show the impact of director networks on the number of bank loan facilities (Almeida, Campello, and Hackbarth 2011). Columns 4 to 6 show the impact of director networks on the dollar value of loan facilities. Columns 7 to 9 report the impact of director networks on loan spread. Columns 10 to 12 present the impact of director networks on book leverage. In Panel C, columns 1 to 3 report the impact of director networks on capital expenditure, measured as the ratio of capital expenditure over total assets at the beginning of each year. Columns 4 to 6 report the impact of director networks on the number of firm employees (in thousand). Robust standard errors in square brackets are corrected for clustering by state. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

### Panel A: Firm Performance

| | **Dependent Variables:** | | | | | |
|---|---|---|---|---|---|---|
| | ROA | | | Market-Adjusted Holding Period Returns | | |
| Change | Year 0 to 1 | Year 0 to 2 | Year 0 to 3 | 1 Year | 2 Years | 3 Years |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Winner | 0.017 | 0.028 | 0.070 | 0.133 | 0.109 | 0.222 |
| | [0.007]** | [0.019] | [0.011]*** | [0.070]* | [0.017]*** | [0.088]** |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.006 | 0.010 | 0.025 | 0.063 | 0.068 | 0.079 |
| Observations | 615 | 597 | 561 | 661 | 633 | 620 |

**Panel B: Firm Financing**

| | Dependent Variables: | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Access to Bank Loan | | | Facility Sum (in $mil) | | | Loan Spread (Basis Points) | | | Book Leverage | | |
| Change from Year 0 to: | Year 1 | Year 2 | Year 3 | Year 1 | Year 2 | Year 3 | Year 1 | Year 2 | Year 3 | Year 1 | Year 2 | Year 3 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Winner | 0.251 | 0.147 | -0.215 | 233.700 | 150.300 | 32.899 | -3.073 | -17.450 | -40.978 | 0.026 | 0.063 | 0.094 |
| | [0.040]*** | [0.183] | [0.376] | [16.843]*** | [176.1] | [237.3] | [5.499] | [3.517]*** | [15.529]*** | [0.006]*** | [0.013]*** | [0.031]*** |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.031 | 0.087 | 0.097 | 0.045 | 0.071 | 0.069 | 0.055 | 0.024 | 0.045 | 0.009 | 0.020 | 0.021 |
| Observations | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 615 | 596 | 560 |

**Panel C: Firm Investments**

| | Dependent Variables: | | | | | |
|---|---|---|---|---|---|---|
| | Capital Expenditure | | | Employment | | |
| Change from Year 0 to: | Year 1 | Year 2 | Year 3 | Year 1 | Year 2 | Year 3 |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Winner | 0.011 | 0.011 | 0.016 | 1.723 | 2.651 | 2.077 |
| | [0.002]*** | [0.008] | [0.004]*** | [0.393]*** | [0.969]** | [1.188]* |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.032 | 0.029 | 0.049 | 0.033 | 0.038 | 0.024 |
| Observations | 580 | 562 | 524 | 610 | 591 | 552 |

# Directors as Connectors:
# The Impact of the External Networks of Directors on Firms

By Quoc-Anh Do, Yen-Teik Lee, and Bang Dang Nguyen
This draft: March 2016

## APPENDIX (ECONOMETRIC CLARIFICATIONS INTENDED FOR ONLINE PUBLICATION)

In this appendix we provide details of the regression discontinuity design (RDD) of close elections based in large parts on Lee (2008) and Lee and Lemieux (2010). The method was first suggested by Thistlethwaite and Campbell (1960) and formalized by Hahn, Todd, and van der Klaauw (2001). Its relatively weak identification condition (vote share cannot be precisely determined by candidates) and its application in close elections were discovered and proven by Lee (2008). Details of the nonparametric estimation of RDD follow Imbens and Lemieux (2008), and the weighted average treatment effect interpretation comes from Lee and Lemieux (2010).

In practice, Caughey and Sekhon (2011) and Grimmer et al. (2012) raise the concern of potentially non-random sorting of winners and losers in close elections to the U.S. House. In response, Eggers et al. (2015) uses a much larger sample of close elections to show that there is no evidence of sorting, and attribute Caughey and Sekhon's findings to pure chance.

**Setting:** For simplicity, let us index each observation by *i*. Suppose that the corresponding cumulative abnormal returns, $CAR_i$, is a function of the treatment variable, namely win/lose status, all observable characteristics $W_i$ as well as unobservables $U_i$. The vote share of each candidate is also a function of $W_i$ and unobservables $V_i$ (while we assume linearity for simplicity, the results are much more general):

$$CAR_i = \beta Winner_i + W_i \gamma + U_i,$$
$$VoteShare_i = W_i \delta + V_i.$$

Assume that conditional on $W$ and $U$, the density of $V$ is continuous. This assumption amounts to saying that each candidate cannot fully determine the exact vote share (partial influence on vote share is still allowed). Therefore, $f_{VoteShare|W,U}(x|W,U)$, the probability density of vote share conditional on $W$ and $U$, is continuous. Then the joint distribution of $W$ and $U$ conditional on vote share is also continuous in vote share, as:

$$\Pr[W = w, U = u | VoteShare = x] = f_{VoteShare|W,U}(x|W,U) \frac{\Pr[W = w, U = u]}{f_{VoteShare}(x)}$$

Because of this continuity, all observed and unobserved predetermined characteristics will have identical distributions on either side of the threshold, $VoteShare = 50\%$:

$$\lim_{x \downarrow 50\%} \Pr[W = w, U = u | VoteShare = x] = \lim_{x \uparrow 50\%} \Pr[W = w, U = u | VoteShare = x]$$

We can thus define and estimate the treatment effect as:

$$\beta_{RDD} \stackrel{\text{def}}{=} \lim_{VoteShare \downarrow 50\%} E(CAR_i|Win) - \lim_{VoteShare \uparrow 50\%} E(CAR_i|Lose)$$
$$= E(CAR_i(Win) - CAR_i(Lose)|VoteShare = 50\%).$$

**Estimation:** The effect can be estimated by approximating $CAR_i$ from both sides of the 50% threshold of vote share, and take the difference. To do so, we implement a nonparametric estimation of $\beta_{RDD}$ by local polynomial regression:

$$CAR_i = \alpha + \beta Winner_i + \boldsymbol{P_w}(VoteShare_i - 50\%)\mathbf{1}_{\{VoteShare_i \geq 50\%\}}$$
$$+ \boldsymbol{P_l}(VoteShare_i - 50\%)\mathbf{1}_{\{VoteShare_i < 50\%\}} + \varepsilon_i,$$

where $\boldsymbol{P_w}(.)$ and $\boldsymbol{P_l}(.)$ are two different second degree polynomials of $VoteShare_i$ (without the constant) to be estimated. The estimator $\widehat{\beta_{RDD}}$ is obtained from:

$$\min_{\alpha,\beta,P_w,P_l} \sum_i \Big(CAR_i - \alpha - \beta Winner_i - \boldsymbol{P_w}(VoteShare_i - 50\%)\mathbf{1}_{\{VoteShare_i \geq 50\%\}}$$
$$- \boldsymbol{P_l}(VoteShare_i - 50\%)\mathbf{1}_{\{VoteShare_i < 50\%\}}\Big)^2 K\left(\frac{VoteShare_i - 50\%}{bw}\right),$$

where the kernel weight function $K\left(\frac{VoteShare_i - 50\%}{bw}\right) = \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{1}{2}\left(\frac{VoteShare_i - 50\%}{bw}\right)^2\right)$ is the probability density function of the standard normal distribution $\mathcal{N}(0,1)$, and $bw$ is the bandwidth (chosen at 0.005 in our benchmark specification). It is implemented by a kernel-weighted OLS with the two polynomial controls. The local polynomial controls deal with the boundary bias in nonparametric kernel regressions. The method requires controlling for observed vote shares, not the vote share predicted by polls or markets. The combined local polynomial regression yields directly $\widehat{\beta_{RDD}}$'s standard error (Imbens and Lemieux 2008).[1]

This specification is equivalent to a two-step procedure of (1) two nonparametric estimations by local polynomial regressions of $CAR_i = F(VoteShare_i) + \varepsilon_i$, separately on the subsample where $VoteShare_i < 50\%$ to estimate the function $\hat{F}_-(.)$, and on the subsample where $VoteShare_i > 50\%$ to obtain $\hat{F}_+(.)$, and (2) calculate $\widehat{\beta_{RDD}}$ as $\hat{F}_+(50\%) - \hat{F}_-(50\%)$.

In practice, the choice of the bandwidth may have considerable influence on the estimate (Calonico Cattaneo Titiunik 2014). To be conservative, instead of calculating the optimal

[1] Other estimation procedures of RDD may differ in the choice of the bandwidth and the kernel function. For example, if one chooses a rectangular kernel function, the estimation is equivalent to an OLS regression on *Winner*$_i$, controlling for two polynomials on both sides of the threshold, within a certain bandwidth. Our results are robust to many different specifications.

bandwidth (Imbens and Kalyanaraman 2012), we show that our results are robust for a large range of bandwidths. We also verified that results are robust to Calonico et al.'s correction.

**Generalizability:** Moreover, if we let the effect be heterogeneous across observations, i.e., $\beta(W_i, U_i)$ with $W_i$ representing all observable and unobservable characteristics of each observation *i*, then the estimate can be rewritten as follows:

$$\beta_{RDD} = \int \beta(W,U) \frac{f(50\%|W,U)}{f(50\%)} dG(W,U),$$

where $G(W,U)$ is the cumulative joint distribution of *(W,U)*, and the weight $\frac{f(50\%|W,U)}{f(50\%)}$ represents the ex-ante likelihood of the characteristics *(W,U)* to produce a close election. $\beta_{RDD}$ is thus a Weighted Average Treatment Effect across all possible observations.

**Inferences:** Standard errors are calculated directly from the local polynomial regression. They are clustered by states, since the main regressor $Winner_i$ varies by each politician-election year combination, and that one needs to take into account potential autocorrelation over the years (as highlighted by Moulton 1990, Bertrand, Duflo, and Mullainathan 2004, and reviewed by Cameron and Miller 2011.) As the state is the most aggregated level possible in this context, clustering by state is the most conservative (following Cameron and Miller 2011). The number of clusters is around 30. While one would need to worry about the issue of few clusters below this number, the simulated results by Cameron, Gehlbach, and Miller (2008) show that tests based on cluster-robust standard errors for 30 clusters still have very good size. To make sure that we stay on the conservative side, we try different levels of clustering in robustness tests, and find that the results remain particularly robust.

The tests also include two-way clustering between directors and candidates, based on Cameron, Gelbach, and Miller (2011), to allow for arbitrary error correlation among observations sharing the same director or sharing the same candidate. Accordingly, the formula of the two-way clustering-robust variance covariance matrix of the vector of estimates is simply:

$$\boldsymbol{V}_{d \vee p} = \boldsymbol{V}_d + \boldsymbol{V}_p - \boldsymbol{V}_{d \wedge p},$$

where $\boldsymbol{V_d}$ and $\boldsymbol{V_p}$ are the variance covariance matrices of the vector estimates when corrected for clustering by directors and by candidates, respectively; and $\boldsymbol{V}_{d \wedge p}$ is the variance covariance matrix of the vector estimates when corrected for clustering by pairs of director-candidate. Those matrices are obtained with standard regression tools.

**RDD Estimation with misspecified prior probabilities:** The RDD by close election relies on a near-random cross-sectional identification; therefore it is robust to misspecification in event study such as misspecified prior probabilities of events. To illustrate this point, we take from Cuñat Gine Guadalupe's (2012) analysis of close votes on corporate governance provisions. Assume a candidate P in a close election, and after the election P-connected firms are valued at $\overline{V}$ and $\underline{V}$ depending on whether P wins or loses. The correct value of connections to P in office is $\overline{V} - \underline{V}$. Suppose that just before the election, the market expects P to win with probability $p$, and to lose with probability $1 - p$. At that point, the expected value that is factored in P-connected firms' stock price is $E_0(V) = p\overline{V} + (1 - p)\underline{V}$.

Market reaction amounts to $\overline{V} - E_0(V) = (1 - p)(\overline{V} - \underline{V})$ if P wins, and $\underline{V} - E_0(V) = -p(\overline{V} - \underline{V})$ if P loses. Hence an event study that considers only market reactions to P's win would naturally underestimate the value of connection ($0 < p < 1$), because the possibility of P's win has been partly factored in connected stock prices. If one assume that the prior probability is 50%, it is possible to infer $\overline{V} - \underline{V}$ from $(1 - p)(\overline{V} - \underline{V})$. This assumption can be tested by comparing market reactions (in absolute value to winner-connected firms with loser-connected firms.

In contrast, identification by RDD uses an estimate of the differences in market reactions between winner-connected firms and loser-connected firms, which is always $\overline{V} - \underline{V}$ no matter what value $p$ takes. The use of CARs, while non-essential to our identification, nevertheless helps reduce market noises and improve estimation efficiency. In using RDD with cumulative abnormal returns, we get the best out of both cross-sectional and time-series methods.

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## Appendix Table A1: Candidate Details

This appendix provides details of close gubernatorial elections in our sample. Turnout is the total number of votes for all the candidates in an election. Vote counts for winner and loser are the total number of votes for winner and loser, respectively. The vote percent is the percentage of votes a winner or loser receives among the top-two contenders in a close election. Incumbent refers to a candidate who seeks for a re-election. Margin of victory is the difference in vote percent between the top-two contenders in a close election.

| No. | Election Date | State | Number Of Candidates | Turnout | Winner | | | | | | Loser | | | | | | Margin Of Victory |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Name | Education | Party | (A) Vote Count | Vote Percent (A)/(A + B) | Incumbent | Name | Education | Party | (B) Vote Count | Vote Percent (B)/(A + B) | Incumbent | |
| 1 | 2010-11-02 | Connecticut | 3 | 1,145,799 | Dan Malloy | Boston College (BA'77) Boston College (JD'80) | D | 567,278 | 0.503 | 0 | Tom Foley | Harvard University (AB'75) Harvard University (MBA'79) | R | 560,874 | 0.497 | 0 | 0.006 |
| 2 | 2010-11-02 | Florida | 7 | 5,359,735 | Rick Scott | Southern Methodist University (JD'80) The University of Missouri-Kansas City (BBA'78) | R | 2,619,335 | 0.506 | 0 | Alex Sink | Wake Forest University (BA'70) | D | 2,557,785 | 0.494 | 0 | 0.012 |
| 3 | 2010-11-02 | Illinois | 5 | 3,729,989 | Pat Quinn | Georgetown University (BS'71) Northwestern University (JD'80) | D | 1,745,219 | 0.505 | 1 | Bill Brady | Illinois Wesleyan University (BS'83) | R | 1,713,385 | 0.495 | 0 | 0.009 |
| 4 | 2010-11-02 | Maine | 5 | 580,538 | Paul LePage | Husson College (BS'71) University of Maine (MBA'75) | R | 218,065 | 0.511 | 0 | Eliot Cutler | Georgetown University (JD'73) Harvard College (BA'68) | I | 208,270 | 0.489 | 0 | 0.023 |
| 5 | 2010-11-02 | Minnesota | 7 | 2,107,021 | Mark Dayton | Yale University (BA'69) | D | 919,232 | 0.502 | 0 | Tom Emmer | University of Alaska at Fairbanks (BA'84) William Mitchell College of Law (JD'88) | R | 910,462 | 0.498 | 0 | 0.005 |
| 6 | 2010-11-02 | Ohio | 4 | 3,852,469 | John Kasich | Ohio State University (BA'74) | R | 1,889,186 | 0.510 | 0 | Ted Strickland | Asbury College (BA'63) Asbury Theological Seminary (Mdiv'67) University of Kentucky (MA'66) University of Kentucky (PhD'80) | D | 1,812,059 | 0.490 | 1 | 0.021 |
| 7 | 2010-11-02 | Oregon | 4 | 1,450,335 | John Kitzhaber | Dartmouth College (BA'69) Oregon Health & Science University (MD'73) | D | 716,525 | 0.508 | 0 | Chris Dudley | Yale University (BA'87) | R | 694,287 | 0.492 | 0 | 0.016 |
| 8 | 2010-11-02 | Rhode Island | 7 | 342,290 | Lincoln Chafee | Brown University (BA'75) | I | 123,571 | 0.518 | 0 | John F. Robitaille | Providence College (BA'70) University of Utah (MS'76) | R | 114,911 | 0.482 | 0 | 0.036 |
| 9 | 2010-11-02 | South Carolina | 4 | 1,344,198 | Nikki Haley | Clemson University (BS'94) | R | 690,525 | 0.523 | 0 | Vincent Sheheen | Clemson University (BA'93) University of South Carolina (JD'96) | D | 630,534 | 0.477 | 0 | 0.045 |
| 10 | 2010-11-02 | Vermont | 7 | 241,605 | Peter Shumlin | Wesleyan University (BA'79) | D | 119,543 | 0.509 | 0 | Brian Dubie | University of Vermont (BS'82) | R | 115,212 | 0.491 | 0 | 0.018 |
| 11 | 2009-11-03 | New Jersey | 12 | 2,423,792 | Chris Christie | Seton Hall University (JD'87) University of Delaware - Wilmington (BA'84) | R | 1,174,445 | 0.519 | 0 | Jon Corzine | University of Chicago (MBA'73) University of Illinois (BA'69) | D | 1,087,731 | 0.481 | 1 | 0.038 |
| 12 | 2008-11-04 | North Carolina | 3 | 4,268,941 | Bev Perdue | University of Florida (ME d'74) University of Florida (PhD'76) University of Kentucky (BA'69) | D | 2,146,189 | 0.517 | 0 | Pat McCrory | Catawba College (BA'78) | R | 2,001,168 | 0.483 | 0 | 0.035 |
| 13 | 2006-11-07 | Minnesota | 6 | 2,202,937 | Tim Pawlenty | University of Minnesota (BA'83) University of Minnesota (JD'86) | R | 1,028,568 | 0.505 | 1 | Mike Hatch | University of Minnesota (BS'70) University of Minnesota (JD'73) | DFL | 1,007,460 | 0.495 | 0 | 0.010 |
| 14 | 2006-11-07 | Nevada | 4 | 582,158 | Jim Gibbons | Southwestern University (JD'79) University of Nevada (BS'67) University of Nevada (MS'73) | R | 279,003 | 0.522 | 0 | Dina Titus | College of William and Mary (BA'70) Florida State University (Phd'76) University of Georgia (MA'73) | D | 255,684 | 0.478 | 0 | 0.044 |
| 15 | 2006-11-07 | Rhode Island | 2 | 386,112 | Donald Carcieri | Brown University (BA'65) | R | 197,013 | 0.510 | 1 | Charles J. Fogarty | Providence College (BA'77) University of Rhode Island (MPA'80) | D | 189,099 | 0.490 | 0 | 0.020 |
| 16 | 2004-11-02 | Missouri | 4 | 2,719,599 | Matt Blunt | United States Naval Academy (BA'93) | R | 1,382,419 | 0.515 | 0 | Claire McCaskill | University of Missouri (BS'75) University of Missouri (JD'78) | D | 1,301,442 | 0.485 | 0 | 0.030 |
| 17 | 2004-11-02 | Montana | 4 | 446,146 | Brian Schweitzer | Colorado State University (BS'78) Montana State University (MS'80) | D | 225,016 | 0.523 | 0 | Bob Brown | Montana State University (BS'70) University Of Montana (ME d'88) | R | 205,313 | 0.477 | 0 | 0.046 |

| No. | Election Date | State | Number Of Candidates | Turnout | Winner | | | | | | Loser | | | | | | Margin Of Victory |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Name | Education | Party | (A) Vote Count | Vote Percent (A)/(A + B) | Incumbent | Name | Education | Party | (B) Vote Count | Vote Percent (B)/(A + B) | Incumbent | |
| 18 | 2004-11-02 | New Hampshire | 2 | 666,280 | John Lynch | Georgetown University (JD'84) Harvard University (MBA'79) University of New Hampshire (BA'74) | R | 340,299 | 0.511 | 0 | Craig Benson | Babson College (BS'77) Syracuse University (MBA'79) | D | 325,981 | 0.489 | 1 | 0.021 |
| 19 | 2004-11-02 | Washington | 3 | 2,810,058 | Christine Gregoire | Gonzaga University (JD'77) University of Washington (BA'69) | D | 1,373,361 | 0.500 | 0 | Dino Rossi | Seattle University (BA'82) | R | 1,373,232 | 0.500 | 0 | 0.000 |
| 20 | 2003-11-15 | Louisiana | 2 | 1,407,842 | Kathleen Blanco | University of Louisiana at Lafayette (BA'64) | D | 731,358 | 0.519 | 0 | Bobby Jindal | Brown University (BS'91) Oxford University (Mlitt'94) | R | 676,484 | 0.481 | 0 | 0.039 |
| 21 | 2002-11-05 | Alabama | 3 | 1,367,053 | Bob Riley | University of Alabama (BA'65) | R | 672,225 | 0.501 | 0 | Don Siegelman | Georgetown University (JD'72) Oxford University (Rhode Scholar'73) University of Alabama (BA'68) | D | 669,105 | 0.499 | 1 | 0.002 |
| 22 | 2002-11-05 | Arizona | 4 | 1,226,111 | Janet Napolitano | Santa Clara University (BA'79) University of Virginia (JD'83) | D | 566,284 | 0.505 | 0 | Matt Salmon | Arizona State University (BA'81) Brigham Young University (MA'86) | R | 554,465 | 0.495 | 0 | 0.011 |
| 23 | 2002-11-03 | Hawaii | 6 | 385,457 | Linda Lingle | California State University (BA'75) | R | 197,009 | 0.523 | 0 | Mazie Hirono | Georgetown University (JD'78) University of Hawaii (BA'70) | D | 179,647 | 0.477 | 0 | 0.046 |
| 24 | 2002-11-04 | Maryland | 3 | 1,706,179 | Robert Ehrlich | Princeton University (BA'79) Wake Forest University (JD'82) | R | 879,592 | 0.520 | 0 | Kathleen Kennedy Townsend | Harvard University (BA'74) University of New Mexico (JD'78) | D | 813,422 | 0.480 | 0 | 0.039 |
| 25 | 2002-11-05 | Michigan | 4 | 3,177,565 | Jennifer Granholm | Harvard University (JD'87) University of California, Berkeley (BA'84) | D | 1,633,796 | 0.520 | 0 | Dick Posthumus | Michigan State University (BA'72) | R | 1,506,104 | 0.480 | 0 | 0.041 |
| 26 | 2002-11-07 | Oklahoma | 3 | 1,035,620 | Brad Henry | University of Oklahoma (BA'85) University of Oklahoma (JD'88) | D | 448,143 | 0.504 | 0 | Steve Largent | Tulsa University (BS'76) | R | 441,277 | 0.496 | 0 | 0.008 |
| 27 | 2002-11-05 | Oregon | 3 | 1,260,497 | Ted Kulongoski | University of Missouri (BA'67) University of Missouri (JD'70) | D | 618,004 | 0.515 | 0 | Kevin Mannix | University of Virginia (BA'71) University of Virginia (JD'74) | R | 581,785 | 0.485 | 0 | 0.030 |
| 28 | 2002-11-05 | Tennessee | 15 | 1,653,167 | Phil Bredesen | Harvard University (BS'67) | D | 837,284 | 0.516 | 0 | Van Hilleary | Samford University (JD'90) University of Tennessee (BS'81) | R | 786,803 | 0.484 | 0 | 0.031 |
| 29 | 2002-11-05 | Vermont | 10 | 230,012 | Jim Douglas | Middlebury College (BA'72) | R | 103,436 | 0.515 | 0 | Doug Racine | Princeton University (BA'74) | D | 97,565 | 0.485 | 0 | 0.029 |
| 30 | 2002-11-05 | Wisconsin | 8 | 1,771,013 | Jim Doyle | Harvard University (JD'72) University of Wisconsin, Madison (BA'67) | D | 800,971 | 0.522 | 0 | Scott McCallum | Johns Hopkins University (MA'74) Macalester College (BA'72) | R | 732,796 | 0.478 | 1 | 0.044 |
| 31 | 2002-11-05 | Wyoming | 3 | 185,459 | Dave Freudenthal | Amherst College (BA'73) University of Wyoming (JD'80) | D | 92,662 | 0.510 | 0 | Eli Bebout | University of Wyoming (BS'69) | R | 88,873 | 0.490 | 0 | 0.021 |
| 32 | 2000-11-07 | Missouri | 7 | 2,346,830 | Bob Holden | Missouri State University (BS'73) | D | 1,152,752 | 0.505 | 0 | Jim Talent | University of Chicago (JD'81) Washington University (BS'78) | R | 1,131,307 | 0.495 | 0 | 0.009 |
| 33 | 2000-11-07 | Montana | 3 | 410,192 | Judy Martz | Eastern Montana College (Associate'65) | R | 209,135 | 0.520 | 0 | Mark O'Keefe | University of California-Sacramento (BS'77) University Of Montana (MS'84) | D | 193,131 | 0.480 | 0 | 0.040 |
| 34 | 2000-11-07 | West Virginia | 5 | 648,047 | Bob Wise | Duke University (BA'70) Tulane University (JD'75) | D | 324,822 | 0.515 | 0 | Cecil H. Underwood | Salem College (BA'43) West Virginia University (MA'52) | R | 305,926 | 0.485 | 1 | 0.030 |
| 35 | 1999-11-04 | Mississippi | 4 | 763,937 | Ronnie Musgrove | University of Mississippi (BA'78) University of Mississippi (JD'81) | D | 379,033 | 0.506 | 0 | Mike Parker | William Carey University (BA'70) | R | 370,691 | 0.494 | 0 | 0.011 |

## Appendix Table A2: Variable Definition

| Variable Name | Description | Data Source |
|---|---|---|
| **Firm Characteristics** | | |
| Market-Adjusted Holding Period Returns | Buy-and-Hold Cumulative Market-adjusted Stock Returns | CRSP |
| Market Capitalization (in Million) | cscho * prcc_f | Compustat |
| Dependence on External Finance | (capx - oancf)/capx | Compustat |
| Market-to-Book | (cscho * prcc_f)/at | Compustat |
| Return on Asset | $ib/at_{t-1}$ | Compustat |
| Book Leverage | (dlc + dltt)/(dlc + dltt + ceq) | Compustat |
| Capital Expenditure | $capx/at_{t-1}$ | Compustat |
| Number of Employee (in thousand) | emp | Compustat |
| Research and Development | $xrd/at_{t-1}$ | Compustat |
| Firm Age | Total number of years since a firm first entry in Compustat | Compustat |
| Payout | dvt + prstkc | Compustat |
| Cash Reserve Ratio | che/at | Compustat |
| Tangibility | ppent/at | Compustat |
| Sales and General Administration Ratio | $xsga/at_{t-1}$ | Compustat |
| Interest Coverage | oibdp/xint | Compustat |
| Access into Bank Loan | Number of Loan facility in which the primary purpose is ("Corp. purposes", "Takeover", "Acquisition Line" or "Capital Expenditures") following Almeida, Campello and Hackbarth (2011) | DealScan |
| Facility Amount (in million) | Facility amount | DealScan |
| Loan Spread (in basis points) | Average loan spread (allindrawn) weighted by facility nominal amount, where loan spread is the stated interest rate above LIBOR. | DealScan |
| Number of Directors | The number of directors in the firm | BoardEx |
| Fraction of Independent Directors | The number of independent directors over total number of directors in the firm | BoardEx |
| Same HQ and Election State (0/1) | Indicator variable equals one if a firm's headquarter is in the election state, and zero otherwise | BoardEx/Compustat/Heider and Ljungqvist (2014) |
| Distance from HQ to Election State Capital (in Miles) | The distance between a firm's headquarter and the capital of the election state in miles | BoardEx/Compustat |
| Federal and State Subsidy | Development subsidies and other forms of governmental assistance granted to companies at both the state and federal levels. The subsidies granted to subsidiaries are aggregated at parent entity. State subsidies include state tax credits, state grants, state financing, state megadeals, and state enterprise zones. | Good Jobs First website (http://www.goodjobsfirst.org) |

| Variable Name | Description | Data Source |
|---|---|---|
| **Board and Director Characteristics** | | |
| Number of External Connections to Gubernatorial Candidates | The number of directors connected to a gubernatorial candidate in the firm | BoardEx/Public Records |
| Fraction of Directors Externally Connected to a Gubernatorial Candidate | The number of directors connected to a winning gubernatorial candidate over total number of directors in the firm | BoardEx/Public Records |
| Number of External Connections to a Winning Gubernatorial Candidates | The number of directors connected to a winning gubernatorial candidate in the firm | BoardEx/Public Records |
| Fraction of Directors Externally Connected to a Winning Gubernatorial Candidate | The number of directors connected to a gubernatorial candidate over total number of directors in the firm | BoardEx/Public Records |
| Male Director (0/1) | Indicator variable equals one if a director is a male, and zero otherwise | BoardEx |
| Director's Age | Director's age | BoardEx |
| Executive Directorship (0/1) | Indicator variable equals one if a director is an executive director, and zero otherwise | BoardEx |
| Independent Director (0/1) | Indicator variable equals one if a director is an independent director, and zero otherwise | BoardEx |
| CEO (0/1) | Indicator variable equals one if a director is the CEO, and zero otherwise | BoardEx |
| Chairman (0/1) | Indicator variable equals one if a director is the chairman, and zero otherwise | BoardEx |
| **State and Candidate Characteristics** | | |
| Regulation Index | The index of regulation by state is measured for 1999, which combines information on labor and environmental regulations and regulations in specific industries such as insurance | Clemson University's Report on Economic Freedom, http://freedom.clemson.edu. |
| Conviction Rate Per Capita | The ratio of convicted corruption cases by population size, averaged from 1976 to 2002 following Glaeser and Saks (2006) | The Department of Justice's "Report to Congress on the Activities and Operations of the Public Integrity Section" |
| Fraction of State Government Employment | The number of state employees over total number of employees in the state | Public Records |
| Male Candidate | Indicator variable equals one if a candidate is a male, and zero otherwise | Public Records |
| Candidate's Age | Candidate's age | Public Records |
| Total State Level Donation in a State Election (in Million) | Total donations to a gubernatorial candidate in a state election cycle in million | Good Jobs First website (http://www.goodjobsfirst.org) |
| Total State Level Donation by a Connected Firm | Total corporate donations by a connected firm to a gubernatorial candidate in a state election cycle | Good Jobs First website (http://www.goodjobsfirst.org) |
| Logarithm of Election Turnout | Logarithm of election turnout | State Election Records |
| Incumbent (0/1) | Indicator variable equals one if a candidate is an | State Election Records |

| Variable Name | Description | Data Source |
| --- | --- | --- |
| | incumbent, and zero otherwise | |
| Time Since Reunion (in Years) | The number of years since an election candidate last attends a school reunion. | BoardEx/Public Records |
| Time Since Graduation (in Years) | The number of years since an election candidate graduates from a university | BoardEx/Public Records |

## Appendix Table A3: RDD Randomness Checks

This table reports robustness checks of the near-randomness of the winning/losing treatment induced by close gubernatorial elections between 1999 and 2010. Each observation pairs a firm's director to one of the top two contenders in a close gubernatorial election, if the director and the contender both graduate from the same university campus and the same degree (Cohen, Frazzini, and Malloy 2008). *Local connected firms* are the ones that 1) have at least one such connected director; and 2) are headquartered either in the election state or within 500 miles from the election state's capital. *Winner* is a dummy variable equal to one (zero) if the candidate wins (loses) the close election. A close election is specified by a winner-loser margin of votes of less than 5% based on their vote shares as a fraction of top-two candidate total votes. All regressions are implemented as Gaussian-kernel weighted OLS, controlling for the quadratic polynomials of vote shares of winners and vote shares of losers. Each column aims to show that a dependent variable's distribution, measured before a close gubernatorial election, is continuous at the cutoff point of 50% vote share. Panel A reports the results on director characteristics (gender, age, executive directorship, independent directorship, CEO, and chairman.) Panel B reports regressions on firm characteristics such as geographic distance (headquarter in election state, in adjacent state, distance between headquarter and state capital in miles), market capitalization, market-to-book ratio, ROA, dependence on external finance, total donations by a connected firm to a candidate, number of directors connected per firm). Panel C presents results for the pre-election firm performance (buy-and-hold cumulative market-adjusted stock returns and ROA), financing activities (number of loan facility measured a la Almeida, Campello and Hackbarth (2011), book leverage, and average loan spread weighted by facility nominal amount, and investing activities (capital expenditure and employment). Panel D presents the results on candidate and election characteristics (gender, age, total donation, election turnout, incumbency, party affiliation, years since graduation, director-candidate belonging to the same cohort in alumni reunion) and state characteristics (state regulation, convictions rate, and government share of state employment). Robust standard errors in square brackets are corrected for clustering by state. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

**Panel A: Director Characteristics**

| **Dependent Variable:** | Gender | Age | Executive Directorship | Independent Directorship | CEO | Chairman |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Winner | -0.170 | 1.618 | 0.014 | -0.053 | 0.001 | -0.101 |
| | [0.182] | [3.860] | [0.047] | [0.062] | [0.037] | [0.070] |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.026 | 0.077 | 0.004 | 0.006 | 0.004 | 0.005 |
| Observations | 694 | 694 | 694 | 694 | 694 | 694 |

**Panel B: Firm Characteristics**

| Dependent Variable: | Proximity to State Capital | | | Firm Characteristics | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Same State | Adjacent State | HQ-Election State Capital Distance | Ln(Market Capitalization) | Market-to-Book | ROA | Dependence on External Finance | Donation to Connected Candidate | Number of Connections |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (9) | (10) |
| Winner | -0.044 | -0.109 | 38.604 | -0.377 | 0.420 | -0.074 | 0.315 | -3,224 | -0.027 |
| | [0.141] | [0.142] | [46.092] | [0.928] | [0.286] | [0.060] | [0.287] | [2,532] | [0.122] |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.109 | 0.035 | 0.084 | 0.022 | 0.011 | 0.016 | 0.024 | 0.189 | 0.063 |
| Observations | 694 | 694 | 694 | 662 | 622 | 622 | 670 | 694 | 694 |

**Panel C: Firm Outcomes**

| Dependent Variable: | Performance | | Financing Activities | | | Investing Activities | |
|---|---|---|---|---|---|---|---|
| | Prior 6-Month Holding Period Return | ROA | Access to Bank Loan | Book Leverage | Loan Spread | Capital Expenditure | Employment |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Winner | 0.072 | -0.074 | -0.733 | 0.001 | 2.854 | -0.005 | -6.335 |
| | [0.074] | [0.060] | [0.452] | [0.044] | [13.965] | [0.014] | [10.655] |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.037 | 0.016 | 0.008 | 0.004 | 0.009 | 0.012 | 0.005 |
| Observations | 680 | 622 | 694 | 628 | 269 | 582 | 619 |

**Panel D: Candidates and State Characteristics**

| **Dependent Variable:** | Gender | Age | Total Donation | Ln(Turnout) | Incumbent | Party | Years Since Graduation | Invitation to a Reunion as the Connected Director | High Regulation | High Convictions Per Capita | High Government Share of State Employment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| Winner | -0.176 | 0.413 | -762,583 | -0.276 | -0.423 | -1.351 | 2.524 | -0.268 | -0.222 | -0.410 | -0.182 |
| | [0.258] | [4.234] | [5,535,858] | [0.333] | [0.355] | [1.278] | [3.778] | [0.162] | [0.281] | [0.257] | [0.291] |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.136 | 0.046 | 0.123 | 0.098 | 0.046 | 0.114 | 0.059 | 0.191 | 0.121 | 0.143 | 0.084 |
| Observations | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 |

## Appendix Table A4: Controlling for Other Observables

Controlling for various observables, including different vote share polynomials, firm, director, and election characteristics, and number of connections, this table presents our RDD nonparametric estimation of the impact of the external networks of corporate directors on the value of their firm by relating stock price cumulated abnormal returns (CAR) of *local connected firms* around close gubernatorial elections in the U.S. between 1999 and 2010 to the winning status of their connected contenders. Each observation pairs a firm's director to one of the top two contenders in a close gubernatorial election, if the director and the contender both graduate from the same university campus and the same degree (Cohen, Frazzini, and Malloy 2008). Local connected firms are the ones that 1) have at least one such connected director; and 2) are headquartered either in the election state or within 500 miles from the election state's capital. CAR are estimated based on the market model around the election day (day 0), using daily data over a 255-day (-315, -61) window. *Winner* is a dummy variable equal to one (zero) if the candidate wins (loses) the close election. A close election is specified by a winner-loser margin of votes of less than 5% based on their vote shares as a fraction of top-two candidate total votes. All regressions are implemented as Gaussian-kernel weighted OLS, with bandwidth equal 0.005, controlling for the quadratic polynomials of vote shares of winners and vote shares of losers. Columns 1 to 4 control for the 1$^{st}$, 2$^{nd}$, 3$^{rd}$, and 4$^{th}$ degree polynomials of vote share of winners and losers, respectively. Column 5 controls for firm characteristics (market capitalization, market-to-book ratio, book leverage, ROA, and Fama-French 10 industry fixed effects). Column 6 controls for director characteristics (age, gender, executive directorship, independent directorship, CEO, and chairman). Column 7 controls for candidate characteristics (age, gender, total donation, and election fixed effects). Column 8 controls for the total number of directors connected to a gubernatorial candidate in a firm. Robust standard errors in square brackets are corrected for clustering by state. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

| | **Dependent Variables: CAR (-1,1)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Winner | 0.031<br>[0.007]*** | 0.041<br>[0.002]*** | 0.041<br>[0.003]*** | 0.038<br>[0.002]*** | 0.045<br>[0.005]*** | 0.040<br>[0.006]*** | 0.027<br>[0.002]*** | 0.040<br>[0.002]*** |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Controls | 1st Degree Polynomial | 2nd Degree Polynomial | 3rd Degree Polynomial | 4th Degree Polynomial | Firm Controls | Director Controls | Election Controls | Number of Connections |
| R-squared | 0.037 | 0.041 | 0.049 | 0.081 | 0.182 | 0.059 | 0.138 | 0.043 |
| Observations | 694 | 694 | 694 | 694 | 615 | 694 | 694 | 694 |

## Appendix Table A5: Alternative Sample

This table presents our RDD nonparametric estimation of the impact of the external networks of corporate directors on the value of their firm by relating stock price cumulated abnormal returns (CAR) of *local connected firms* around close gubernatorial elections in the U.S. between 1999 and 2010 to the winning status of their connected contenders. Each observation pairs a firm's director to one of the top two contenders in a close gubernatorial election, if the director and the contender both graduate from the same university campus and the same degree (Cohen, Frazzini, and Malloy 2008). Local connected firms are the ones that 1) have at least one such connected director; and 2) are headquartered either in the election state or within 500 miles from the election state's capital (unless stated otherwise in columns 1 and 2). CAR are estimated based on the market model around the election day (Day 0), using daily data over a 255-day (-315, -61) window. *Winner* is a dummy variable equal to one (zero) if the candidate wins (loses) the close election. A close election is specified by a winner-loser margin of votes of less than 5% based on their vote shares as a fraction of top-two candidate total votes. All regressions are implemented as Gaussian-kernel weighted OLS, with bandwidth equal 0.005, controlling for the quadratic polynomials of vote shares of winners and vote shares of losers. Columns 1 and 2 focus on local connected firms that are headquartered in the election state or within 250 miles from the election state's capital, and in the election state or within 100 miles from the election state's capital, respectively. Columns 3 to 6 consider 4%, 3%, 2%, and 1% vote margin, respectively. Robust standard errors in square brackets are corrected for clustering by state. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Subsamples: | Election State OR Within 250 Miles | Election State OR Within 100 Miles | 4% Vote Margin | 3% Vote Margin | 2% Vote Margin | 1% Vote Margin |
| Winner | 0.041<br>[0.002]*** | 0.034<br>[0.008]*** | 0.041<br>[0.002]*** | 0.041<br>[0.002]*** | 0.042<br>[0.002]*** | 0.038<br>[0.003]*** |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.046 | 0.081 | 0.041 | 0.041 | 0.041 | 0.048 |
| Observations | 404 | 193 | 657 | 457 | 238 | 179 |

## Appendix Table A6: Different Levels of Standard Error Clustering

Correcting for various levels of clustering, this table presents our RDD nonparametric estimation of the impact of the external networks of corporate directors on the value of their firm by relating stock price cumulated abnormal returns (CAR) of *local connected firms* around close gubernatorial elections in the U.S. between 1999 and 2010 to the winning status of their connected contenders. Each observation pairs a firm's director to one of the top two contenders in a close gubernatorial election, if the director and the contender both graduate from the same university campus and the same degree (Cohen, Frazzini, and Malloy 2008). Local connected firms are the ones that 1) have at least one such connected director; and 2) are headquartered either in the election state or within 500 miles from the election state's capital. CAR are estimated based on the market model around the election day (Day 0), using daily data over a 255-day (-315, -61) window. *Winner* is a dummy variable equal to one (zero) if the candidate wins (loses) the close election. A close election is specified by a winner-loser margin of votes of less than 5% based on their vote shares as a fraction of top-two candidate total votes. All regressions are implemented as Gaussian-kernel weighted OLS, with bandwidth equal 0.005, controlling for the quadratic polynomials of vote shares of winners and vote shares of losers. Columns 1 to 13 cluster the standard errors by election year, election state, election, candidate, director, company, school, director-company, candidate-election year, director-election year, company-election year, school-election year, and candidate-director-company-school-election year, respectively. Column 14 clusters the standard errors two ways by both firm and candidate. Standard errors in square brackets are robust. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

| | **Dependent Variables: CAR (-1,1)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) |
| Winner | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 |
| | [0.001]*** | [0.002]*** | [0.002]*** | [0.015]*** | [0.017]** | [0.018]** | [0.011]*** | [0.017]** | [0.015]*** | [0.017]** | [0.018]** | [0.011]*** | [0.020]** | [0.020]** |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cluster | Election Year | Election State | Election | Candidate | Director | Company | School | Director-Company | Candidate-Election Year | Director-Election Year | Company-Election Year | School-Election Year | Candidate-Director-Company-School-Election Year | Two-Way Candidate Company |
| R-squared | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 |
| Observations | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 |

## Appendix Table A7: Director Networks and State Subsidies

This table presents our RDD nonparametric estimation of the impact of the external networks of corporate directors on state subsidies of their firm by relating various proxies for state subsidies to *local connected firms* before and after close gubernatorial elections in the U.S. between 1999 and 2010 to the winning status of their connected contenders. Each observation pairs a firm's director to one of the top two contenders in a close gubernatorial election, if the director and the contender both graduate from the same university campus and the same degree (Cohen, Frazzini, and Malloy 2008). Local connected firms are the ones that 1) have at least one such connected director; and 2) are headquartered either in the election state or within 500 miles from the election state's capital. CAR are estimated based on the market model around the election day (day 0), using daily data over a 255-day (-315, -61) window. *Winner* is a dummy variable equal to one (zero) if the candidate wins (loses) the close election. A close election is specified by a winner-loser margin of votes of less than 5% based on their vote shares as a fraction of top-two candidate total votes. All regressions are implemented as Gaussian-kernel weighted OLS, with bandwidth equal 0.005, controlling for the quadratic polynomials of vote shares of winners and vote shares of losers. Panel A and C report the respective levels and change in state and federal subsidies two and six years, respectively, around close gubernatorial elections. Panel B and D show the levels and change in specific type of state subsidy received two and six years, respectively, around close gubernatorial elections. Subsidies are development subsidies and other forms of governmental assistance, aggregated at parent entity, granted to companies. State and federal subsidy are indicator variables equal one if a firm receives a subsidy from state and federal government, respectively, and zero otherwise. Robust standard errors in square brackets are corrected for clustering by state. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

**Panel A: State and Federal Subsidy Two-Years around Elections**

| | Dependent Variables: | | | | | |
|---|---|---|---|---|---|---|
| | State Subsidy (0/1) | | | Federal Subsidy (0/1) | | |
| | 2 Years After Election | 2 Years Before Election | Change | 2 Years After Election | 2 Years Before Election | Change |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Winner | 0.050 | -0.003 | 0.053 | -0.027 | -0.027 | 0.000 |
| | [0.015]*** | [0.003] | [0.014]*** | [0.056] | [0.056] | [0.000] |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.048 | 0.021 | 0.047 | 0.032 | 0.032 | 0.004 |
| Observations | 694 | 694 | 694 | 694 | 694 | 694 |

**Panel B: Types of Subsidies Two-Years around Elections**

| | Dependent Variables: | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | State Loan (0/1) | | | State Tax Credit (0/1) | | | State Tax Credit (Dollar Value) | | |
| | 2 Years After Election | 2 Years Before Election | Change | 2 Years After Election | 2 Years Before Election | Change | 2 Years After Election | 2 Years Before Election | Change |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Winner | 0.047 | -0.006 | 0.053 | 0.056 | -0.003 | 0.059 | 33,108 | -1,658 | 34,766 |
| | [0.019]** | [0.005] | [0.016]*** | [0.012]*** | [0.003] | [0.011]*** | [6,101]*** | [2,913] | [6,290]*** |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.024 | 0.030 | 0.024 | 0.048 | 0.021 | 0.048 | 0.048 | 0.021 | 0.034 |
| Observations | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 |

**Panel C: State and Federal Subsidy Six-Years around Elections**

| | Dependent Variables: | | | | | |
|---|---|---|---|---|---|---|
| | State Subsidy (0/1) | | | Federal Subsidy (0/1) | | |
| | 6 Years After Election | 6 Years Before Election | Change | 6 Years After Election | 6 Years Before Election | Change |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Winner | 0.121 | -0.003 | 0.124 | -0.027 | -0.028 | 0.001 |
| | [0.029]*** | [0.003] | [0.029]*** | [0.056] | [0.056] | [0.002] |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.063 | 0.022 | 0.061 | 0.032 | 0.027 | 0.019 |
| Observations | 694 | 694 | 694 | 694 | 694 | 694 |

**Panel D: Types of Subsidies Six-Years around Elections**

| | Dependent Variables: | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | State Loan (0/1) | | | State Tax Credit (0/1) | | | State Tax Credit (Dollar Value) | | |
| | 6 Years After Election | 6 Years Before Election | Change | 6 Years After Election | 6 Years Before Election | Change | 6 Years After Election | 6 Years Before Election | Change |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Winner | 0.114 | -0.006 | 0.120 | 0.129 | -0.003 | 0.132 | 645,444 | -43,684 | 689,129 |
| | [0.035]*** | [0.005] | [0.032]*** | [0.028]*** | [0.003] | [0.028]*** | [116,873]*** | [45,269] | [105,819]*** |
| Vote Share (Winners) & Vote Share (Losers) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.049 | 0.030 | 0.045 | 0.076 | 0.021 | 0.075 | 0.049 | 0.023 | 0.049 |
| Observations | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 |

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