POLITICAL CONNECTIONS OF NEW BUSINESS VENTURES

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I hereby that this thesis has not been and will not be, submitted in whole or in part to another University for the award of any other degree.

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Abstract

The perceived capability of corporate organizations to influence politics, although fueling an ongoing public debate, features in literature as a source of probable benefits. According to the majority of the pertinent studies, these benefits, more often than not, materialize with important value-adding implications. In the U.S. context, whereby political money contributions constitute the prevalent way of establishing connections, this can result in a hefty return on a firm's political investment.

Our research posits that if political connections formed via monetary donations elevate the donor to a higher status, this should reflect in circumstances whereby a firm needs to assert its quality to other economic agents. This is the case for firms that are plagued by the market newness liability. Whether as a form of insurance from tail risk or entitlement to economic rents, proximity to politics offers legitimacy and a compelling way of introducing a new venture to the marketplace. To prove this conjecture, we mainly draw from IPOs for representing a setting of acute uncertainty.

Our findings confirm that both lobbying and PAC (Political Action Committee) expenditure pays off on listing day as donors incur less underpricing; an effect which can be amplified with contribution size and strategic targeting of recipients. Donor IPOs also experience negative offer price revisions and lower aftermarket volatility. Collectively, these results offer new empirical grounding to uncertainty and signaling theories.

Subsequently, we frame IPO pricing as an efficiency problem for prospective issuers and develop an approach of general application in finance, where relationships of influence are suspected. Rather than imposing a regression-based framework, we allow relationships to manifest themselves in a data-driven manner. Our analysis reveals nonlinearities between IPO pricing efficiency and the two contribution avenues (justifying the fully nonparametric treatment). We are able to uncover relationships separately according to business sector, which we interpret in terms of varied competitive environments.

Broadening up our scope prior to and after the IPO event, we document that connected firms are associated with a longer time to venture or other equity capital

financing, attesting to a greater financial autonomy. Additionally, they attain larger market shares and have a superior likelihood of survival in the public domain.

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Chapter 1 - Introduction

1.1 Background and motivation

The central axis this thesis revolves around is that of corporate political connections. This notion of acute public interest, defined by any conceivable interdependencies between business organizations and political institutions as on the basis of resource and agent sharing, has sparked substantial interdisciplinary research. A common theme emerges in the value-relevance of a firm's political strategy. Acknowledging a (limited) number of studies that allude to a latent form of perquisites consumption (e.g. Ansolabehere et al., 2003; Aggarwal et al., 2012), ties to the foremost loci of power have been shown to confer privileges which normally remain inaccessible. For example, connected firms secure bank loans on advantageous terms, systematically enjoy tax discounts, receive more frequently government bailouts but are considerably less likely to be detected for malpractices and fraudulent behavior (Faccio, 2006; Faccio and Parsley, 2009; Cooper et al., 2010; Yu and Yu, 2011; Correia, 2014; and Chen et al., 2015). Overall, the multifaceted benefits highlight proximity to politics as a salient niche of relationship capital and invite further research in pursuit of additional, currently overlooked implications.

Invariably, the existing literature (inclusive of the aforementioned studies) focuses on sizable, well-established firms which have nurtured their political network over a commensurately long period of time. As a result, these firms have already shaped a corporate identity and reputation within the market. That is, they are known for fulfilling their economic role and not as a consequence of their political outreach. Recent evidence from China's IPO frenzy, addresses connected firms at an earlier stage in corporate life cycle, that of the transition from the private to public domain (Fan et al., 2007; Francis et al., 2009). This research, however, encounters two major challenges: i) the distinct character of the local capital market constitutes the extensibility of findings precarious and ii) connections abound because of the old regime legacy and, therefore, barely indicate strategic investment in politics. In a departure from these works, the aim of this thesis is to introduce a novel function that political connections may serve in the special setting of new ventures. Specifically, it

develops the notion that this type of influential acquaintances can assist businesses to combat the market newness liability by providing the necessary legitimacy. In this respect, political connections can effectively refer a young firm to the market and lay the foundations for future success. The following analysis sheds light on the mechanics of this relationship. In particular, this thesis comprises three empirical chapters with each one exploring the above proposition from a theoretically or methodologically complementary angle.

Chapter 3 centers on the process of going public for politically connected firms. Our main argument is that if indeed this type of network confers certification, this dimension should be most apparent under circumstances of immense uncertainty as is typically the case at an IPO. The findings are robust and of high economic significance. IPO underpricing, the foremost cost in the listing procedure, subsides as a result of the decreased ex ante uncertainty characterizing the offering. Yet, as we show the effect varies considerably according to the perceived attractiveness of connections. In this respect, a need for strategic networking arises, so that a new venture maximizes the return on political investment.

The notion that political connections should not be regarded as a 'one size fits all' solution is further developed in Chapter 4. However, the main distinction is now drawn based on the employed means rather than the targeted politicians. Specifically, the two main proxies for political connections in the literature, lobbying and PAC (political action committee) campaigns, are comparatively assessed as to the extent that allow an issuer to claim a superior valuation for the ownership foregone. An additional contribution to the broader IPO literature pertains to the framing of IPO price discovery as an efficiency problem to be treated in a fully nonparametric way. The benefit of the data-driven approach is twofold as: (i) it is attentive to the dynamic nature of interpersonal relationships capturing any nonlinearities in the relationships and (ii) it overcomes a series of shortcomings in the IPO research such as the problem of return comparability, self-selection and simultaneity bias.

Finally, Chapter 5 broadens its scope to encompass the full spectrum of events during a new venture's life cycle. Key corporate milestones, ranging from the attainment of early external financing such as angel or venture capital to the firm's performance in a public domain, are sequentially visited in pursuit of separate evidence

of the interplay with politics. To this end, we document that staying in the good graces of politicians can be a stable source of competitive advantage. For example, connected firms enjoy considerable financial autonomy, increased market shares and a larger likelihood of survival over the long-run. The next paragraphs provide more detail about the motivation as well as the specific research areas that the aforementioned studies intend to contribute to.

1.2 Political money contributions of U.S. IPOs

Stimulated by the prolific literature on the value-enhancing element of proximity to politics, we investigate a prospective issuer's possibility to capture a larger portion of the surplus value created at an IPO by proceeding to that day 'connected'. The central premise is that the association with politics has the potential to eliminate a lot of informational disparities and alter the dynamics in pricing negotiations to the issuer's advantage. This should ultimately result in lower IPO underpricing.

The majority of pertinent theories differentiate themselves according to the particular pair of IPO participants identifying as culprits for the pervasive valuation bias. On the one hand, underpricing is taken to reflect the de facto information asymmetry between the issuer and market investors (see, e.g., Rock, 1986; Welch, 1989; Allen and Faulhaber, 1989; Chemmanur, 1993). Alternatively, the pair of issuer and lead underwriter comes to the forefront with underpricing evidencing the extent of each party's bargaining power (for example, Loughran and Ritter 2002, 2004; Hoberg, 2007; Liu and Ritter, 2010). This study steps on both strands of literature to introduce political contributions as an effective mechanism for containing the foremost cost in the going public process.

First, both contribution types entail substantial disclosure which should naturally cause a non-negligible portion of the informational asymmetries to subside. A more level informational playing field is also attainable with increased interactions among the primary participants in the IPO. This brings forward the networking effect of political expenditure as an entry ticket into a niche system of similarly politically involved entities in which institutional investors and the lead underwriter can have a central role by virtue of their size and level of sophistication. Second, we develop the notion that

donor equities carry special value for the underwriter. In this regard, political connections are perceived to insulate issuers from tail risk; a feature that fosters expectations for a long-term business relationship with the investment bank as in the form of future issuance, M&As and revenue for the brokerage arm. And if these benefits allude to a medium to long-run horizon, facilitating a clientele with perceived influence upon political elites can immediately bolster an underwriter's reputation and, therefore, the ability to gain in market share. On balance, notwithstanding whether the management strategically engages in political campaigns with an eye at the IPO or not, lobbying and PAC contributions can combat the causes of IPO underpricing in a holistic manner.

We seek evidence through the assembly of a unique dataset that involves the scrutiny of a large sample of U.S firms for either form of political expenditure. The time window is restricted to 5 years prior to an IPO. Besides donors, we trace the profiles of the recipient politicians. To investigate for their differential appeal to market participants, we hand-collect from the archives of the Federal Election Commission (FEC) qualitative dimensions such as Congress affiliation, partisan camp, representing State and length and breadth of political career. Consistent with the recent literature, this information is operationalized by means of the Cooper et al. (2010) indexes of relative power, strength and ability.

The main findings divulge an association of high economic significance. In particular, a 10% rise in political expenditure results in 2.5% less IPO underpricing. Considering the median contribution size of $ 71.5 thousand, a surprisingly cost-effective mechanism emerges for mitigating listing-related friction. Furthermore, in accord with our initial conjecture, the effect varies significantly with candidates' identity. Interestingly, a market bias towards Democratic politicians and candidacies for House of Representatives confirms itself at all levels of statistical significance. More expectedly, high-ranked incumbents with lengthy tenures of accomplishment pose as a more value-adding target compared to new challengers or average-performing Congress members. If carefully tailored, therefore, political contributions can complement the list of common pre-IPO strategies such as employing prestigious auditors (Beatty, 1989), joining forces with VCs with track records of successful offerings (Megginson and Weiss, 1991), engaging reputable underwriters (Carter et al., 1998), assembling boards with esteemed directors (Certo, 2003) and securing a credit rating (An and Chan, 2008).

1.3 Political connections and IPO underpricing: An efficiency problem

As discussed above, a prospective issuer is capable of constraining IPO underpricing by virtue of its political connections. Although the effect is, on average, beneficial, we acknowledge that hidden information may reside in likely nonlinearities. Delving into the mechanics of the association, this chapter investigates a question of general applicability: what is the most accurate way of modeling political capital and relationships of influence? In using lobbying and PAC campaigns as proxies for corporate political connections, the challenge lies in describing a setting that will be attentive to their different philosophy and, therefore, the different types of connectedness that they give rise to. To this end, we abandon the typical regression-based framework in favor of a direct, data-driven approach. Specifically, we frame the IPO underpricing process as an efficiency-analysis problem and assess the issuer's ability to minimize underpricing across a variety of settings.

Efficiency can be defined as the ratio of an input to an output. A ratio analysis, in turn, is a very useful tool provided that suitable prior weights on inputs (and outputs) are available in order to render comparisons meaningful. However, these weights are difficult to be determined in a subjective manner and, often, there is a need for prior information. The inability to define reliable weights causes several obstacles for observing benchmarks and, thereby, setting plausible input and output targets to facilitate the quest for efficiency. Our study illustrates how this limitation can be overcome through the adoption of a nonparametric frontier approach known as data envelopment analysis (DEA).

DEA is a mathematical programming method which, once applied in the IPO setting, offers the advantage of automatically assigning different weights based on the values of IPO offer and first aftermarket prices. As a result, it enables us to derive an empirical frontier anchored in the most efficiently valued IPOs relative to the others and set reliable benchmarks across our sample. For first time in the literature, therefore, we develop a way of assessing IPOs' relative efficiency based on the ability of the issuer to maximize the IPO offer price given the aftermarket closing price. Having established this efficiency–based valuation measure, we subsequently apply a probabilistic

approach (Daraio and Simar 2005, 2007; Bădin et al., 2012) in order to re-measure the relative efficiency of the proposed IPO underpricing process under the direct effect of different levels of lobby and PAC money. In this respect, we are able to account directly for whether an increase in the amounts disbursed to politicians influences the ability of the issuer to reduce underpricing and, therefore, to evaluate the IPO in the optimal direction.

The advantage of our proposed methodology over a parametric regression framework is threefold as: (1) it has been shown to accommodate with efficacy input - output combinations obviating the need for an a priori imposed functional form. Therefore, it confers the ability to explore any nonlinear relationships and reveal different threshold values for the examined effect of lobby and PAC money on IPO efficiency levels; (2) it can be communicated with clarity to decision makers conveying insight about the benchmarking units; and (3) it remains unaffected by endogeneity, a typical source of bias in the IPO-return equation, as it involves efficiency evaluation rather than outcome prediction.

The results unveil important nonlinearities in the relationship of efficiency with the two contribution avenues and thereby justify the fully nonparametric treatment. By and large, PAC contributions confirm their hypothesized role as a deterrent against excesses in the amount of money that is left on the table by prospective issuers. With the effect surviving a battery of robustness exercises pertinent to sampling as well as the scale assumptions underpinning the model, market participants are shown to especially factor in the existence of direct, interpersonal relationships with policy makers. The conflicting evidence from lobbying contributions further corroborates this conclusion. In particular, when the full sample is employed the association of lobbying with IPO efficiency obtains an inverted “U”-shape form. However, this is to alter to a “U”-shape once we restrict IPOs with positive returns which lie on the empirical frontier and, therefore, are de facto efficient. At the same time, the identification of best and worst performers on a top-30 basis reveals that the majority of IPOs exhibiting efficiency have taken advantage of both lobbying and PAC contributions alluding to a complementary nature as per the ‘access-influence’ hypothesis of Milyo et al., 2000.

Intrigued by this peculiar pattern, we bring to the forefront the heterogeneous political objectives that firms across the various economic sectors are likely to pursue.

Plausibly, disparities in the degree of regulation, reliance on government contracts and the salience of labor unions within a particular industry comprise some of the elements that contextually deem the one contribution type more value relevant over the other. The comparison of three economic sectors (Energy and Power, Financial and Industrial) strongly attests to the need for strategically tailored spending. In particular, lobbying contributions in Energy and Power account for a positive nonlinear effect on IPOs' efficiency levels, whereas PAC money appears to erode value. This evidence is in accord with a heavy regulatory framework commanding for quality communication between those who set policy and affected entities. The reverse relationship is observed in the Industrial sector; we surmise that PAC campaigns, as a superior means for networking, cajole decision makers into government purchases as well as favorable appropriations of the federal budget for the industry as a whole. Interestingly, the Financial sector, already exerting a political role by virtue of its centrality to the economy, barely warrants an economically meaningful association of either lobbying or PAC with IPO efficiency levels.

1.4 The influence of political connections on new ventures: From inception to peril

For a holistic study of the implications of political involvement for new ventures, the final chapter abandons the IPO focus to encompass a series of other prominent events throughout the corporate life cycle. In order of occurrence, these events comprise the likelihood of angel or venture capital financing, the time to listing, the performance and overall standing within the public domain and, ultimately, the failure as in the form of a corporate transformation or delisting. In addition, the broadened time frame lends itself well to the study of endowments effects. Accordingly, a parallel research question pertains to the extent that founders' own political networks can mark a distinct course, possibly a 'red-carpet' for start-up companies.

In the early stages of corporate life cycle, political connections appear to give rise to an interesting idiosyncrasy of introversion. This is observable in the underrepresentation of venture capital investors within connected firms' ownership structure. Combined with the evidence showing a longer time to IPO, these ventures exhibit in practice their aversion to short-termism and premature exit strategies.

Though, this selective behavior is at least partially an outcome of the financial autonomy that connected firms are typically entitled to. In this respect, our evidence attests to the superior financing alternatives that remain accessible to these organizations which manage to stay in the good graces of politicians (Faccio, 2006; Boubakri et al., 2008 and Houston et al., 2014).

Benefits continue to accrue to politically connected firms even when financing ceases to be the upmost priority, as is the case subsequent to an IPO. Applying a number of performance measures, we associate political influence with the firm's ability to attract increase revenue and, therefore, reinforce its competitive position within the market. At the same time, we encounter a phenomenon that features in Boubakri et al. (2008) and is described by the firm's inability to convert market share to a commensurately large accounting profit. Fitting a Cox proportional hazard model, the time to event (i.e. positive earnings per share) analysis shows political involvement to defer profitability to a considerably more remote time. A final organizational outcome examined is that of survival as evidenced by the likelihood that a firms remains in our sample 5 years following its IPO. Given that a large minority of firms fail to adjust to the increased requirements of operating as public entities, we hypothesize that powerful acquaintances should be most valuable when an outcome poses of permanent or irreversible nature. Indeed, the empirical evidence strongly warrants this direction. In line with Shane and Stuart (2002) who reach this conclusion through directors' social capital, we establish the extensibility to the political capital.

In drawing the above inferences, we reveal important insight about the dynamics of a firm's connectedness. At inception, founders' proprietary political network is proven a transferable asset and suffices for the new organization to claim the associated benefits. As long as these individuals retain their stake at the organization, their behavior and legacy (inclusive of the political footprint) continues to weigh upon the corporate aspects. This situation is to sharply alter upon the transition to a public ownership status. This time acts, in a lot, as a turning point whereby the salience of founders' contributions as a determinant of corporate outcomes abates. Concurrently, alternative means of participation which foster greater representation of the organization such as top management team's contributions and, especially, centrally planned campaigns as in the form of lobbying and PAC account for the lion's share of the explanatory power. Therefore, political outreach can be endowed, but similarly with any other asset, it is

subject to depreciation and requires replenishment that caters appropriately to the particular stage in corporate life cycle.

Chapter 2 - Literature review

2.1 Corporate political connections: an overview

The research on political connections has been originally motivated by the empirical observation that a fraction of firms commits resources for purposes extending beyond their corporate mission in order to influence issues of public interest. In this respect, the seminal works of Masters and Keim (1985), Zardkoohi (1985) and Grier and Munger (1993) have played an important role in explaining this selective behavior. Further, they have provided a solid theoretical framework for subsequent researchers to study the interplay of political connections with a number of corporate aspects such as financial reporting (Ramanna and Roychowdhury, 2010; Chaney et al, 2011), operating performance (Roberts, 1990; Fisman, 2001; Boubakri et al., 2008; Faccio and Parsley, 2009; Cooper et al., 2010), cost of capital (Houston et al., 2014), executive compensation (Aslan and Grinstein, 2012; Skaife et al., 2013), corporate social responsibility initiatives (Chin et al., 2013), government bailout packages (Faccio et al., 2006), professional misconduct and fraudulent activities (Yu and Yu, 2011; Correia, 2014).

2.1.1 Determinants of corporate political involvement

Masters and Keim (1985) researching the probable determinants of a firm's choice to interfere in politics hypothesize a number of future benefits that these organizations can reasonably aspire to. Further, the authors allow for heterogeneity in incentives according to the dissimilar needs of each firm's industry and special competitive environment. For data availability reasons, they limit the scope of their study to PAC contributions made by Fortune 500 companies in the election cycle 1981-1982. The main analysis includes a probit regression that models the PAC probability based on a list of 10 firm and industry-specific factors. In particular, the probit coefficients reveal an increased contributions' likelihood for larger establishments with a wide base of employees, even more so when these firms operate in a highly unionized

industry. Inversely, the association is negative for firms operating with a large number of competitors. The interpretation lies in the free-ridership problem which is accentuated in this situation. Interestingly, the financial sector is shown less likely to give rise to PACs. The authors propose instead the centrality of this sector as the backbone of the economy which, by and large, obviates the need for further political involvement.

In a parallel research endeavor, Zardkoohi (1985) obtains qualitatively similar results for a number of political activity determinants that overlap with Masters and Keim (1985); namely, proxies for size, competitive environment and the role of labor unions within the firm's industry. However, Zardkoohi, accounting for possible nonlinearities, documents a parabolic relationship between market share and political activity. Notably, the researcher observes that beyond a certain threshold of market penetration, firms contract their political budget. In this respect, Zardkoohi explains that market power can act as a substitute for political power. Especially for firms that resemble monopolies and are capable of extracting rents as such, the corporate interests can be best served by drawing the least possible attention from policy makers. Lastly, the author adds that most likely a firm under these circumstances is successfully realizing economies of scale. This, again, means that it can operate optimally under the status quo and possible interventions by regulators could put this organizational capability at jeopardy.

In the same spirit, Grier and Munger (1993) conduct a study that is largely based on the two seminal works of 1985. The authors engage a more comprehensive sample (5 election cycles and a diverse sample of companies that spans 124 different industries at the 3-digit level of the SIC code). Their contribution also extends to the introduction of new political activity determinants into the standard probit model of Masters and Keim (1985). As a consequence, while the authors come up with corroborating evidence in support of the previously identified determinants, they also document incremental explanatory power for the reliance on government contracts, regulated industries, collective-actions and other antitrust concerns. Importantly, this study acknowledges the possibility of a self-selection bias within the sample of contributing firms and corrects appropriately by means of selectivity-corrected econometric models and additional robustness checks.

Also adhering to the method of Heckman selection models, Hart (2001) adds one last motive that may underscore a firm's political behavior, namely research and development (R&D). The viability of a firm that relies on its internal capabilities to develop unique processes largely conditions on the existence of solid legislation that protects proprietary rights. Equally often, the case might be that a firm seeks permission to pursue technologies or products that affect other stakeholders. Notably, the desired outcome, in the first situation, is the rigidity in the law-making process while leniency and flexibility is required in the second situation. In essence, the advancement of corporate interests remains the actual common theme highlighting the opportunistic and rent-seeking behavior of corporate donors. Additionally, the author provides a second line of argument. Taking R&D as a proxy for operational complexity, he posits that with greater degree of complication, the less value a firm's exit threat obtains as a means of exercising pressure on policy makers. In turn, this bargaining deficiency should be remedied through alternative ways, including monetary contributions. To devise an opportune setting for testing the effect of R&D on political expenditure, the author assembles a sample of 120 high-technology firms over the period 1977-1996. Overall, the analysis confirms the failure of prior studies to account for what is now proven as an important determinant. Notably, the author submits corroborating qualitative evidence which obtains by interviewing company executives.

Political ideologies and partisan sidelines also claim an important role. Shon (2010) revisits the turbulent 37-day recount period which followed the 2004 U.S. presidential elections (also known as the 'Florida recount') in order to conduct an interesting experiment. Specifically, Shon studies the association of corporate campaign contributions over the two-year interval preceding the elections with donor firms' market performance. The sample comprises 6,708 U.S-listed companies. Consistent with prior work on the covariance of share prices with political involvement, the relationship is significant and robust. At the same time, the sign of the direction remains conditional on the supported race. In particular, firms that aligned with Bush evidenced a sharp appreciation in market value; the opposite was true for firms that supported Gore. To highlight the substantial economic implications of the effect, the author draws evidence from gas and oil stocks. Because of the traditional ties with the Republican Party as well as the sizeable stake of the Bush family itself, the industry gained an

aggregate value of $ 103 billion, thereby proving the investment character of campaign financing.

Chin et al. (2013) assess the impact that political ideologies can exert upon organizational outcomes. In particular, they investigate for a possibly differential pattern of resource allocation on CSR (corporate social responsibility). They develop a threefold hypothesis. That is, CEOs leaning favorably towards the Democratic (Republican) Party are more (less) likely to commit a sizeable budget to CSR, even more (less) so when they enjoy increased power and are also more (less) inclined to defend this expenditure in the aftermath of poor financial performance. To test this conjecture, the researchers trace the political ideology of 249 CEOs prior to assuming the CEO position using their individual contributions as a proxy of partisan orientation. The empirical findings fully confirm the hypothesized effect. In addition, CEOs with a definitive political identity commonly tend to establish corporate PACs as fund-raising vehicles for further support to their favored candidates. Taken together, this evidence suggests that political values of influential individuals can be transferred and injected into their organizations in a discernible manner.

2.1.2 The value-relevance of political connections

Fisman (2001) provides important evidence in support of a symbiotic relationship between business and politics. Focusing on the Southeast Asian crisis of 1997, the study investigates reasons for the unprecedented capital outflow that the region witnessed at that time. A huge criticism concerned the misallocation of investment funds based on political preferences rather than market-driven mechanisms. In order to test the validity of this claim, the author comes up with an efficient solution for shedding light on the local interdependencies. Taking the paradigm of Indonesia, Fisman ensures an opportune testing ground: the country enjoys remarkable political stability and its highly centralized structure resembles a pyramid in the sense that on top of every major organization links can be traced to President Suharto or a member of his family. Moreover, because the time frame coincided with the last days that Suharto remained in office, the researcher ingeniously associated negative news on the state of his health to the market performance of quoted companies as well as the Jakarta Stock

Exchange Composite Index (JCI). The postulated relation is not only confirmed but also the strength of the association is greatly conditioned on the 'directness' of the connections between firms and Suharto. The severity of the negative information, an additional test that Fisman subjected his results to, also claimed incremental explanatory power on the subsequent market reaction.

Event studies like this have also taken place in a U.S. setting. An older one has been produced by Roberts (1990) who has documented a sharp decline in the share price of traded firms after the death of Senator Henry 'Scoop' Jackson in September of 1983. More recent, corroborating evidence comes from Faccio and Parsley (2009). The authors document a decrease in share price for firms headquartered in a politician's hometown upon the announcement of her unexpected death. Conclusively, the findings from Fisman (2001) complement the evidence from the U.S. on the existence of important feedback effects between the corporate world and the realm of politics.

Shane and Stuart (2002) explore the effect of initial endowments on the evolution of new ventures. Specifically, they investigate the extent to which entrepreneurs' social capital positively influences the survival and further development of start-ups. The sample comprises 134 business ventures that have emerged over the period 1980-1996 with the sole purpose of commercializing MIT-developed inventions. Evidence is drawn through distinct organizational outcomes: failure, venture capital financing and IPO. The social capital is defined in the broadest terms to include *direct* interpersonal or business relationships between the founding team and VC-affiliated individuals or *indirect* whereby the relationships are derived through a third party. In accord with the authors' conjectures, social capital is found conducive to this early-type of financing. Furthermore, firms are more likely to undertake an IPO risking a smaller likelihood of failure. On this basis, founders' social capital emerges as a valuable endowment. Notably, due to the retrospective nature of the data, these findings can be subject to bias in a twofold manner: i) entrepreneurs may have a blurred recollection of early-life contacts and ii) entrepreneurs who are ultimately successful at securing VC-support, because of the gratefulness factor, may have a superior recollection of their past acquaintances (recall bias); even more so when compared to ventures that experienced failure.

Faccio et al. (2006) focus on the government bailouts of private firms within the period of 1997-2002. By doing so, they shed light on the value-relevance of political connections in the special case that an organization is confronting economic distress and, ultimately, the threat of bankruptcy. Scrutinizing 35 countries, including the U.S., the authors find connections to significantly increase the likelihood of a bailout. Countries that receive financial aid from either the International Monetary Fund or the World Bank are even more probable to bailout politically involved firms than their non-connected peers. Interestingly, the former firms tend to systematically exhibit worse financial performance than the latter ones before and after the received bailout. As a result, the authors conclude that connections consistently lead to resource misallocation and impede growth in countries with struggling economies.

Boubakri et al. (2008) study the privatization process of 245 organizations based on 27 developing and 14 developed countries over the period 1980-2002. Their main research question lies within the role of the organic ties that these firms naturally maintain with local governments: do they impede or facilitate the transition to the private domain? In addressing this enquiry, the authors investigate a subsample of 87 firms which host an incumbent or retired politician in the board of directors. These directly connected firms significantly underperform the rest privatizations in a number of performance measures (e.g. market share growth, return on sales, earnings growth). Notwithstanding the adverse effect, the researchers state that a firm's chance to retain connected boards in the private domain is largely endogenous. In particular, a closer analysis of these organizations profiles reveals more leverage, a regulated industry, and geographic proximity to the key loci of power (for example, as when headquarters are located in the capital city). Other institutional factors such as political stability and legal system efficiency are also associated with incremental explanatory power. Lastly, the chance of spotting politicians within the board positively relates to the residual equity stake in the company retained by the local government but is inversely associated with foreign ownership.

Cooper et al. (2010) elucidate the correlation between firm performance and proximity to politics. To this end, they employ a large and comprehensive sample of U.S. public firms supporting candidacies for the U.S. Congress within the period 1979-2004. To approximate the breadth and depth of firms' political involvement, the researchers devise ingenious indexes that capture multiple dimensions of the recipient

politicians' profiles such as incumbency status, career progression in Congress, majority party alignment and affiliated constituencies. They also factor in the length of the relationship between firms and candidates as evidenced by an uninterrupted pattern of PAC contributions. By and large, the higher a donor firm scores in the proposed indexes the higher cumulative abnormal returns is expected to realize. Future earnings are also positively associated with contributions. The profile of recipients that maximize this effect comprises candidacies identifying with the Democratic Party and running for the House of Representatives. An incrementally positive effect is also observed once a politician's constituency coincides with the firm's state of headquarters.

Chaney et al. (2011) commit evidence that ties to politics relate inversely to a firm's accounting quality. In an international study of 19 countries (inclusive of the U.S.) drawn from both mature and developing capital markets the researchers test whether increased public scrutiny, because of the political shadow, forces connected firms to produce above par financial reporting documents or whether the accounting standards shrink in value relevance and, as a consequence, the firm's disinterest reflects on the produced output. Notably, firms with ex-ante problematic accounting quality resorting to politics also for the purpose of obtaining immunity to business malpractices, including poor financial reporting, have been excluded from the assessed sample. Overall, the empirical findings robustly support the poor accounting quality conjecture. Adding to their value-relevance interpretation, the authors highlight that in order to safeguard the longevity of their connections, firms have an apparent incentive to strategically conceal or report in an ambiguous manner the benefits derived as a result of the political network.

Houston et al. (2014) attest to the preferential access to debt financing for the politically connected firms of S&P 500. Their benefit in this respect is twofold as not only do they incur lower interest expenses but also the accompanying covenants are significantly less restrictive. The authors explore two different lines of reasoning that can plausibly drive this phenomenon. The first interpretation, the *Borrower Channel*, posits that links to politics augment a firm's credit-worthiness and, ultimately, this is what creditors reward. Alternatively, the *Bank Channel*, highlights the bankers' need to cajole politicians in an attempt to build their own network by granting a special treatment to their protégés. To disentangle between the two possibilities the authors draw evidence from a subsample of loans given by financial organizations which have

already established strong connections with politicians and, consequently, have been in less need of the debtor's proprietary network (a series of other secondary tests is also employed for this purpose). With the results remaining qualitatively unchanged, the *Borrower Channel* emerges as the most probable argument.

2.1.3 Abuses and ethical concerns

Confirming the public sentiment of suspicion, corporate political connections are commonly found to foster purposes that not only defy business ethics but also are legally liable. Recent evidence is mounting.

For example, Yu and Yu (2010) investigating a sample of U.S. firms that have exhibited fraudulent activity within the period 1998-2004 are able to draw an unambiguous link to lobbying money. Specifically, lobbying the U.S. Congress results in a lower hazard rate for being held accountable for an illegal behavior and even if the firm is detected that will typically be 4 months later than the detection time of a non-lobbying firm. Further, when firms are matched by industry and accounting fundamentals, the disparity in the detection time approximates a full year. The authors provide evidence that, within this time interval, corporate insiders proceed to aggressive sales of their shares so that they insulate their personal wealth from the imminent perils. The fact that more than half of incumbent Congressmen typically embark on lobbyist careers upon the termination of their political service explains much of the observed immunity.

In the same spirit, Correia (2014) studies the cross-section in the association between lobbying and PAC contributions to the probability as well as the monetary severity of enforcement actions imposed on U.S. firms by the Securities Exchange Commission (SEC). Documenting a strong negative association, the researcher unveils three distinct avenues that provide protection from SEC's disciplinary mechanisms: employing lobbying firms that are connected to the SEC, granting campaign financing to politicians that are important for the operation of the SEC and lobbying the SEC itself. In addition, firms appear fully aware of these resources and are not reluctant to spend heavily on them as a form of insurance against the regulatory agency. Non-

coincidentally, firms exhibiting subpar accounting quality or systematically engaging in misreporting come up among the most probable donors.

Ramanna and Roychowdhury (2010) consider the increased scrutiny on a company affairs brought about due to its political connections. In what the authors designate as the 'political cost hypothesis', they develop the proposition that firms are strongly incentivized to mitigate the actual magnitude of economic rents extracted by staying in the good graces of politicians. This is to prevent any negative publicity against both the corporation and its associated political network. Consequently, this strategy should result in accruals choices that deflate current earnings while deferring a significant portion to future reporting periods. Using the U.S. federal elections of 2004 as a natural experiment, the authors show firms to overwhelmingly account for profit-decreasing accruals in the quarters most closely preceding the election time. In addition, they draw special evidence from the subsample of firms maintaining a greater interest in the outsourcing of one or more lines of production, as the loss of industrial jobs to countries with cheaper labor costs topped the political agenda at that specific electoral race. With the findings to emerge even stronger in this paradigm, the authors offer reasonably robust evidence in support of the political cost hypothesis.

The effect of political connections on executive compensation is subject to an ongoing debate in the literature. In particular, while there is consensus on the fact that connections, in general, lead to inflated pay packages, the evidence suggesting commensurate value creation for shareholders is at best mixed. In this respect, Skaife et al. (2013) reduce lobbying contributions to agency costs which erode shareholders' wealth. Specifically, they find CEOs of lobbying firms to significantly exceed in compensation CEOs of non-lobbying but otherwise comparable firms. Interestingly, they report a sharp jump in overall remuneration at the time a firm with no prior lobbying activity files its first lobbying report. Although lobbying firms can be associated with expanding market shares, the economic impact on the firm's bottom line appears negligible. Further to the agency cost view, when corporate governance structures become stronger the executive compensation level approximates more the industry average.

Aslan and Grinstein (2012) also attest to the higher remuneration received by politically connected CEOs. Opting for a more direct method of identifying

'connectedness', the researchers trace all hard money campaign donations made by CEOs over the period 1996-2006 in a sample of companies of heterogeneous sizes (i.e. Mid-Cap 400, Small-Cap 600 and S&P 500 firms). In this sample, donor CEOs are able to earn on an annual basis about 9% more, while exhibiting a 17% decrease in their pay-performance sensitivity. Applying the measures of candidates' relative power and ability devised by Cooper et al. (2010), the researchers find that the effect is more pronounced once the connection is strategically targeted at the most 'suitable' types of politicians. However, in contrast to Skaife et al. (2013), the findings also reveal at least a partial pass-through into a firm's operating performance which increases by 0.3%. In this case, contributions are congruent with shareholders' interests.

2.2 Key studies on IPOs: an overview

The perennial puzzle of IPO underpricing (i.e. the positively skewed distribution of IPO returns, also characterized by a fat tail) has entered the corporate finance literature in a rather incidental manner. In particular, Stoll and Curley (1970) embarking to investigate a likely differential access to equity capital for corporate issuers based on asset intensity (termed as 'equity gap' in the study), trace the returns realized over the first day of trade. Employing a large sample of U.S. firms from the late 50's and early 60's, the researches fail to find empirical support in favor of the covariance of the cost on equity capital with a firm's size. One finding, however, which emerges as a common theme in the study and survives a battery of robustness tests, reveals another type of gap. That is, the positive difference between the first-aftermarket close and IPO offer price.

Follow-up research by Ibbotson (1975) over an overlapping time period estimates an average first-day return of 11.4 percent. Ibbotson finds no evidence of abnormal aftermarket performance beyond day one. Specifically, the author allows for a sufficiently large time interval to elapse in order for the initial sentiment to subside and investigates returns from the 2nd to the 6th month of trading. After accounting for transaction costs, IPO shares appear to co-vary with the market, thereby signifying the transient nature of the underpricing effect. As a result, the author admits to have proven but not resolved an important pricing conundrum.

In a first enquiry on the causation for the observed anomaly, Logue (1973) brings to the forefront the underwriters' market structure. As the latter ones refrain from engaging in price wars with one another in order to attract new offerings, a model of monopsony arises. Consequently, the pricing outcome reflects the relative bargaining power of the issuer with lead underwriter. Logue proposes a series of factors which could benefit the former one in negotiations such as a large size and the ability to sustain business from organic profitability. The underlying assumption is that the cost of capital becomes lower for organizations which disseminate financial autonomy. Yet, a typical IPO issuer is plagued by severe cash scarcity and, thus, some degree of underpricing appears inevitable.

Since these seminal works, the causes of IPO underpricing have been subject to voluminous research. Share allocation, agency conflicts and behavioral arguments contribute to an ongoing debate which may not empirically single out a dominant culprit. As per the comprehensive survey study of Ritter and Welch (2002), we differentiate among the pertinent theories based on whether they assume a status of symmetric information among the key IPO participants or not.

2.2.1 Theories on IPO underpricing

Sharp information asymmetries can exist among the buyers of IPO securities. Accordingly, Rock (1985) views two groups of IPO investors: an informed and an uninformed one. Expectedly, the former group places bids for quality offerings and protects itself from committing capital to troublesome or questionable companies. Given the severe rationing of IPO shares, this causes uninformed investors to attain allocations only when informed investors withdraw their interest. Consequently, in order for an incentive to arise for uninformed investors to participate in the process, offerings should be marketed with a built-in discount. In this case, the bias in pricing offsets the bias in share allocation.

Beatty and Ritter (1986) stress on investment bankers' need to value IPO shares in a way that closely approximates an 'equilibrium price'. In turn, an equilibrium price is a price which factors in an issuer's ex ante uncertainty. In this respect, IPO investors behave similar to the holders of a call option demanding a premium that is

commensurate with risk and the equilibrium price, in essence, becomes an exercise price. Although the authors concede that proxies for ex ante uncertainty are plagued by substantial noise, they propose the following two: i) gross proceeds (the inverse of) and ii) number of the intended uses of proceeds as listed in an IPO prospectus (S-1 document). Deviations from the equilibrium are invariably harmful for an underwriter's business. If the latter one underprices excessively, the clientele in the form of new issuers will be discouraged. Alternatively, if the underpricing is too frugal, the sentiment of discontent will pass on to the buy-side. Under both circumstances, the end result converges on the impairment of the underwriter's reputational capital; a finding for which the authors provide strong empirical support.

Benveniste and Spindt (1989) compare an IPO to a conventional auction sale. In general, they deem the analogy successful noting, however, two key differences: (i) investors' bids represent mere indications of interest than binding commitments and (ii) the pricing and allocation criteria remain concealed from the auction participants. With these considerations in mind, the authors develop a theoretical model of information-revelation to explain IPO underpricing. Accordingly, they view no plausible reason for roadshow invitees to disclose their proprietary information, unless this entails some sort of compensation. Indeed, underwriters opportunely allow for a discount in the IPO offer price in order to provide an incentive for truthful information revelation, even though this is ultimately done at the client firm's expense. Furthermore, regular investors, i.e. buyers of both 'hot' and 'cold' offerings should also possess priority over more selective or seasonal type of investors.

Benveniste and Wilhelm (1990) from a cross-country framework shed light on the resulting inefficiencies when regulatory authorities intervene in underwriters' marketing effort. In the U.S. capital markets, one such obstacle comprises the NASD Fairpractice Rule imposing a uniform valuation over the period of offer, resembling to a call's option exercise price. In other countries, such as the United Kingdom and Singapore, the 'evenhanded' distribution of oversubscribed offerings is mandatory. Both dimensions hamper underwriters' efforts to alleviate the winner's curse. The outcome results in increased IPO underpricing, even more for Singaporean issuers who remain subject to both regulations. The conclusion drawn from this study is a broader one: the underwriters' discrimination in IPO pricing and allocation is conducive to the efficient market functioning and, as such, it should be preserved rather than suppressed.

Hanley (1993) assembles a sample of U.S firms going public over the period 1983-1987 with the purpose of empirically investigating the information revelation theory of Benveniste and Spindt (1989). A first examination on the basis of descriptive statistics appears encouraging to this direction. In particular, firms with IPO offer prices in excess of the upper limit of their filing price range account for a mean first-day return of 20.7%. In the most celebrated case, the Microsoft IPO, the final price was revised to $21 from an initially predicted range of $16-19. On the day of listing, the closing aftermarket price raised further to $27.75, yielding a return of 32%. Indeed, the empirical analysis confirms upward price revisions as an important determinant of IPO underpricing. In contrast, the association of negative revisions with first-day return fails to attain statistical significance. This evidence attests to a partial adjustment phenomenon in response to good news disclosure. Then, the magnitude of the abnormal return comprises informed investors' compensation for sharing their private insight. A second, complementary means of compensation involves preferential share allocations. Lastly, the author investigates the implications on long-term performance showing price revisions to have negligible explanatory power over two-year returns. The fact that the effect remains exclusive to the first-day return equation corroborates the notion of price manipulation as a means of deferred compensation.

Cornelli and Goldreich (2001) delve into the bookbuilding process of 39 offerings (of which 23 IPOs and 16 SEOs) over the years 1995-1997. These offerings comprise 20 countries and a wide spectrum of industries. Bidders represent 60 different nations from Australia, Europe, North and South America. The lead bookrunner for all of these cases remains a major European investment bank which has facilitated the study by providing the authors access to typically unseen technicalities. In this regard, the detailed bid information is conducive to revealing any preferential allocations to bidders disclosing their proprietary information. For instance, the authors trace whether a bid reaches the maximum limit in price. If this is the case, the price cap indicates the fluctuations in demand within the boundaries of a set price range. Alternatively, absent an upper limit, the only relevant information for the underwriter in the price discovery process remains the quantity of demanded shares. Accordingly, the findings reveal that investors opting for price caps are more valuable in information production and, therefore, are rewarded by means of preferential allocations. The same rationale and privileged treatment applies to those bidders subsequently revising their bids. In

addition, regular investors are preferred; therefore, the conjecture of Benveniste and Spindt (1989) is empirically validated. Finally, domestic investors are shown to enjoy an advantage over international ones

Allen and Faulhaber (1989), Welch (1989) and Chemmanur (1993) also attach to IPO underpricing an important information production role. Acknowledging the disparities in the level of information between company insiders and IPO investors, these studies revolve around the issuer's objective function. Accordingly, a common theme emerges in quality issuers' need to promulgate their above average standing. Because information production is costly, however, a powerful mechanism to convey this message would be a sizeable discount in IPO offer price. This concession is meant to comprise a 'signal' for uninformed investors (hence, pertinent theories are collectively referred to as signaling theories) as other IPOs plausibly are incapable of bearing this expense. As for the benefits of this strategy, they presumably arise in due time by means of: seasoned equity offerings (Welch, 1989), an optimistic market reaction to dividend announcements (Allen and Faulhaber, 1989) and the attraction of analyst coverage (Chemmanur, 1993). In this respect, underpricing, as an issuer's endogenous decision, obtains an investment character. At the same time, the underwriter plays a peripheral role as simply being a rationing administrator.

An empirical application of these models features implicitly in Loughran and Ritter (2004). In a time-series analysis of U.S. IPO returns over the period 1980 to 2003, the authors, at first, observe sharp variations in underpricing according to specific sub-periods. For example, the average returns within the periods 1980-1989, 1990-1998, 1999-2000 (the dotcom bubble) and 2001-2003 have been 7%, 15%, 65% and 12%, respectively. Even when correcting for the effect of an overheated market, as in late 90's, the authors attest to an upward trend which they attribute predominantly to issuers. Resorting to an issuer's objective function similar to the signaling studies, Loughran and Ritter envisage changes in the relative weighting of objectives, with issuers increasingly emphasizing non-financial factors over the maximization of IPO proceeds. In line with Chemmanur (1993), analyst coverage is empirically shown to dominate the listing decision. Notably, issuers actively seek underwrites which have a reputation of drawing attention to their offerings, even if this is the outcome of excessive underpricing. Non-coincidentally, the financial press routinely regards a hefty first-day return as well as oversubscription to be indicative of successful IPOs. Finally, Loughran

and Ritter add to the picture the self-serving behavior of key executives who are often willing to trade a reduced offer price for their preferential access to the allocation lists of future (underpriced) offerings by the same underwriter.

Behavioral interpretations of IPO underpricing also feature in literature. Arguably, the most celebrated of these studies is Loughran and Ritter (2002) which introduces the application of prospect theory to the IPO paradigm. Focal to this framework is the convexity (concavity) in losses (gains) for issuers' value function, with the midpoint of filing price range serving as the reference point. Reinforcing this insight into IPO pricing, the authors illustrate the negative impact of the overvaluation as descending from a previously assigned high barely leaves management in the same state of complacency as that high had never existed. Thus, the concluding pricing meeting is expected to give rise to renegotiations where an issuer of proven bargaining efficacy fiercely pressures for recouping some of the lost value.

Lowry and Shu (2002) trace the legal risk that IPO companies encounter. In a sample of issuers over the period 1988-1995 about 6% of them are found to be subjects of litigation pertinent to IPO matters and, predominantly, IPO pricing. The associated cost is substantial. On average, it accounts for 11% of proceeds raised. Notably, in some cases the settlement process costs as much as half of the IPO proceeds. Apart from the financial burden, the cost may extend to reputational damages for the issuer as well as the rest of the agents that have been involved in the process (e.g. accounting, underwriting and legal intermediaries). Therefore, an incentive emerges for issuers to deliberately offer underpriced shares as a form of insurance. Parenthetically, the effect should be even more obvious for those firms that for other reasons (unrelated to financing decisions) constitute frequent targets of litigation. Investigating for this enquiry raises important simultaneity bias concerns as firms may lowball offer price with an eye to subsequent legal implications and the latter ones may appear milder because of the observed underpricing. This problem is ultimately overcome by means of instrumental variables estimation and an extensive sensitivity analysis. Within this framework, the authors provide robust evidence for their postulated effect of IPO underpricing as a means of both litigation insurance and litigation deterrence.

Lowry and Schwert (2004) address the question of whether the new equities' pricing discovery is an efficient process. They investigate this query from two

complementary angles: i) the filing price range that an investment banker initially assigns and ii) the final IPO offer price. In the first test, the midpoint of filing price range is regressed on a series of firm and offering-specific characteristics, i.e. the information that has been publicly available at that time. Overall, these covariates can explain the heterogeneity in price updates much in the same manner as they relate to IPO returns. The observed effect also appears of the same magnitude with that in the first-day returns equation (i.e. 3%). Thus, the authors conclude that while for no apparent reason underwriters fail to incorporate into pricing all public information, the anomaly is economically insignificant so that a speculator may barely set up a profitable trading strategy. Subsequently, these pricing updates and the returns on market portfolios over the book-building period as proxies for private and public information, respectively, are used to explain the variation in IPO-day returns. The fact that both variables produce statistically significant coefficients confirms underwriters' selective processing of both information types. Yet, again the effect in economic terms remains negligible. Taken together, this evidence leads the authors to the conclusion that the pricing process is 'almost efficient'.

2.2.2 Issuers' strategies to mitigate the problem of asymmetric information

In order to combat ex ante uncertainty and disseminate signals of quality, issuers can exhibit particular resourcefulness. Accordingly, the literature shows them to deploy a plethora of pre-IPO strategies such as: (1) employing top-ranked auditors (Beatty, 1989), (2) aligning forces with venture capital firms (VCs) of a proven record of taking companies public successfully (Megginson and Weiss, 1991; Hsu, 2004), (3) hiring high-caliber underwriters (Carter et al., 1998), (4) recruiting prestigious executives for the top-echelon positions (Certo, 2003), and (5) obtaining a credit rating shortly before tapping the equity capital markets (An and Chan, 2008).

More closely, Beatty (1989) brings to the forefront the role of auditors as one of the key independent agents involved in an IPO. The conjecture is intuitively simple in the sense that the established accounting firms are reluctant to impair their reputational capital by facilitating offerings which ultimately result in excessive underpricing.

Regardless of the clients' objectives from an imminent IPO, an impeccable reputation comprises the foremost asset of market leading auditors and, therefore, a correlation between accountants' brand equity and issuer's quality should be apparent. Indeed, the author's proxies for a CPA firm's reputation, fees and a big-8 affiliation, yield a strong association when regressed on the amounts of money that is left on the table at listing. Importantly, the sign of the direction is negative corroborating the postulated effect.

Megginson and Weiss (1991) stress on the cooperation with VCs as a different, yet powerful, alliance. An alliance that as authors comment comprises as much of a substitute for prestigious auditors and underwriters as is a complement to them. Contrasting a sample of 320 VC-backed firms with the same number of non-VC backed issuers appearing as the closest neighbors in terms of industry classification and offering size, the VC- backed firms incur significantly lower underpricing as well as underwriting costs. The observed effect is attributable to the certification function that successful VC firms can serve in the process of going-public. Of course, this does not preclude an underwriter's concession to share a larger portion of the surplus value created at IPO with the issuer (and, indirectly, the VC firm) because of the recurring stream of revenue generated by a long-term relationship with the VC. In line with this argument, the researchers show increased VC loyalty to top-ranked investment banking firms. An additional finding pertains to the long-term investment horizon of reputable VCs as evidenced by the retention of sizeable equity stakes deeply within the post-IPO period.

Hsu (2004) shows issuers to value and actively pursue the certification and legitimacy stemming from VC affiliations. This reflects on a mean of 10%-14% discount which reputable VCs enjoy when purchasing start-up equity. The substitution of prestige for price denotes that non-financial objectives systematically supersede pricing considerations in entrepreneurs' decisions to share ownership in new ventures. The empirical evidence is drawn from a special sample of start-ups. The popular 'Entrepreneurship Laboratory (E-lab)' module offered by MIT's Sloan School of Management assigns a number of graduates to the management team of actual start-up firms provided that the latter ones have made it to a Series A funding round. For the purposes of the study, this sample is opportune because it is the outcome of reasons unrelated to financing choices such as entrepreneurs' perceptions of the value-added of MIT students. Consequently, inferences are least affected by self-selection which is a

pervasive bias in this type of experiments. Additionally, the author reports that a new venture is about three times more likely to accept the offer of a reputable VC than that of a cheaper but less established financing firm.

Conceptually similar to Megginson and Weiss (1991), Carter et al. (1998) assess the effect of underwriter reputation on IPO returns. However, their manuscript complements first-day returns evidence with the study of long-run (three-year) IPO performance. Overall, the authors corroborate two widely-documented phenomena in the IPO literature: the IPO underpricing and the long-term underperformance of the new equities. Nevertheless, once a distinction is drawn based on underwriter's reputation, both of the relations feature considerably milder than average. As a result, prestigious underwriters more than compensate issuers for the higher underwriting commissions which they typically charge. Parenthetically, in testing the above conjectures, the authors mark a further contribution. Specifically, they develop a proprietary measure of an underwriter's reputation which they find superior to that introduced by Megginson and Weiss (1991). Inspired by the format of Hollywood billboards, this measure relies on the order in which the investment banking firms appear on tombstone announcements and is proven particularly influential within the underwriters' market.

Certo 2003 appeals extensively to sociological theory in order to propose the assortment of prestigious executives as a means of signaling quality in a top-down manner. The author contends that investors' decision- making is, among other things, guided by anchoring. In this respect, directors who can be plausibly associated with prestige, a fusion of personal skills, professional experience and social network, offer legitimacy to their organizations. In the IPO setting, this feature is key to overcoming the market newness liability. The author concedes an inherent inability of all signaling theories to warrant causation net of confounding factors. However, directors' prestige fulfils the basic requirement of an efficient signaling mechanism as it entails significant cost in the form of: i) remuneration expenses for the firm and ii) reputational cost for the executives. Moreover, burning money in this, and other types of signals, is of little use if the target audience is incapable of properly receiving and decoding the message. Addressing this further concern, directors' prestige appears to be a feature easily discernible with a broad appeal to the investor community.

Using this theoretical framework, Chemmanur and Paeglis (2005) empirically investigate how managerial quality and reputation weighs upon a variety of IPO performance aspects. Three measures of these attributes are introduced: i) top management team's (TMT) education and prior professional experience, ii) TMT's tenure within the company and turnover and iii) CEO dominance framed as the sum of CEO's fixed components of compensation over the respective components of TMT's compensation. Issuers scoring highly on these dimensions are shown to realize a multitude of benefits at IPO: limited underpricing, increased interest from institutional investors, lower underwriting expenses and greater appeal to top-ranked underwriters. Over the long-term, returns for this IPO niche remain satisfactory escaping the underperformance problem encountered by average issuers. The benefits extend from market valuations to the firm's operating performance. The authors evidence a positive correlation between the above measures of quality with the management's ability to engage in and successfully implement positive NPV projects. Because prestigious managers are aware of their own market value, the authors note that only the larger establishments could afford to satisfy their financial and non-financial objective functions.

An and Chan (2008) pay special attention to a small sample of issuers that have been prudent enough to ensure a credit rating before going public. Specifically, over the period 1986-2004, 161 U.S. IPO firms, out of a total population of 5,141, were able to provide to investors an objective and readily identifiable sign of quality. Even if this feature assesses creditworthiness, and notwithstanding the fundamental conflicts of interests between debt and equity holders, a credit rating can claim an important role in mitigating ex ante uncertainty as it grants uninformed investors a benchmark to relate to. As a consequence, the rated issues capitalize this benefit in terms of a considerably smaller first-day return. In addition, the authors emphasize that what ultimately matters is the existence of a credit rating per se, rather than the level of it; firms of a higher rating realize no statistically different returns than lower-rated issuers. Accounting for the fact that a set of common firm characteristics may jointly determine initial returns and a firm's decision to pursue a rating, in the first place, a variety of econometric methods are employed in order to treat the endogeneity problem. Overall, the effect survives all of the robustness tests, while the endogenous nature of the variable in interest is confirmed.

2.3 Data envelopment analysis (DEA) in finance

Grounded on the ideas of Farrell (1957), data envelopment analysis (DEA) is a linear programming formulation that describes a correspondence between multiple inputs and outputs. Unlike a production function which is defined by an equation, the DEA's envelope is data-driven. That is, DEA (and not the researcher) determines which input-output combinations are efficient and thereby shape the efficient frontier. The suboptimal combinations in the sample derive their efficiency score with reference to the observed deviation from what is allowed to emerge as a 'real' production function. This type of benchmarking is conducive to revealing how a decision making unit should modify the particular input-output blend in order to gravitate towards efficiency.

Although the technique features in the seminal work of Charnes et al. (1978) pertinent to the performance evaluation of educational programs and in subsequent studies on operations management (Banker et al., (1984), Serman (1984) and Mahajan (1991)), the finance literature has been sluggish to adopt the DEA construct. Some traces can be found in Varian (1990) which makes a compelling argument for the adoption of a nonparametric approach when it comes to measuring the optimal performance of customers, investors and other economic agents. Assigning a lesser priority to statistical significance, Varian upholds that the economic significance of a deviation from the optimal behavior entails more relevance. Employing a set of variables (quantities demanded, price and output), he develops metrics relying on residuals which capture the difference of outputs over inputs from unity. Seiford and Thrall (1990) rely on these measures in order to draw a direct link with efficiency scores derived from DEA.

Relying on an adequately crafted theoretical framework, therefore, Murthi et al. (1997) apply DEA into the portfolio performance assessment and circumvent essential shortcomings of the widely-used Jensen's alpha and Sharpe index. For example, the assumption of zero transaction costs underpinning both measures is relaxed with a mutual fund's expense ratio and applicable loads to be among the model's inputs (along with the manager's trading turnover and the standard deviation of returns). At the same time, returns retain their position as the output variable similar to the Sharpe index.

Within a corporate finance context, the research resorting to DEA analysis is recent, evidencing the increasing approval of the non-parametric approach in issues of resource allocation and capital budgeting decisions. In one of these studies, Duzakin and Duzakin (2007) assess firm performance across the economic sectors in Turkey by means of a DEA model with 3 input (assets, gross value and number of employees) and 2 output variables (earnings before tax and export revenue). Engaging 480 of the largest organizations in the country, the researchers find only 9 of them to operate with efficiency and 65 when firms are rank-ordered within each different industry.

Corporate event studies also begin to appreciate the DEA benefits. For example, Halkos and Tzeremes (2013) develop a bootstrapped DEA procedure in order to assess efficiency gains of hypothetical mergers or acquisitions (M&As). The inputs comprise labor, total deposits and physical capital whereas loans and securities are the outputs. Applying this framework over the period 2007-2011 the study finds the fiscal crisis to cause any gains in operating efficiency from hypothesized M&As to evaporate. An additional conclusion is that a merger does not necessarily result in technical efficiency gains even if each of the banks is technically-efficient on a stand-alone basis.

In the IPO paradigm, DEA estimation remains in its infancy which comes as a surprise given the perennial quest in this literature to overcome endogeneity concerns within the first-day returns' equation. The sole extant study comes from Gregoriou and Kooli (2006); however, with a theoretical framing that focuses on investors' ability to maximize their return on IPO shares, the authors overlook the big picture which rests upon the excessive amount of capital foregone at listing. Their decision making units are indicative to this matter, with the offer price, number of shares and IPO proceeds comprising the inputs whereas the first aftermarket price and quarterly return making up the outputs.

Intangibles as inputs into DEA models predominantly revolve around research and development (R&D). In this respect, Sueyoshi and Gotto (2009) center on the interplay of R&D intensity with the financial performance of two manufacturing industries in Japan which constitute traditional drivers of growth for the national economy. Confirming their conjecture about a differential effect conditional on industry-specific features, the authors register a positive association in a sample of machinery manufactures whereas R&D appears as a liability to the performance of

electric equipment firms. The list of intangibles may appear more comprehensive. For example, Demerjian et al. (2012), in assessing managerial ability on the efficient use of firm's resources, complement R&D with balance sheet items such as 'goodwill' and 'other intangible assets'. On the other hand, intangibles that escape statutory reporting such as a firm's networking and overall relationship capital are barely used as inputs into the production process, even though a DEA model would be particularly compatible with their dynamic nature and less predictable association with firm performance.

2.4 Gaps in literature and the contribution of the present study

As it becomes apparent from the previous sections, the value-relevance of corporate political connections and the IPO event feature extensively in the corporate finance literature. Their between interplay may be: i) implied (e.g. Fisman, 2001; Ritter and Welch, 2002; Cooper et al. 2010 Chin et al., 2013), ii) assessed in the context of emerging markets as in Fan et al. (2007) and Francis et al. (2009) or iii) draws evidence from state-owned enterprises (SOEs). In contrast with these studies, the present thesis intends to address the following gaps in the extant literature:

The immediate or very short-term effect of proximity to politics complements findings obtained from medium to longer-term horizons (Cooper et al. 2010; Yu and Yu, 2011; Chin et al., 2013; Coreia, 2014). Common-sensually, establishing links to politicians or other government officials comprises a source of probable benefits which manifest themselves ad hoc when political favoritism is needed. From a novel prospective, we explore the possibility that political connections as a means of introducing a firm into the marketplace and overcoming the liability of newness (Stinchcombe, 1965).

In this sense, we also contribute to the IPO literature which examines issuers' strategies for combating the ex ante uncertainty and instilling confidence in prospective investors. A non-exhaustive list includes: resorting to top auditing firms (Beatty, 1989), (2) sharing ownership with VCs that have a reputation for successfully taking companies public (Megginson and Weiss, 1991), (3) being underwritten by reputable investment banks (Carter et al., 1998), (4) filling the top-echelon positions with revered

executives (Certo, 2003), and (5) obtaining a credit rating (An and Chan, 2008). We expand this list by proposing alliances with politicians as a novel yet potentially powerful strategy.

With regard to the extant studies on IPOs our contribution is twofold. The existing literature studies politically connected IPOs in emerging markets with the big majority of the studies focusing on China (also as in Fan et al. (2007) and Francis et al. (2009)). Our empirical evidence is drawn from a mature western capital market (i.e. U.S.). Therefore, our inferences are free from elements which are idiosyncratic to developing countries or the Chinese state-driven capitalism.

Relatedly, the studies of Jenkinson and Mayer (1988), Perroti and Guney (1993) and Dewenter and Malatesta (1997) report conflicting findings on the underpricing of SOE (state-owned enterprises). However, a significant portion of the issuer-specific uncertainty subsides when the newly floated securities relate to a national government. As a consequence, the evidence may hardly be extensible to corporate issuers.

Interestingly, the survey study of Ritter and Welch (2002) expresses the speculation that allocation of IPO shares may, on occasion, serve as a means of exerting political influence. The authors, however, provide no empirical support. If valid, this practice can conceivably generate a multitude of implications for the efficient functioning of capital markets as well as the political system. Yet, it is at least surprising that none of the later researchers has picked upon this seed.

A final contribution that the present study claims is the applied methodology. The persistent phenomenon of IPO underpricing raises concerns' on issuers' efficiency in determining an offer price. Therefore, framing the process of going public as a production-analysis problem, our aim is at pinpointing the efficiently priced IPOs. Once properly identified, these issuers can act as benchmarks and their emulation is expected to allow issuers capturing a larger portion of the surplus value created at an IPO.

Chapter 3 - Political money contributions of U.S. IPOs

3.1 Introduction

In the last week of October 2013, with barely 15 days remaining to the planned IPO, Twitter Inc was intensifying its effort to finalize a price range for its offering. Interestingly, the firm chose this busy week to file its first-ever lobbying report. The issues lobbied for comprised a long agenda, mainly pertinent to consumer matters, foreign relations, technology and copyright. This lobbying expenditure came complementary to Twitter's newly formed political action committee (PAC) in a timely and coordinated effort to reach Washington just before the company's equity reached the New York Stock Exchange. Twitter hardly pioneered the practice of political money contributions (PMC) in light of an imminent IPO. The rival social network, Facebook, initiated its own PMC effort within the year prior to going public, and Google, back in 2004, launched lobbying campaigns in a similar time frame.

While the list of prospective issuers with a PMC record goes on, the corporate finance literature has yet to draw the link to IPO performance. Considering the prolific research on the possibilities for information flow in favor of the least informed party at the IPO event (e.g. Beatty, 1989; Megginson and Weiss, 1991; Carter et al., 1998; Certo, 2003; Chemmanur and Paeglis, 2005 and Francis et al., 2010), it is surprising that PMC activity has not been explored as a means of firms to communicate access to the highest echelon of government. The present study explores the impact of such cash flows on a company's listing endeavor by raising questions of broader public interest. Is the level of a firm's PMC spending a suitable proxy for 'political connectedness'? If so, do market participants factor in corporate political donations under circumstances of acute uncertainty such as in the IPO paradigm? Further, how do the two prevalent PMC types, lobbying and PAC, compare in terms of overall effect on IPO underpricing and do they substitute or complement each other? Finally, which group of recipients should PMC firms be targeting in terms of political party (i.e. Democrats or Republicans), Congress chamber (i.e. Representatives or Senators) and individual characteristics? After all, is there such thing as an 'ideal' PMC strategy?

In an important departure from recent studies that focus on the benefits accruing to established public firms nurturing connections with political figures (e.g. Cooper et al., 2010; Ramanna and Roychowdhury, 2010; Yu and Yu, 2011 and Chaney et al., 2011), we investigate new issuers' likelihood of seizing a larger portion of the surplus created in the going-public process by means of PMC expenditure. Contributions to lobbying and PAC campaigns, within a reasonably short period before floatation, can create value for at least two non-mutually exclusive reasons. First, a connected firm enjoys proximity to other connected entities that play a role in the IPO, in particular institutional investors. Positioning itself as an additional node in the network, management can gain insight into market sentiment and issues of demand; vice versa, firm-specific cues towards the principal buyers are direct and frequent. This first-order channel of communication is likely to eliminate a significant portion of informational asymmetries in the going-public process. For more peripheral to the network parties, such as first-day investors, a traceable record of PMC could constitute important disclosure of preemptive action taken against imminent risks. At a minimum, access to the highest decision-making bodies promulgates a firm's ability to maneuver with less friction in the institutional environment, thereby mitigating *ex ante* uncertainty. Second, politically involved issuers possess sufficient bargaining power to contain an underwriter's propensity for distributing discounted IPO shares to preferred customers. An edge in the pricing negotiations may stem from: (1) the connected firm's financial autonomy, rent-extraction capability and overall reputation (Hart, 2001; Faccio, 2006; Boubakri et al., 2008 and Houston et al., 2014); (2) It can equally be a product of management sophistication, a necessary quality in order to orchestrate and go after political connections in the first place. Taken together, the setting appears opportune for PMC issuers to incur less of the foremost cost entailing the listing endeavor, i.e. IPO underpricing[1].

To test this conjecture, we assemble a large and comprehensive sample of U.S. IPO deals spanning the period from 1 January, 1998 to 30 June, 2013. We manually investigate each issuing firm in the archives of the U.S. Federal Election Commission (FEC) and Center for Responsive Politics for evidence of PMC activity within the five-year period preceding the listing date[2]. We thus obtain our special sample of interest,

[1] 'Underpricing' is the prevailing IPO jargon for the realized return over the first trading day.

[2] We expect the effect of PMC on IPO performance to be more pronounced with increased time proximity to the IPO day. Approximately 81% of PMC firms have exhibited their spending within the 12-month

PMC firms. Comparing PMC IPOs' mean first-day return of 19% with the remaining IPOs' mean underpricing[3] of 29%, we come up with strong preliminary evidence for our hypothesized effect of political donations on IPO returns. Notably, assessing the fundamentals of PMC firms, we find these issuers to be associated with superior quality as proxied by market share, profitability, leverage and years of operational experience. It becomes, therefore, plausible that PMC firms, rather than seeking a 'life jacket' in politics, are involved in order to manage, in due course, the legal and institutional uncertainties that lie ahead. Our empirical findings show that this strategy becomes discernible by market participants and pays off on the first day of trade. Employing the full IPO sample, we regress underpricing on a firm's choice to engage in PMC, along with common covariates from the literature, and confirm the inverse relation; lobbying money, PAC contributions and any combination of the two PMC routes significantly result in leaving less money on the table.

Econometrically, we exercise caution in the above analysis to draw inferences least distorted by endogeneity. Given the highly discretionary nature of PMC, it is likely that firm-specific features driving the PMC decision weigh also upon IPO pricing. To account for feedback effects, we instrument for PMC involvement with a battery of established, in the relevant literature, PMC determinants while also introducing novel ones, especially tailored to the IPO setting. We estimate selection and outcome equations in a two-stage procedure applying the Heckman and the instrumental variables (IV) methods. The former approach addresses the bias stemming from firms' self-selection into the PMC practice. The IV method, instrumenting by means of fitted values, adds robustness to our selection of PMC determinants. Pursuing enhanced efficiency for the resulting coefficients, we also estimate the equations system simultaneously via maximum likelihood. Invariably, the three estimation techniques lend strong support to the validity of our inferences.

With our main conjecture confirmed, we turn our attention from the *PMC involvement* per se to *PMC level*. We draw evidence from the PMC IPO sample to ensure that results are not simply driven by size. In assessing the incremental importance of a dollar disbursed for lobbying or PAC contributions, we record that the more substantial the PMC magnitude appears, the more constraining the effect on initial

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period preceding the IPO. In our robustness checks, we test the validity of our results in this special subsample as well as alternative time windows.

[3] Hereafter, we use the terms 'first-day return' and 'underpricing' interchangeably, similar to literature.

return emerges. The relation is of high economic significance; *ceteris paribus*, an additional 10% PMC expenditure reduces IPO underpricing by 2.5%. In light of this evidence, far from acting as a nominal value proxy for connectedness, PMC obtains a definite investment character.

Further, we take advantage of the traceable nature of PAC contributions (as opposed to lobbying opaqueness) and study the differential effect on IPO return by recipient candidate profile. First, we draw a distinction between the two Congress chambers and test for an incremental Senate effect. Interestingly, findings dispel the popular perception that attaches special prestige to U.S. Senators; sponsoring campaigns for the House of Representatives entails more value. Second, we split across party lines and, once more, contrary to the common view accompanying the Republican Party as the 'pro-business party,' we show that a Democratic bias in contributions brings about the least underpricing. Third, we portray candidates not only as structural units of their main affiliations, but also as portfolios of distinctive characteristics of their own. To this end, we resort to the Cooper et al. (2010) taxonomy and construct the respective indexes for candidate 'strength,' 'power' and 'ability.' By and large, the cross section of these dimensions upon IPO returns reveals a more compelling effect for home state candidates and lengthy tenures of accomplishment. Given the scarcity of liquid assets in the pre-IPO regime, this insight facilitates the efficient appropriation of PAC funds based on strategic targeting of recipient candidates. Another key implication pertains to the nature of the relationship per se. That is, establishing robust links with (any type of) candidates necessitates a firm's commitment to a recurring and uninterrupted pattern of contributions. Of course, with a median firm age of 8 years at IPO, time is also in short supply. Overall, we conclude that notwithstanding the significant adversities, and to a large extent because of them, a PMC record successfully promulgates an issuer's determination to grow in political reach in parallel to the rest of its asset base.

We expand our horizon beyond the listing day to draw support from the bookbuilding period. Following both the magnitude and direction of filing price revisions, we explore how a PMC record weighs on price discovery. Evidently, it systematically leads to downward revisions of IPO offer price. This relation, in conjunction with the modest underpricing, attests to the highballing of PMC offerings, a phenomenon that only partially reverts in light of informed investors' feedback. In this case, the underwriter foregoes a nontrivial fraction of the surplus created in the going-public process in favor of the issuer; a behavior that is in line with the bargaining power

of donor firms but less compatible with the networking effect of PMC. We seek additional evidence from cases whereby the lead underwriter is also politically connected. We recognize two distinct avenues through which this becomes possible: (1) The underwriter is active in political contributions similar to IPO firms and (2) the underwriter derives connectedness indirectly through its PMC clientele. While the results invariably corroborate our main conjecture in this study, the effect is amplified for underwriters with a scarcity of the second (indirect) type of connections. Therefore, PMC issuers are shown to be sought-after in themselves rather than as liaisons between the investment banker and the loci of power.

For a holistic study of the PMC effect, we also trace the aftermarket volatility of IPO equities. Following a matched sample approach, we assign to each PMC IPO a non-PMC closest neighbor and record the standard deviation of returns on the two portfolios within specific time intervals that extend up to a year after the issue. Invariably, the results prove that PMC shares trade significantly more smoothly than their non-PMC counterparts. In addition, we show that the wider the interval, the more sizeable the difference in mean volatility grows to be. Apparently, the PMC-driven sentiment extends well beyond the IPO event.

We subject findings to a battery of robustness exercises. First, we assess the time sensitivity of our results by introducing alternative cutoffs with regard to PMC distance from the IPO day. Second, in order to disentangle the effect of each contribution type, we rerun our main regressions for lobbying and PAC in isolation. With this testing to yield a qualitatively similar relation, our choice for grouping under a common PMC umbrella is largely warranted. Notably, the least underpriced IPOs have employed some blend of lobbying and PAC contributions. This proves that a PMC effort, in order to fulfill its mission, whether as a means to reduce information asymmetries or a bargaining weapon, needs to be both sizeable and focused; lobbying contributions cater for the size factor by being uncapped, PAC contributions provide the more personalized dimension by entering directly into candidates' campaign coffers. Third, we acknowledge the existence of a special group of PMC IPOs ('political by birth') that commence contributions shortly after foundation. We test separately for these early birds allowing for a possible covariance of the PMC effect with the corporate life cycle. With inadequate evidence to support this conjecture, though, a long apolitical past is shown to pose no threat to the PMC-stemming benefits.

This study makes important contributions to IPO and corporate finance literature while addressing concerns of mounting public interest such as the symbiotic relation between the corporate world and politics. First, we show how a firm's political donations, commonly associated with remote and indirect benefits, translate into an immediate and measurable gain on the IPO day. With a median expenditure of $ 71.5 thousand, such contributions exert a profound effect on altering the relative dynamics in an IPO as both underwriter and market investors factor in a firm's Washington strategy; the former assigns a premium valuation and the latter systematically maintain first-day return at a modest level. Second, we contrast lobbying and PAC spending, as the two main PMC types, and disentangle their effect on IPO performance. Highlighting special strengths and weaknesses for each strategy, we make a case about their complementary nature towards an effective mechanism for combating *ex ante* uncertainty. Third, differentiating among PAC money recipients by Congress chamber, party affiliation and individual characteristics, we devise an optimal target group for the most constraining effect upon underpricing. The implications for prospective listers are unambiguous: a dollar spent on PMC activity saves many more on the actual listing day. Sure enough, uncertainty-driven underpricing can be fought with alternative tools; for instance, marketing campaigns or charities. In that case, however, the advantage of a well-implemented PMC strategy would be twofold as: (1) it typically entails a dramatically lower investment; and (2) the likely benefits are expected to extend over well beyond the IPO event.

Our study relates to the works of Beatty (1989), Megginson and Weiss (1991), Carter et al. (1998), Certo (2003), Faccio (2006), An and Chan (2008), Francis et al. (2009), Cooper et al. (2010), Ramanna and Roychowdhury (2010), Yu and Yu (2011) and Correia (2014). A focal point in the IPO literature has been issuers' effort to overcome moral hazard and adverse selection concerns by signaling quality. In this regard, firms reportedly employ a plethora of means. A nonexhaustive list shows issuers targeting prestige spillovers by: (1) hiring reputable auditors (Beatty, 1989), (2) inviting VCs with a proven record of successful IPOs (Megginson and Weiss, 1991), (3) employing top-notch underwriters (Carter et al., 1998), (4) infusing management teams with prestigious executives (Certo, 2003), and (5) seeking a credit rating (An and Chan, 2008). Expanding this literature, we produce the first study to relate political donations to IPO performance and introduce PMC as a novel strategy for a prospective lister to claim value with assertiveness. Another strand of literature stemming from the interplay

of politics with business (Faccio, 2006; Cooper et al., 2010; Ramanna and Roychowdhury, 2010 Yu and Yu, 2011) draws evidence from firms with several years of experience as public corporations that have developed their connections over a sufficiently large time span. From an alternate perspective, the present study fixates upon the IPO event for highlighting a firm's need to fast-track connections in the pre-IPO period, so that it cashes in benefits as early as the first day of trade.

The rest of the chapter has the following structure. Section 3.2 reviews selected studies of IPO and political connections literature. Section 3.3 develops our hypotheses. We describe our sample and contrast the two PMC types in Section 3.4. Section 3.5 outlines our methodology. The empirical analysis is in Section 3.6. We test the robustness of our results in Section 3.7. Finally, Section 3.8 concludes the chapter.

3.2 Related literature

3.2.1 Theoretical framework

Price discovery for new equity offerings is an inherently uncertain process. The relevant literature invariably captures this uncertainty by means of listing day aftermarket performance. Since the seminal works of Stoll and Curley (1970), Logue (1973) and Ibbotson (1975) have revealed a robust pattern of abnormal positive returns, a plethora of theories attempt to explain the conundrum of IPO first-day return, which is appropriately referred to as underpricing. The asymmetries in information among the various parties involved in an IPO deal serve as a focal point for most explanations offered. For example, Rock (1986) and Beatty and Ritter (1986) maintain that in light of a de facto informational disadvantage, risk-averse investors are naturally inclined to pressure for a discount price. In parallel, effective price discovery requires unbiased feedback from engaged investors and, if possible, their proprietary insight. But since private information comes at a cost, the underwriter is likely to adjust the offer price downwards in order to provide compensation at the issuer's expense (see Benveniste and Spindt, 1989; Benveniste and Wilhelm, 1990 and Spatt and Srivastava, 1991). Accordingly, the need to underprice lies at the intersection of demand-side and bookbuilding factors.

Another strand of literature, also stemming from the asymmetric information

framework, assigns value to underpricing and illustrates circumstances under which an issuer would concede to a large first-day return. Far from the market friction view, Welch (1992), Habib and Ljungqvist (2001) and Demers and Lewellen (2003) regard a reasonably low offer price as an effective marketing tool for appealing to an extended base of uninformed investors. The implicit assumption is that the firm will be able to capitalize in due course on the enhanced attention drawn from a euphoric IPO, recouping more wealth than what was given up at listing. Chemmanur (1993) adds increased analyst coverage to the benefits of a high initial return while a number of studies pertinent to the legal implications of IPOs highlight the lawsuit deterrence effect of a strong first-day close (Hughes and Thakor, 1992; Drake and Vetsuypens, 1993 and Lowry and Shu, 2002).

Lastly, Loughran and Ritter (2002), in a notable turn from asymmetric information to prospect theory, portray underpricing as a rather harmless vice, suggesting that initial investors, already being in a prosperous state through the amassment of IPO proceeds, rarely reckon the marginal utility foregone on the first day of trade. Yet, it is Jay Ritter who estimates on his website the cost of global IPO underpricing to be $135.12 billion. And this only captures the period 1998–2012. Consequently, the astronomical magnitude of the amount fosters skepticism against any behavioral explanations assigning a lesser importance to the efficient pricing process.

3.2.2 Political connections as a value adding strategy

The value adding component of corporate political connections is explored in literature via two main routes; these either involve scrutiny of company insiders' proprietary network or, alternatively, apply a 'follow-the-money' approach going after cash flows directed from corporate coffers to politics.

Within an international or cross-country context, poor data availability and, on occasion, deliberately opaque interrelations between the business world and local governments typically leave no option but to directly investigate the individual profiles of corporate officials. In these cases, companies derive their connections through directors and executives who either actively engage in politics or remain closely related to others who do. Faccio (2006) applies this identification method in a comparative study of 47 countries and finds that connected firms are able to sustain larger market

shares without this feature to reflect proportionately on the accounting bottom line (see also Boubakri et al., 2008). The study observes further that connected firms maintain significantly more levered capital structures as they enjoy preferential access to debt financing (e.g. lenient debt covenants), although there is no evidence of incurring a smaller interest expense than their peers. Chaney et al. (2011) assess the reporting quality of more than 4,500 firms in 19 countries and reach the conclusion that politically connected firms are not penalized for consistently underperforming in this field. Apparently, in light of political reach, accounting data shrinks in value relevance.

Tracing political connections in the U.S. at the director's level, similarly to the above studies, would likely produce less enlightening results. In the Faccio (2006) database, out of a total of 6,007 U.S. firms examined, only 13 of them qualify to be classified as politically connected. U.S.-centered literature circumvents this limitation by recognizing corporate expenditure for political purposes (overwhelmingly, lobbying and PAC) as a valid proxy for political connections. Notably, within this methodological framework, the particular PMC type appears of minor importance. For example, even though Chen et al. (2010) and Cooper et al. (2010) concentrate on lobbying and PAC contributions, respectively, they draw a common conclusion: donor firms robustly enjoy superior financial and accounting returns. Besides performance, political money has been documented to facilitate more questionable ends. Indicatively, Correia (2014) finds that PMC lower the probability of an SEC enforcement action and, even if the firm is subjected to one, the financial penalty is expected to be very moderate. Yu and Yu (2011) take this argument one step further and stress the immunity to fraud that lobbying can provide. Interestingly, "firms that lobby on average have a significantly lower hazard rate of being detected for fraud, evade fraud detection 117 days longer, and are 38% less likely to be detected by regulators."

3.2.3 Political connections and the listing project

Recent studies on China show that political connections can play a decisive role towards a successful IPO. Fan et al. (2007), drawing evidence from the (partial) privatizations of Chinese state-owned enterprises (SOEs), attest to the contained underpricing that these firms incur when headed by incumbent or past government officials. Corroborating this research, Francis et al. (2009) discuss the threefold benefit that a strong association with the government entails by supporting premium valuations,

imposing discipline on first-day returns and reducing costs throughout the entire issuance process. Yet, the distinct character of the Chinese capital markets casts doubt on the applicability of this insight into a cross-country framework. More importantly, these connections, largely an inheritance from the past economic model, entail no cost and, therefore, may not be considered as an issuer's political strategy. Resorting to the international privatization literature, the studies of Jenkinson and Mayer (1988) and Perroti and Guney (1993) meet on the excessive underpricing of SOEs compared to non-SOE IPOs, a finding that is challenged in Dewenter and Malatesta (1997). But again, any inferences to be drawn from SOEs to the typical corporate issuer remain, at best, dubious as the *ex ante* uncertainty is fundamentally different when the state is a counterparty. In a U.S. setting, Ritter and Welch (2002), within a line that has surprisingly escaped attention, raise the speculation that underwriters employ the allocation of (discounted) IPO shares as a tool for influencing politicians. Logically, the alignment of incentives should fundamentally be revised when the issuer, rather than standing between the investment banker and the sought-after connections, assists in bridging the distance. We develop this proposition in the next section.

3.3 Hypotheses development

Political connections formed via PMC, whether the firm operates in a private or public domain, remain in essence a long-lived intangible asset and may hardly be framed as preparation for an imminent offering. Even so, a precedent of donations can profoundly alter the relative dynamics in an IPO. To uncover the incremental value accruing to a firm soliciting equity capital 'connected,' we rely upon two non-mutually exclusive lines of argument.

First, if, as per Logue (1977), IPO pricing mirrors an issuer's bargaining power vis-à-vis lead underwriter, a valuable deal for the former party is likely to emerge once it convincingly transmits less dependence upon the latter agent's resources. A PMC setting is in line with this spirit as: (1) the de facto esteem of connected firms simplifies the marketing effort and generally appears to be more compatible with the types of offerings that enhance an underwriter's reputational capital, rather than those relying on it for certification (as in Carter and Manaster, 1990); (2) the preferential access to alternative means of financing (Faccio, 2006; Boubakri et al., 2008 and Houston et al.,

2014) allows for the possibility of either waiting until a satisfactory negotiated outcome arises or cancelling the deal altogether; and (3) the rent-extracting capacity attributable to connections (Hart, 2001; Faccio, 2006 and Cooper et al., 2010) reinforces expectations of a recurring business relationship with the underwriter, as in the case of follow-on offerings, M&A activity and trading revenue for the brokerage arm. A more subtle point can be deduced not as a result of the PMC act per se, but on the basis of management's determination to pursue one additional resource: PMC-stemming benefits. Arguably, an issuer identifying with the minority of firms that challenge the boundaries of the prevailing institutional environment and go after policymakers is also less likely to concede to a lowballing of the IPO price.

Second, PMC reduce information asymmetries for principal participants involved in the listing process. A more level playing field is attainable: (1) within a niche network of similarly politically connected people or entities. Institutional investors, without precluding other economic agents (underwriter, retail investors, financial and legal intermediaries etc.), can be central to such an association by virtue of an advanced sophistication level. In this respect, political connections shape for the IPO firm an additional channel through which it can exchange inside information for projections of demand and overall market sentiment; (2) due to the disclosure element entailing both the filing of lobbying reports and the identification of PAC recipients. Logically, reassessing an issuer's risk exposure in conjunction with all remedial action taken in the form of PMC alleviates an important portion of *ex ante* uncertainty. Let one of our opening examples, Facebook, illustrate further this notion. With intellectual property infringement posing as a primary threat, operational viability remains conditional on the protection of proprietary rights. Indeed, the firm's IPO prospectus (S-1 document), among other risk factors, declares: "If we are unable to protect our intellectual property, the value of our brand and other intangible assets may be diminished, and our business may be adversely affected." Yet, an investigation of the company's PMC activity is likely to mitigate related concerns divulging a substantial and ongoing lobbying effort on issues of copyright, patent and domain name protection, a campaign that was also complemented by PAC contributions towards the leadership of the relevant Congressional committees[4]. Notwithstanding the multifaceted role that a

[4] The election cycle 2010–2011 saw substantial PMC activity for Facebook Inc. In detail, lobbying expenditure reached $ 1,701,390 and total PAC contributions $ 270,000. Among PAC recipients we note Bob Goodlatte ($ 2,000) and Mel Watt ($ 2,000) as the chairman and ranking member, respectively, of

PMC record can obtain in the elimination of asymmetries, Ritter and Welch (2002) recognize that "all theories of underpricing based on asymmetric information share the prediction that underpricing is positively related to the degree of asymmetric information."

In sum, the potential channels lend support to PMC as a means of imposing discipline on first-day returns and lead to our main hypothesis:

H.1. Ceteris paribus, underpricing is inversely related to political money contributions of IPO firms.

If lobbying and PAC contributions are complementary PMC types, the firm has to devise an efficient portfolio of PAC recipients[5]. In light of the cash-constrained environment of a typical IPO firm, the targeting of candidates warrants careful study.

We first differentiate based on Congress chamber affiliation. The Senate is commonly surrounded with greater prestige than the House of Representatives. Two plausible reasons are the Senate's filibuster prerogative (the right to delay or postpone a proposal by extending debate indefinitely) and the authority 'to advise and consent' to major presidential appointments (U.S. Const. Art. II, sec. 2). Nevertheless, the majority of studies simply point to the size differential between the two Houses; undoubtedly, contrasting the 100 seats of the Senate with the 435 (voting) seats of the House of Representatives creates a strong impression of a Senatorial predominance (e.g. as in Grier and Munger, 1993). Given the above, we expect additional prestige to accrue to firms contributing preferentially to Senate candidates and the merits of being associated with the more privileged Congress chamber should reflect on IPO return.

H.2.a. Underpricing decreases more with PAC contributions to Senate rather than House candidates.

Disentangling the effect of PAC contributions across political party lines is a complex task. The relevant studies highlight firms' strategy to target incumbents, irrespectively of party affiliation, and converge to the conclusion that firms spend to

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the Intellectual Property, Competition, and the Internet committee of the House of Representatives. In the Senate, PAC recipients include John Kerry ($ 2,500) and Jim DeMint ($ 2,500) as the chairman and ranking member, respectively, of the Communications, Technology and the Internet committee.

[5] Lobbying, because of its impersonal nature, does not allow for any further differentiation other than the monetary intensity of the contribution.

ensure access rather than to influence the outcome of elections or for other ideological reasons (Stigler, 1971; Grossman and Helpman, 1994 and Milyo et al., 2000). Lowery and Brasher (2004: 133) describe this phenomenon in an accurate manner: "most of the economic sectors do not put all of their eggs in one partisan basket. They give to both parties; or, more specifically they give to incumbents, which means that they give to both parties,"

Because of corporate donors' indifference, literature has turned its attention to the partisan preferences of market investors. In this respect, some early insight from Niederhoffer et al. (1970) and Riley and Luksetich (1980) associates a bullish market with the aftermath of Republican victories. At the firm level the evidence is rather mixed. Goldman et al. (2009), tracing corporate political contributions from the 2000 election cycle, refute altogether an association of the outcome of the elections with post-election market returns. In contrast, Shon (2010), also using data from the turbulent period of the 2000 Florida recount, documents a significant relation between campaign donations and stock prices. With a broader time window, Cooper et al. (2010) conclude that PAC contributions have a strong positive relation with both market and accounting measures of performance, documenting an incremental contribution effect for Democrats.

Notwithstanding the discord in literature, a portion of the issuer-specific uncertainty is likely to subside from the association with the 'pro-business' party and Republicans may hardly dispel this stereotypic identity.

H.2.b. Underpricing decreases more with PAC contributions to Republican rather than Democratic candidates.

Down to the level of individual characteristics, each candidate comprises a unique portfolio of attributes. Among them, we attach special weight to: (1) geographic scope, (2) an uninterrupted relationship with the firm, and (3) a track record of leadership while in Congress.

Faccio and Parsley (2009), in a provocative manner of pinpointing the interdependent relations between businesses and local authorities, document a decrease in share price for firms headquartered in a politician's hometown upon the announcement of her unexpected death. Within a U.S. context, Roberts (1990) had

already witnessed a similar effect for Washington-based companies following the loss of Senator Henry 'Scoop' Jackson in September of 1983. In assessing the value of connections, therefore, we need to acknowledge the symbiotic relationship among the local pillars of power, especially for those firms maintaining an extended operational base in the headquarters' state. Additionally, literature favors constant streams of PAC money, as opposed to one-off or sporadic spending (Strattman, 1995, 1998 and Krozner and Strattman, 1998). Intuitive as this proposition may appear, nurturing long-term political connections is a challenging project; prospective issuers, with a median age[6] of 8 years, face severe time and liquidity constraints. But again, we expect such adversities to assert the firm's determination regarding political involvement. Finally, for a maximum impact per PAC dollar spent, we propose the selection of recipients on the basis of their relevant agenda-setting power and collegial esteem within the Congress chambers. We proxy for these qualities by means of committee assignments and committee rankings.

H.2.c. Underpricing decreases with recurring contributions towards home state candidates and lengthy tenures of accomplishment.

3.4 Data and sample

3.4.1 Sample selection criteria – IPO

To assemble our sample we retrieve information from the Securities Data Company (SDC) covering the entire population of IPOs that have been floated on U.S. exchanges for the period 1 January, 1998 to 30 June, 2013. Consistent with previous literature (e.g. Loughran and Ritter, 2002), we eliminate those IPOs priced at less than $5 per share, limited partnerships, reverse LBOs, ADRs and foreign issuers whose shares may be already trading in local markets. In addition, while allowing for financial firms, we exercise caution not to include closed-end funds, REITs, royalty trusts and special purpose investment vehicles. To this end, we do not consider firms with SIC codes between 6723 and 6999 or companies that, even though they bypass Thomson

[6] We use data from Jay Ritter's website in order to estimate this statistic for a time horizon exactly overlapping with the one used in this study, i.e. 1 January, 1998 to 30 June, 2013. The total sample includes 2,403 IPOs.

Reuters filters for closed-end funds, still operate as such. Finally, we exclude corporate spin-offs; these firms have typically been parts of large, mature businesses and thus entail considerably less uncertainty than the average issuer. The remaining sample is merged with the databases of Compustat and the Center for Research in Security Prices (CRSP) from which we obtain IPO firms' accounting fundamentals and aftermarket performance data, respectively. After these interventions, we end up with a final sample of 1,578 unique IPO deals.

3.4.2 The two alternate routes to PMC: Lobbying & PAC

Lobbying and PAC contributions comprise the two main avenues available for U.S. corporations to reach out to the Congress chambers. The decision to engage in either practice is made by a firm's top-echelon executives. We investigate political money spent by firms within a time frame of up to five years before the IPO date. Ultimately, this methodology generates our special sample of interest of 273 IPOs with PMC.

Lobbying is the prevalent means, in terms of both frequency and size, by which U.S. companies interfere in the making of politics (de Figueredo and Richter, 2014). Dollar contributions made to this end (publicly disclosed under the Lobbying Disclosure Act of 1995) aim to advance a firm's perspective of the institutional framework within which it operates. Consequently, rather than being directed at specific politicians, lobbying pertains to the essence of the legislative process. Of course, the fact that no money enters candidates' campaign coffers hampers the traceability of cash flows to the individual recipient level. For example, the relevant document acknowledging a contribution succinctly mentions that a firm lobbied the "U.S. House of Representatives" or the "U.S. Senate." Notwithstanding the indirect character, lobbying constitutes a robust proxy for connections as lobbyists typically are political insiders with extended networks of contacts. In addition, the uncapped element of contributions enables the extent of connectedness to be quantified with accuracy. We obtain lobbying data from the files of the Center for Responsive Politics (CRP). CRP derives information directly from the semi-annual lobbying disclosure reports filed with the secretary of the Senate's Office of Public Records (SORP) and initiates coverage from the year of 1998, inclusively. Matching the IPO deals with the CRP database, we are able to identify 244 IPO firms that have reportedly engaged in lobbying.

PACs (political action committees), commonly established by firms and other special groups, have the explicit purpose of supporting or fighting against a candidate's election. The corporate treasury is eligible to provide for a PAC's operating expenses but may not grant any additional support. Instead, the funds need to originate from third-party sources for which a firm routinely resorts to its key constituents (employees, shareholders etc.). As a consequence of their traceability feature, PAC contributions constitute the most widely used proxy for corporate America's political connections (Milyo et al., 2000). We rely for our PAC data on the Federal Election Commission's (FEC) electronic archive. Appendix B depicts the display of a typical search. To extract more of the informational wealth residing in these cash flows, we manually investigate each IPO firm within the 'Candidate Master' and 'Contributions to Candidates from Committees' files so that we record the detailed profiles of the recipients (party affiliation, House membership, representing state and more). This search yields 89 IPO firms that have contributed to PACs.

3.4.3 Descriptive statistics & sample identification

Table 3.1 provides a preliminary description of our full sample (N=1,578) vis-à-vis the subsamples of firms with (N=273) and without (N=1,305) PMC. The period from 1 January, 1998 to 30 June, 2013 spans 8 election cycles, which we use as time frames for the IPO deals. Grouping in this manner, we illustrate that the number of PMC IPOs need not fluctuate in proportion with overall IPO activity. For example, 2004–2005 was the election cycle with the most PMC firms (60); yet the total IPOs (271) accounted for almost half of those in the 1998–1999 cycle (465). Interestingly, even though the latter period coincided with the late 90s' bubble and, hence, gave rise to the majority of IPOs (29.47% of our full sample), the number of PMC firms (30) exactly equals that of the most recent election cycle of 2012 – 30 June, 2013. There is, therefore, nontrivial evidence that the frequency of prospective issuers resorting to PMC is on the rise.

Next, we array IPOs into the divisions of the Standard Industrial Classification (SIC) code. Most PMC firms fall within the manufacturing division (34.8%) followed by the service division (26.74%) and finance, insurance and real estate division (15.02%). The findings appear plausible in light of the heavy regulatory frameworks accompanying a lot of industries within these divisions (see Appendix A for a detailed

identification of regulated industries). In contrast, divisions experiencing minimal regulations exert more frugality on PMC activity (e.g. the wholesale and retail trade division accounts for a mere 5.49% of total PMC firms). Intuitively, firms most directly affected by legislation possess a stronger incentive for frequent disbursements. Consistent with this notion, 29.30% of PMC firms come from regulated industries while the respective percentage for the non-PMC sample sharply drops to 19.70%. In addition, we observe that PMC firms are less likely to be associated with Internet or technology industries, venture capital financing and the NASDAQ exchange. Based on market capitalization, PMC firms are worth close to 5 times more ($ 2,441.55 million on average) than their non-PMC counterparts ($ 498.33 million on average) and this is not a result of overvaluation as shown by a lower Tobin's Q[7] (mean value of 2.33) compared to the non-PMC sample (mean value of 2.98).

Table 3.2 presents descriptive statistics for the overall sample as well for the PMC and non-PMC subsamples. We define all variables in Appendix A. Substantial preliminary evidence in support of our main hypothesis for less underpricing accruing to donor firms can be found in Panel A. First, PMC IPOs record an average first-day return of a modest 19%. This accounts for a good ten percentage points decline compared to the 29% return of non-PMC IPOs. Second, a pattern of downward offer price revisions appears, at first sight, compatible with the need to 'leave money on the table' so as to compensate informed investors for disclosing proprietary information (as per Hanley, 1993 and Loughran and Ritter, 2002). However, as we show in later sections, it primarily attests to the initial overvaluation of donor IPOs and the resulting need for correction, a phenomenon idiosyncratic to the PMC setting. Notably, it is within the PMC sample, exclusively, where the mean value of revisions (-2%) assumes a negative sign. In passing, the mean differences in returns and revisions come out significant at the 1% and 5% level, respectively.

Panel B analyzes all IPO characteristics to be used as control variables in the subsequent regressions. On a comparative basis, PMC firms are considerably larger than their non-PMC counterparts as demonstrated by the average gross proceeds raised: $ 354 million for the former and $ 92 million for the latter IPOs. They also deliver superior profitability (captured by an earnings per share dummy) and rely less on leverage. In addition to stronger fundamentals, PMC firms possess more years of

[7] We calculate Tobin's Q as market capitalization over the replacement cost of total assets.

operational experience with a mean age approximating 25 years; that is about 10 years older than the average of the non-contributing sample. Consistent with the overall quality image, PMC IPOs are less likely to resort to venture capital financing and are mainly taken public by top-ranked underwriters. In contrast, stocks from the Internet or the broader technology sector, which usually have IPOs at infant stages (so as to fuel further growth), are relatively underrepresented in the PMC sample. Notably, this may also serve as a hint regarding their relative absence from NASDAQ, technology issuers' favorite listing platform. Interestingly, the dotcom period of 1999–2000, for all of its record-high IPO activity, gave rise to fewer PMC IPOs, in proportion terms, than the credit crunch crisis of 2007–2008. Finally, there is no significant difference in the percentage of retained ownership between the PMC and non-PMC group. On the whole, many of these characteristics have been shown to exert influence on IPO pricing. Any effect caused on first-day return by the new covariate in the valuation equation (i.e. PMC) must result net of the confounding factors. To facilitate this analysis, we define a cross-sectional setting in the next section.

For communicating the essence of contributions in a visual way, we refer the reader to Panel A of Table 3.3, i.e. top-fifteen IPOs ranked by PMC intensity. Overall, the first-day returns of these PMC heavyweights are dwarfed by annual average IPO returns in all but three cases (Talecris Biotherapeutics, SAIC and Mastercard). In a striking example, the second largest contributor, PentaStar Communications, documents a return of 7.5% amidst the overheated market of 1999 with the record-high mean IPO underpricing of 70.3%. From a complementary angle, Panel B presents the top-fifteen recipients of PAC money. A Republican candidate, Rick Santorum, leads the list with total PAC proceeds of $ 109.4 thousand. The general trend appears to be in favor of the Republican party and the House of Representatives. Unsurprisingly, all candidates share long tenures that span almost the entire horizon of our study.

Over the eight election cycles under research, the 273 identified PMC firms have channeled $ 74.29 million and $ 6.75 million towards lobbying and PAC contributions, respectively. The apparent lobbying bias also pertains to the particular PMC combination employed. Specifically, 184 IPOs (i.e. 11% of the total; 68% of the PMC sample) have practiced lobbying but not PAC contributions whereas 28 firms (i.e. 2% of the total; 10% of PMC) possess PAC-only experience. The remaining 61 IPOs (i.e. 4% of the total; 22% of PMC) have stayed active in both PMC types. The relative proportions are schematically shown in Figure 3.1.

The descriptive statistics of contributions are reported in Table 3.4. The mean (median) political money, a construct for aggregating lobbying and PAC amounts, equals $ 297 thousand ($ 71.5 thousand). Partitioning by contribution type, IPOs disburse about 1 dollar in PAC for every 4 lobbying dollars. The respective means are $ 75.9 thousand for PAC contributions and $ 303 thousand for lobbying. Tracing PACs down to the recipient level, IPO firms provide campaign financing to a mean (median) of 41 (10) candidates. Notably, consistent with previous work showing firms spend primarily for access, with little or no interest in the outcome of elections or ideology, the lion's share of the funds is targeted at incumbents (Grossman and Helpman, 1994 and Milyo et al., 2000). Panel A of Figure 3.2 graphically represents the time evolution of PMC types, by dollar magnitude and number of donor companies. Similarly, Panel B depicts the appropriation of funds by Congress chamber and political party affiliation

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3.5 Methodology

3.5.1 PMC choice & PMC level

To fully capture the effect of PMC on underpricing we distinguish between a firm's choice to engage in PMC and cash flow recorded towards this purpose. In doing so, we cater for our reluctance to assign an a priori linear relation between PMC size and dollars left on the table. Indeed, a meticulous study on the nature of lobbying and PAC contributions reveals reasons or circumstances under which the intensity of contribution weighs less than the PMC act per se.

According to the Lobbying Disclosure Act of 1995 (LDA), a lobbying contact is any oral or written communication (inclusive of electronic interactions) to an executive branch official or a legislative branch official that is made on behalf of a client with regard to the formulation, modification or adoption of federal laws, executive orders or government contracts, etc. Conceivably, once lobbying is framed as a communication endeavor, monetary intensity also becomes contingent to the intrinsic characteristics of the message it is meant to convey. For instance, evidence (as in Leech et al., 2005; Bonardi and Keim 2005 and Baumgartner et al., 2011) shows that messages of a salient

or relevant nature consume more lobbying resources. And this is by no means conditional on outcome.

PAC contributions, in spite of an unambiguous mission (i.e. fundraising vehicle for a candidate's campaign), pose two main challenges. First, the FEC-imposed $ 10 thousand ceiling[8] on corporate contributions allows for minimal support for any particular candidate. To put this amount in perspective, 2012 data from Vital Statistics on Congress estimate the cost of winning a seat in the U.S. Senate and House of Representatives at $ 10.3 million and $ 1.6 million, respectively. More scope for differentiation can arise from the assembly of a portfolio of candidates; yet, this brings about a second challenge. Specifically, committee memberships, rankings, incumbency (as well as length of) and majority party alignment are all features that distribute unequally the agenda-setting power among elected officials (as in Cooper et al., 2010) so that the number of sponsored candidates hardly adds up to a firm's overall sphere of influence.

Given the above, the next section engages the full sample in order to assess the effect of PMC involvement on first-day return. Subsequently, we focus on the cash flow level and, drawing evidence from the PMC sample, we gauge the incremental effect on underpricing per PMC dollar spent.

3.5.2 Estimation methods

To relate PMC involvement to IPO pricing, we specify a treatment effects model as follows:

$$Ln\,(1 + underpricing)_i = a + \beta\, X_i + \ \gamma\, PMC_i + \varepsilon_i \qquad (1)$$

where X_i encompasses a vector of firm- and IPO-specific characteristics, PMC enters the model as a dichotomous variable, and ε_i stands for the residual term. Further, letting Z be a set of measurable determinants of PMC, we can define accordingly the selection equation as:

$$PMC_i^* = \omega\, Z_i + \eta_i \qquad (2)$$

[8] However, corporate PACs are not precluded from covering federal candidates' expenses. Such expenses should presumably be unrelated to electoral campaign purposes and are designated as 'independent expenditure.'

where $PMC_i = \begin{cases} 1, & if\ PMC_i^* > 0 \\ 0, & if\ PMC_i^* \leq 0 \end{cases}$

A greater degree of complication resides within the estimation approach as we can barely lend support to the stochastic independence of the variable in interest. Firms that place the legislative framework among their key operational risks are inclined to self-select themselves into the PMC practice. In addition, unobservable determinants of PMC such as a firm's extant political network and overall exposure to the institutional environment are also susceptible to influence pricing. We therefore expect these elements to enter equations 1 and 2, through ε and η, respectively, giving rise to feedback effects. Heckman (1979) proves how this selection bias cripples the reliability of OLS estimates and, ultimately, comes down to an omitted variables problem. In a setting that diverges from Heckman (1979) only in that the outcome equation regressand (underpricing) assumes a value for every observation (IPO) in the sample, we can similarly apply the proposed two-stage procedure to account for the bias. Within a corporate finance context, among others, Cohen (2003) resorts to the aforementioned method to treat the endogenous nature of the binary regressor of financial reporting quality, and so do An and Chan (2008) for a firm's decision to obtain a credit rating before an IPO.

Econometrically, we can make a case for the need for selectivity correction by rewriting equations (1) and (2) in an augmented model as shown below:

$$E[Ln(1+underpricing) \mid PMC = 1] = \beta' X + \gamma + E[\varepsilon \mid PMC = 1]$$

$$= \beta' X + \gamma + \rho\, \sigma_\varepsilon \frac{\varphi(\omega' Z)}{\Phi(\omega' Z)} \qquad (3)$$

Respectively, the model for the non-PMC IPO becomes:

$$E[Ln(1+underpricing) \mid PMC = 0] = \beta' X + \rho\, \sigma_\varepsilon \frac{-\varphi(\omega' Z)}{1-\Phi(\omega' Z)} \qquad (4)$$

Subtracting equation (4) from (3), we derive the incremental expectation due to PMC:

$$E[Ln(1+underpricing) \mid PMC = 1] - E[Ln(1+underpricing) \mid PMC = 0] =$$

$$= \gamma + \rho\, \sigma_\varepsilon \frac{\varphi(\omega' Z)}{\varphi(\omega' Z)(1-\Phi(\omega' Z))} \qquad (5)$$

where Φ and ϕ refer to the cumulative and density distribution function, in this order, of the standard normal distribution.

Modeled as such, the incremental expectation coincides with the OLS estimate of (γ), which distorts the actual effect on underpricing to a direction determined by the sign of the terms in equation (5). This bias can be dispelled by the inclusion of the *inverse Mills ratio (λ)*, which is hypothesized to be the omitted variable in equation (1). The selectivity correction, conditional on PMC, obtains then the form:

$\lambda = \frac{\varphi(\omega' Z)}{\Phi(\omega' Z))}$ if PMC=1 or $\lambda = \frac{-\varphi(\omega' Z)}{1-\Phi(\omega' Z))}$ if PMC=0

An alternative estimation approach that we employ is *full information maximum likelihood (FIML)*. Making a stronger assumption about the bivariate normality of the residual terms in equations 1 and 2, we estimate the system simultaneously. Because it processes all available information at once, FIML is a more efficient estimation technique than the two-stage procedure described above (Aldrich and Nelson, 1984). In addition, the FIML estimates allow us to test the null hypothesis of residual terms independence by means of the Wald test.

Finally, we relax the assumption of the normal distribution of the residuals and thus challenge the validity of our results outside the Heckman framework. This is attainable with an *instrumental variables (IV)* approach (see Wooldridge, 2002, chapter 5), which instruments for PMC, in Equation 1, via ω. The use of fitted probabilities as an instrument implies that the probit model can assume a suboptimal specification with minor effect on the IV estimates. This robustness property of the IV approach allows for flexibility in the selection of explanatory variables, a vital feature considering the substantial discord in literature about the exact PMC determinants. Incidentally, the IV setting is opportune for the Hausman test, which we conduct as an additional endogeneity control.

3.6 Empirical results

3.6.1 Determinants of PMC activity

In this subsection, we investigate a battery of plausible incentives for political donations and report the results in Table 3.6. The estimation techniques previously discussed converge to a probit regression in order to model a firm's likelihood to resort to PMC. Although interesting in its own right, this regression, once augmented by IPO literature covariates, comprises the first stage of both the Heckman and the instrumental variables methods. As such, it is critical to satisfy the exclusion restriction via a regressor influencing the PMC decision but not IPO underpricing. To this end, we employ the variable *Bills introduced* referring to those ideas for legislation which have received adequate support to become a bill. Indeed, while it is unlikely that this factor affects first-day returns, firms' incentives for PMC should increase with a longer agenda of issues brought before Congress. From the side of incumbent officials, a heavier workload reasonably consumes more resources either as inputs into the legislative process (i.e. lobbying) or in the effort to reconcile the policy making consequences with the chances for reelection (i.e. PAC), so that the demand for contributions appears also larger. For a systematic study, we classify PMC determinants into four general categories: i) firm profile & visibility, ii) internal politics, iii) political exposure, and iv) operational complexity. This specification yields a pseudo-R^2 of 23.3%.

3.6.1.1 Firm profile & visibility

As evidenced in the descriptive statistics, PMC activity flourishes with a bigger corporate footprint. Masters and Keim (1985) illustrate how *asset* intensity reinforces a firm's ability to exert scrutiny over its institutional environment and policy-related issues. From a rent-seeking framework, Hart (2001) views any benefits earned by PMC as accruing to firms in proportion to their size. As for the cost, larger establishments can opportunely spread it over a wider asset base. In a similar vein, a hefty level of *cash flow* proxies for resource availability. Masters and Keim (1985) make a case about the propensity of cash-affluent firms to contribute more, maintaining, nonetheless, an interesting reservation: successful firms may strategically abstain from political action in order to avoid unwanted public attention; this is particularly true for those firms that resemble monopolies and are capable of extracting rents as such. *Firm age* is a controversial variable in the sense that older firms are more likely to have invested in ties to politics and to nurture them via PMC on an ongoing basis. On the flip side, Hart (2001) upholds that their younger rivals may engage in aggressive contributions

pursuing a quick fix to a perceived deficiency in political reach. However, this syndrome of making up for lost time is likely to blur their vision with regard to the value relevance of PMC investment. Finally, we include *media coverage*. Given the disclosure scarcity of the pre-IPO environment, media attention can magnify a firm's dependence on institutional environment and sketch out possible risks, above and beyond a typical 'Risk Factors' section on the S-1 form. Within this context, PMC dollars can act as a sweetener to public concerns and infuse forward-looking predictions with renewed optimism.

The probit results confirm that large and cash-affluent firms are more likely to engage in PMC. Further, media coverage obtains a positive and highly significant coefficient (at the 1% level), corroborating our last conjecture. In contrast, firm age comes out as a poor PMC determinant in the IPO setting.

3.6.1.2 Internal politics

Theorists have indicated a plethora of organizational aspects that are directly influenced by management's political standpoint. For example, Chin et al. (2013) evidence that U.S. firms with liberal (conservative) CEOs, in the aftermath of subpar financial performance, sustain (limit) corporate social responsibility initiatives. Extending this research to political donations, they find that the more liberal the top-echelon executives appear, the more PMC spending aligns with Democratic purposes. More often than not, however, ideological or partisan preferences of management and other stakeholders, also driven by individual ambition, exist in a state of conflict and compete fiercely over the available PMC budget (for example, Hart, 2001). Thus, to the extent that contributions represent a form of perquisite consumption, organizational politics plays a decisive role in shaping a firm's PMC behavior. We allow this dimension to enter the probit model through the inclusion of the *pre-IPO management ownership* and the percentage of *unionized employees* in the firm's industry. Additionally, given the multifaceted influence that a *venture capital* (VC) firm exerts on a prospective lister (e.g. from the appointment of directors to IPO time selection), we account accordingly for its presence by means of a dummy variable. Predicting, however, the direction of this relationship entails considerable uncertainty as the cues stemming from the grandstanding theory are mixed (Gompers, 1996). It may be the case that younger VCs, anxious about gaining prestige, attach value to PMC as a time-and-

cost-efficient tool for promoting an image of connectedness. On the other hand, because they tend to myopically fixate on the IPO day, VCs are incentivized to exert frugality as the PMC benefits can appear remote and incompatible with a short-term investment horizon.

The estimate of the probit coefficient shows that the PMC probability increases with management's equity stake at all conventional levels of significance. It also increases with the participation of venture capital (at the 10% level of significance). Given VCs' anchoring on listing time, we pay particular attention to this finding. Evidently, VCs recognize at least some short-term benefits in PMC, thereby aligning with our main conjecture in this study. In contrast, the percentage of unionized employees in the firm's industry obtains an insignificant coefficient.

3.6.1.3 Political exposure

A firm's special competitive and geographic environment naturally claims significant explanatory power over the PMC decision. At the industry level, Zardkoohi (1985) acknowledges two possibilities: bourgeoning PMC participation may inspire firms to align efforts for benefits accruing to the industry as a whole or, alternatively, give rise to free riders as a public good. To infer the interpretation that IPO firms lend support to, we use *Industry PMC* (i.e. number of corporate donors in the same 4-digit SIC code) and the *HHI* (Herfindahl-Hirschman Index) for market concentration. To account for geography, we include the number of *Electoral College* votes corresponding to the state of the firm's headquarters. Intuitively, a larger number of local candidacies not only increases the demand for campaign funds but also perpetuates and polarizes the political debate.

Interestingly, while these variables are among the well-established PMC determinants (e.g. Cooper et al., 2010 and Skaife et al., 2013), in the IPO paradigm, we can only make a robust case (at the 1% level of significance) about our instrument (i.e. Bills introduced) and Industry PMC. Moreover, the positive association of the latter variable with PMC involvement favors the coalition over the free-ridership scenario. In passing, the coefficients on HHI and the Electoral College fail all conventional levels of significance.

3.6.1.4 Operational complexity

Hart (2001) highlights salient implications for the role of R&D as a proxy for asset specificity; he posits that the more specific a firm's operations appear, the less power an exit threat obtains as a means of exercising pressure on policymakers. Under this framework, there should also be a positive relation between R&D and PMC involvement. We investigate this possibility by identifying via a dummy variable (*R&D*) those IPOs disclosing an R&D expenditure. PMC incentives due to complication can also arise from a rigid regulatory framework. We similarly use a dummy variable (*Regulated industry*) for regulated IPOs. As such, we designate issuers with SIC codes of 4900–4939 (electric and gas), 1300 (oil and gas extraction), 4000–4700 (transportation), 4800 (telecommunications), 4950–4959 (sanitary services) and 6000–6712 (financial companies). Especially for those sectors in the economy experiencing government as both a regulator and buyer, the resource dependence theory predicts increased chances of contributions towards the key decision loci. We capture this dual role of government by means of a dummy variable (*Government purchases*) set to 1 for the five sectors topping the Economic Census list of U.S. public spending (i.e. defense, health, energy, transportation and education). As a last dimension to operational complexity, we take the number of a firm's *business* and *geographic segments*. Diversification at any of these levels induces contributions as at least some segments are likely to reap the benefits; this expectation causes a risk-averse management to view PMC as a somewhat safer bet (also as per Zardkoohi, 1985).

The results strongly suggest an increased PMC likelihood in the presence of escalating operational complexity. Specifically, R&D expenditure, regulated industry, government purchases and business segments all obtain positive coefficients, significant at the 5% level or better. The geographic segments make up an interesting deviation with a coefficient that is both negative and insignificant. We surmise that with greater geographic reach a firm becomes capable of leveraging its exposure to different legislative frameworks and campaign financing needs so that the PMC decision obtains a highly contextual character.

3.6.2 The effect of PMC on IPO underpricing

Table 3.7 reports our empirical results explaining the effect of PMC on

underpricing for the full sample of firms (N=1,578). To demonstrate the robustness of findings, we tabulate the resulting coefficients from all three estimation methods: the Heckman two-stage procedure (Column 2), the MLE two-equation treatment model (Column 3) and the instrumental variables method (Columns 4 and 5). We reserve Column 1 for the OLS estimates to facilitate benchmarking.

The dependent variable remains in all specifications the first-day return estimated as the difference between the first aftermarket price and the IPO offer price divided by the IPO offer price. From the seminal studies on IPO returns (Stoll and Curley (1970), Logue (1973), Ibbotson (1975)), the systematic dwarfing of the IPO offer price by the first closing market price has become apparent. Further it remains surprisingly robust across time according to evidence from more recent studies (Ritter (1991), Jain and Kini (1994), Loughran and Ritter (1995)). Statistically, the distribution of IPO returns can be described as leptokurtic and right-tail skewed. Accordingly, we apply the following logarithmic transformation of the dependent variable:

$$\textit{First-day return} = Ln((\textit{IPO Closing Price} - \textit{Offer Price}) / \textit{Offer Price} + 1)$$

as a treatment to the skewness problem. The transformation augments the explanatory power of the model, without altering in any way the inferences. This approach features commonly in the IPO literature (e.g. Leone at al. 2007, Chahine and Filatotchev 2011).

Among the regressors, we include key variables that have been shown to account for much of the variability in returns. Specifically, we use:

Firm age set equal to the number of years elapsing from a firm's foundation to IPO. Previous literature commonly employs age as a surrogate for risk (Ritter, 1984, 1991; Schultz, 1993 and Carter et al., 1998). The assumption is that firms with operations dating back longer have proven their resilience against market swings and thus constitute safer investments. Acknowledging the lesser degree of uncertainty surrounding long-lived organizations, we expect them to incur smaller underpricing.

Venture capital. Hsu (2004) illustrates how "VCs' extra-financial value may be more distinctive than their functionally equivalent financial capital." Reputable venture capital financiers with a proven record of successful IPOs can lend credibility to their investment portfolio firms. Moreover, Megginson and Weiss (1991) note that they are typically involved in order to stay as opposed to cashing out at the IPO time. This vision makes venture capitalists extra cautious against any excesses on the amount of money to

be left on the table. Alternatively, Loughran and Ritter (2004), shifting perspective from the certification to the grandstanding hypothesis, refute the long-term horizon of VCs. Instead, they describe a sense of urgency so that the latter release funds towards the next IPO targets. Of course, a premature IPO is an opportune setting for heavy underpricing. We leave the actual direction of the relationship up to empirical investigation.

IPO proceeds. We use this item as a proxy for size. Increased visibility inevitably causes larger companies to leave a proportionately bigger footprint within the investor community. Therefore, the latter can relate with more clarity to the firm so that issuer-specific uncertainty diminishes.

Earnings per share (EPS) is taken as a dichotomous variable in order to capture issuers with a positive bottom line in the year trailing the IPO. Firms attaining a sizeable accounting return should be associated with less uncertainty, and thus lower first-day returns. At the same time, profitability, in the pre-IPO period, comes second to presenting a convincing vision for sustainable profitability in the post-IPO period. In one extreme illustration, Trueman et al. (2000) find that in the realm of Internet stocks, nonfinancial measures of performance, such as the number of unique visitors and page views, dominate net income in value relevance. Consequently, we maintain mixed expectations about the sign of the EPS coefficient.

Leverage. We estimate this ratio as pre-IPO total liabilities over pre-IPO total assets. A reasonably high level of leverage is expected to impose discipline on management consistent with the mechanisms described in Jensen (1986). *Ceteris paribus*, we expect firms relying heavily on debt financing to leave less money on the table.

Credit crunch and *dotcom period* capture the 2007–2008 turbulence in financial markets caused by the subprime mortgage crisis and the overheated period of 1999–2000 (thoroughly described in Ljungqvist and Wilhelm, 2003), respectively. They both enter the model as indicator variables.

Industry controls enter our model by means of indicator variables for *technology* and *Internet firms* to account for the excessive underpricing that these IPOs typically entail (e.g. Aggarwal, 2002). In addition, we control for the exchange by means of a *NASDAQ* dummy for being the preferred marketplace for the majority of IPOs.

Underwriter rank pertains to the perceived quality of the agent underwriting the issue. Carter and Manaster (1990) evidence significant underpricing by firms engaging prestigious underwriters and interpret it as a means to signal quality (conceivably only

strong issuers are capable of assuming this cost). Arguably, an established underwriter would not risk impairing his reputational capital by facilitating an offering of dubious quality.

Share overhang, defined as the ratio of shares retained by pre-IPO shareholders to the total equity given up in IPO (refer also to Bradley and Jordan, 2002), reflects the natural dilution caused by the issuance. This cost is incurred proportionately by all shareholders retaining equity post-offering. As a result, with a large number of new shares (low overhang ratio) the losses escalate, making incentives to underprice less compelling.

Market return is estimated as the average return realized on the value-weighted CRSP index over the 20 trading days preceding the offering. It is a measure of the overall market sentiment prevailing at the time of the IPO, and as per previous research (Logue, 1973; Hanley, 1993; Loughran and Ritter, 2002; Derrien and Womack, 2003; Lowry and Schwert, 2004 and Derrien, 2005), it is expected to positively associate with IPO return.

Revisions refer to the change of the IPO offer price from the midpoint of the initial filing price range and are a product of all public and private information that becomes available to the underwriter by the time of listing. As a complementary pricing metric, we are equally interested in its cross section with PMC and use it as an outcome variable in subsequent investigation. At the same time, one could draw from Hanley (1993) and the partial price adjustment theory to advocate its inclusion on the right-hand side of the first-day return equation. To address possible omitted variables concerns, we employ this additional covariate as a robustness exercise in Column 5.

Overall, the three estimation methods in Columns 2, 3 and 4 yield highly significant (at the 1% level) coefficients on the PMC variable and confirm the predicted negative sign. Further, the resulting coefficient magnitudes are notably consistent with each other. They also sharply contrast the OLS benchmark, in Column 1, which even though attests to the negative relation (at the 5% level), it comes out less than a fourth of the other estimates. Augmenting the baseline specification to account for revisions, in Column 5, confirms the incremental explanatory power of this covariate, yet the effect of PMC remains intact[9]. In sum, though we may not completely rule out alternative

[9] The 1% threshold of statistical significance for the PMC coefficient is marginally missed. We reiterate the Heckman and MLE estimations, including the revisions variable, and attain the 1% level of

interpretations of the negative association between PMC involvement and IPO underpricing, the results accord with our twofold conjecture that PMC level off the informational playing field and confer increased bargaining power.

The findings pertaining to the control variables are interesting in their own right. We obtain a positive and highly significant coefficient on proceeds raised while presumably size should lead to less, rather than more, underpricing; this may hint at the need to attract more uninformed investors via a discount. The coefficient on age (significant and negative) corroborates previous research showing long-lived companies to be associated with more chances of survivorship, and thus less uncertainty. Consistent with Bradley and Jordan (2002), we attain a significantly positive coefficient on share overhang; dilution costs are greater in issues with lower overhang suggesting a lower underpricing and vice versa. In contrast, underpricing significantly increases with Internet and technology stocks as per Ljungqvist and Wilhelm (2003). This explanation may naturally extend to the coefficient (likewise positive and significant) on NASDAQ for being the preferred listing platform for technology issuers. Expectedly, the coefficient on the dotcom period is positive and highly significant, evidencing the excessive funds that were left on the table in the bullish period of 1999–2000. The fact that the overall market sentiment reflects on initial returns is also captured by the coefficient on market return (positive and significant at all levels). The positive and significant values on venture capital and underwriter rank contradict the findings from Carter and Manaster (1990) and Megginson and Weiss (1991), though they are strongly aligned with evidence from Beatty and Welch (1996), Loughran and Ritter (2004) and Lowry and Murphy (2007). Notably, we register no significant relation for a firm's leverage and earnings per share, confirming our conjecture about the mixed signals that both disseminate to market investors. Finally, the credit crunch crisis of 2007–2008, in spite of a heavy shadow on the volume of IPO activity, appears to leave IPO underpricing unaffected.

To establish the endogenous nature of PMC, we look for separate evidence in each estimation method employed. First, the coefficient on the inverse Mills ratio exhibits high statistical significance (p=1%), lending support to our initial suspicion about firms' self-selection into the PMC practice. Second, the Wald test, involving the

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significance for both methods. For simplicity, we report in Column 5 the most conservative estimate, only.

maximum likelihood estimators, attests to the correlation of the residual terms in the selection and outcome equations at the 1% level. Third, the Hausman test, from an instrumental variables framework, strongly indicates the presence of feedback effects (p=5%). Evidently, latent determinants of the PMC decision are also impounded into first-day returns. Taken together, these findings are in line with the rejection of the null hypothesis of no endogeneity.

In Table 3.8, we focus on the PMC sample (N=273) in order to assess the effect of *PMC (dollar) level*, rather than simple *PMC involvement*, on underpricing. Including the same covariates as previously, we now use as variables of interest: (1) *political money* (Specification 1) to capture any combination of lobbying and PAC contributions; (2) *lobby money* (Specification 2) to concentrate on all lobbying IPOs; and (3) *PAC money* (Specification 3) to account for all PAC IPOs. Invariably, the resulting coefficients on these variables attain significance, at all conventional levels, while maintaining their negative sign. Consequently PMC, far from representing a nominal value proxy of 'connectedness' or a good faith gesture (in the case of PAC), proves its definite investment character with an incremental effect on underpricing for each dollar disbursed. Further, the coefficient magnitudes are non-negligible. All else being equal, a modest 10% increase in PMC spending accounts for a 2.5% reduction in underpricing. The practical implications from this relationship are important. Given the median contribution size of $ 71.5 thousand, issuers can rely on PMC as a cost-effective option for combating *ex ante* uncertainty and positioning themselves in pole position in the negotiations with the underwriter. Thus, our results come up not only statistically but also highly economically significant.

3.6.3 The efficient PAC plan & strategic targeting for less money left on the table

With PAC contributions being an indispensable element of a well-organized PMC effort, we now explore the type of candidate that market investors want issuers to connect to. Hypothesis 2 frames candidates' overall appeal in terms of contextual as well as idiosyncratic characteristics. We test for the effect of both categories on first-day return in Table 3.9. In Specifications 1 through 4, we view candidates solely as structural units of their basic affiliations and aggregate contributions towards the House of Representatives (Specification 1), U.S. Senate (Specification 2), Democratic party

(Specification 3) and Republican party (Specification 4). This generic treatment of recipients provides interesting insight into the relative dynamics that candidates obtain, exclusively, by virtue of their chosen Congressional or partisan sideline. Specifically, while all regressions result in negative and significant coefficients, the House of Representatives dominates the Senate in terms of both coefficient magnitude and level of statistical significance. Similarly, Democratic candidates have a marginal advantage over Republicans. These findings cast doubt upon the value relevance of two widely held beliefs. First, the extra prestige accruing to the Senate appears less conducive to a firm's effort to preempt the political agenda. A plausible reason lies within the constitutional command for all revenue and appropriation bills to be originated in the House of Representatives. Consequently, support for the House (as opposed to the Senate) accounts for a more prompt interference in the chain of the legislative process. Second, we provide new evidence from the IPO setting that refutes the existence of a Republican bias among market participants. In this regard, we extend the work of Cooper et al. (2010) who document higher abnormal returns with the cross section of contributions to Democratic rather than Republican candidates, as we show that the latter also fall short in the mitigation of *ex ante* uncertainty.

At the micro level, we test candidate features that are expected to influence IPO underpricing as per Hypothesis 2.c. In order to exploit further the traceable nature of PAC contributions, we abandon the 'follow-the-money' approach that has been used so far in the study and replace the variables of interest with comprehensive measures of candidate characteristics. Following the recent literature (e.g. Correia, 2014 and Aslan and Grinstein, 2012), which increasingly resorts to the constructs of Cooper et al. (2010), we introduce the following indexes:

1) The first index, $PI^{STRENGTH}$, is expressed as follows:

$$PI_{it}^{strength} = \sum_{j=1}^{J} Candidate_{jt,t-5} \times I_{jt} \times \frac{NCV_{jt}}{NOV_{jt}} \times rellength_{jt,t-5}$$

where $Candidate_{jt,t-5}$ is a binary variable assuming the value of 1 if the firm has raised PAC money in support of candidate j over the period t−5 to t; I_{jt} is a binary variable set to 1 if candidate j has been an incumbent at time t, and 0 otherwise; NCV_{jt} is the number of votes that candidate j's party holds in office at time t; NOV_{jt} is the number of votes that candidate j's opposing party holds in office at time t; and $rellength_{jt,t-5}$ is the

number of months that the relationship between firm i and candidate j spans assuming uninterrupted PAC contributions until time t.

2) The second index, PI^{POWER} , is defined as follows:

$$PI_{it}^{power} = \sum_{j=1}^{J} Candidate_{jt,t-5} \times I_{jt} \times \left[\sum_{m=1}^{M} \frac{Committee\ rank_{mt}}{Median\ committee\ rank_{mt}} \right]$$

where Committee $rank_{mt}$ is the reciprocal of candidate j's rank on committee m; Median committee $rank_{mt}$ is the median number of members on a given committee m of which candidate j is a member; and the rest of the variables are defined as above.

3) The third index, $PI^{ABILITY}$, is expressed as follows:

$$PI_{it}^{ability} = \sum_{j=1}^{J} HomeCandidate_{jt,t-5} \times I_{jt} \times \frac{NCV_{jt}}{NOV_{jt}}$$

where $HomeCandidate_{jt,t-5}$ is a binary variable set to 1 for contributions supporting candidacies from the state of a firm's headquarters, and 0 otherwise. All other variables are defined as above.

We present the results of this last set of regressions in Specifications (5), (6) and (7). The coefficient signs are invariably negative with $PI^{STRENGTH}$ and PI^{POWER} attaining statistical significance at the 1% level, whereas $PI^{ABILITY}$ is significant at the 10% level. Accordingly, the candidate characteristics that we have assumed to instill confidence in the prospects of a new public firm are valid: (1) veteran Congress members with a proven record of career progression and (2) local politicians, to a lesser extent, are conducive to maintaining first-day returns within range. Intuitive as this relation appears, we note that a firm's political capital is subject to all challenges residing in intangible assets valuation (e.g. lack of measurement scale or absence of control over future benefits). In this respect, connections have to overcome intrinsic uncertainty also pertinent to their relative strength, power and ability, as defined above, before they claim any positive spillovers to issuer-related uncertainty. To this end, candidates scoring highly in the three indexes merit priority in PAC funds appropriation for posing as more value-increasing targets compared to other colleagues in Congress or new challengers.

3.6.4 A closer look at the causes of the limited underpricing of PMC IPOs

Acknowledging the multifaceted influence that a PMC strategy can exert on an IPO, we seek seperate evidence in support of its appeal to market investors and lead underwriter.

3.6.4.1 Volatility behavior of PMC and matched non-PMC IPOs beyond the listing day

Could an extant PMC record impose discipline on subsequent returns realized on PMC shares in the same manner that it does on first-day returns? If so, PMC IPOs can be plausibly less underpriced because of fewer concerns among investors relating to liquidity or the level at which a politically connected stock will trade. To explore this enquiry, we follow a matched-sample approach, assigning to each PMC IPO a non-PMC counterpart of the same listing year and 2-digit SIC code. These criteria bring about the elimination of 72 IPOs or, approximately, 25% of the PMC sample. From the resulting matches, we further filter for proceeds raised and choose the IPOs exhibiting the greatest proximity in this feature. Ultimately, this method leaves us with a sample of 201 PMC IPOs to be assessed vis-à-vis a sample of 201 nearest neighbors.

The variable of interest, volatility, is taken as the standard deviation of daily returns realized within a short time frame subsequent to floatation (similar to Ritter, 1984). We set this interval to 60 days and report the statistics in Table 3.10. To account for a probable roller coaster course of share prices within the first few trades, we allow for 7 trading days to elapse and start recording returns at day 8. For robustness purposes, we reiterate this analysis using the intervals of 120 and 365 days. In all cases, the PMC securities entail significantly lower (at the 1% level) volatility than their matched counterparts. Indicatively, over the 60-day horizon, the mean volatility of the PMC IPOs (3.1%) is 18% lower than that of non-PMC IPOs. The difference is accentuated by the number of days elapsing: PMC IPOs are 21% and 31% less volatile when measured over the 120 and 365 days, respectively. Notably, while the standard deviation of volatility remains constant across time for the PMC IPOs (at 1.3% to 1.4%), it increases in excess of 50% across the periods for the non-PMC IPOs, so that the matched sample yields a standard deviation as high as 6.9% over 365 days. Overall, the aftermarket evidence suggests considerably less discord on the value of PMC shares.

3.6.4.2 Bookbuilding for PMC equities & underwriters' own political ties

To complement our buy-side findings, we now bring to the forefront the role of the underwriter and see whether we can meet again at an underpricing containment conclusion. To this end, we rely on two sets of tests.

First, we draw evidence from the price discovery process. A smooth ride of PMC equities on the first day of trade, and beyond, invites debate as to whether it reflects the outcome of an equally smooth bookbuilding period or a hard-fought balance among powerful participants. To the extent that political connections can facilitate information flow, they are expected to obviate, to a significant degree, the need for residual information production and subsequent interventions in pricing (as per Benveniste and Spindt, 1989 and Hanley, 1993). Alternatively, in line with the bargaining power argument, political connections are a notion potent enough to constitute the underwriter more conceding to management's value claims. There is, thus, increased likelihood of the investment banker producing an initial price range inflated by an implicit PMC premium and soliciting investor bids from a high stating point.

Relevant studies consistently operationalize bookbuilding turbulence in terms of the offer price deviation from the midpoint of the initial filing price range (Benveniste and Spindt, 1989; Benveniste and Wilhelm, 1990; Spatt and Srivastava, 1991; Hanley, 1993; Cornelli and Goldreich, 2001 and 2003). Because of its comprehensive nature, we expect this metric to lend itself equally well in describing bookbuilding under a PMC regime. We explore this cross-section in Table 3.11. All covariates of the earlier specifications retain their place in the new regressions as pricing for bookbuilding participants and aftermarket investors is driven by the same firm- and IPO-specific characteristics (refer for a proof to Lowry and Schwert, 2004). We thus leave the right-hand side of the equation unchanged, adjusting only for *market return*, which now captures the holding period return from filing to IPO day.

Due to the endogeneity concerns previously discussed[10], Columns 1 and 2 present the instrumental variables estimates of the model with the dependent variables to be absolute filing price revisions (*Absolute revisions*) and filing price revisions (*Revisions*), respectively. Investigating the magnitude of revisions vis-à-vis their sign reveals a distinct pricing pattern for connected firms. In particular, the insignificant

[10] In a methodologically similar manner to the first-day return equation of Table 7, we conduct the Hausman test and reject the null of no endogeneity. Although these statistics are not reported in Table 11, in the interest of clarity, they are available from the authors upon request.

coefficient on PMC in Column 1 indicates that connected firms are generally not any easier to value than other IPOs. As shown in Column 2, however, the average revision in the PMC regime comprises a sizeable (13%) downward adjustment; a finding which fulfills all conventional levels of statistical significance. Therefore, the monotonically negative effect lends support to issuers' bargaining power for attaining an initial valuation that is ultimately proven overoptimistic. At the same time, this also suggests an informational disadvantage from the perspective of the underwriter which casts doubt on the networking effect of PMC.

Second, we consider the possibility that the underwriter is also connected. If underwriters with no traceable links to politics perceive clients' connections as substitutes, they are incentivized to exert more effort towards retaining connected issuers. Consequently, this subsample could introduce bias and overstate the overall PMC effect. To investigate for a differential pricing behavior, we collect further data on the lead underwriter's political expenditure in an approach identical to that for PMC issuers. Therefore, our baseline model is augmented by the interaction of PMC with an *unconnected* dummy variable (Column 3). In an alternative definition, whereby connectedness arises indirectly through a PMC clientele, the *unconnected* dummy is set to 1 for underwriters facilitating no more than 1 PMC IPO in any given year (Column 4).

Two conclusions can be drawn from the resulting estimates. First, with the PMC coefficient maintaining the negative sign (at the 5% level of significance) across both specifications, an IPO firm can expect to benefit from a political strategy regardless of the chosen underwriter; issuer's and investment banker's PMC do not cancel each other out. Second, with the interaction term exhibiting statistical significance (at the 5% level) for indirectly connected underwriters only, we show that attracting PMC IPOs comprises an end in itself as opposed to a means for establishing ties to politicians. This finding is in accord with evidence from Houston et al. (2014) showing lower spreads on connected firms' loans as a result of their perceived creditworthiness rather than a banker's attempt to cajole the borrower's network.

Overall, a PMC record can alter the relative dynamics in an IPO. In particular, it constitutes the investment banker more conceding at a time when the issuer comes at it strongest. This setting comprises an alternative, yet complementary, explanation for the moderate underpricing of PMC IPOs.

3.7 Additional robustness tests

3.7.1 Sensitivity analysis

Our main concern about the validity of results is twofold, pertaining to the time and type of PMC. In this section, we adopt a sensitivity analysis framework allowing for both of these dimensions to vary. To facilitate comparison, Panel A of Table 3.12 recaps the instrumental variable estimates γ_1 and γ_2 for the effect of PMC on initial return and filing price revisions, respectively.

With regard to time, we have been content so far to record cash flows extending up to 5 years prior to floatation day. This line was drawn due to database limitations and, more importantly, out of the authors' belief that older PMC, even though historically interesting, are devoid of potent signaling value. An illustration would entail the longest-tenured (6 years) representatives, i.e. Senators. Given the staggered-terms structure, one third of the Senate seats are up for election every couple of years. Therefore, a donation dating longer than five years may apply to the Senate's oldest third only. But even this minority of Senators would be, by that point, amidst a new electoral campaign requiring fresh funding. This sequence of events underscores a firm's need to fine-tune PMC with the listing project so that a dated PMC record does not turn into a sunk cost. As for firms with no prior donation experience, such a time interval is adequately large for a PMC momentum to evolve and promulgate connectedness even as a work in progress.

This argument could also backfire, rendering our 5-year horizon questionable in favor of a shorter period. To explore this possibility, we stratify PMC IPOs into three subsamples based on floatation day proximity: (i) 119 firms exerting PMC within a period of 6 months or less; (ii) 120 IPOs with PMC older than 6 months and up to a year; and (iii) the remaining 34 IPOs with PMC dating older than one and up to five years. For each of these groups, we reiterate our main regressions for the effect of PMC on both initial return and filing price revisions. In the interest of brevity, Panel B focuses on the resulting coefficients, γ_1 and γ_2, which convey the gist of our analysis. Evidently, time considerably undermines γ_1 and γ_2 in magnitude and statistical significance across the two specifications. As a consequence, PMC of the 6 most recent months invariably attain the most compelling effects. The strongest evidence in support

of the recency argument comes from the return equation; once the 6 months' cutoff has been violated, PMC dating no longer than a calendar year prior to the IPO results in an almost identical effect to PMC that is up to five years old. In parallel, the statistical significance of the coefficients descends the conventional levels, fulfilling, however, the 10% threshold even for the earliest cash flows. The sensitivity to time extends to the revisions equation and coefficient γ_2. The differentiation comes from a high coefficient magnitude for the full 12-month period preceding the IPO, which shrinks nearly by half beyond our second cutoff, while also abolishing the high statistical significance.

Next, we test for the particular cash flow type. So far, we have drawn from the asymmetric information and bookbuilding theories to argue that it is PMC involvement (and level of) that arouses market participants' confidence, assigning a somewhat incidental role to the preferred avenue (i.e. lobbying, PAC and their between combinations). Yet, we have to rule out the possibility that positive externalities of either PMC type flow into, and artificially inflate, the effect of the alternate type. To this end, we split the sample further in order to explicitly account for: i) 61 firms that have employed both PMC methods; ii) 184 firms that have lobbied for but not contributed to PAC; and iii) 28 firms that have contributed to PAC but not lobbying. Panel C disentangles the differential effect of each possible spending manner. As expected, the effect on both initial return and price revisions is highly robust to PMC type with γ_1 and γ_2 significant at the 5% level or higher. Notably, significance is maximized when '*Both lobby-PAC*' is used, for no other sample attains the 1% level in both equations. Therefore, this analysis sheds light on the complementary nature of lobbying and PAC contributions. We conjecture that the personal nature of PAC contributions enables and reinforces more effective lobbying, in the sense that it creates more 'eager ears' for the issues that the company lobbies for. On the other hand, malleable policymakers are of little use in lieu of the strategic communication element entailing a well-implemented lobbying effort. In an optimal setting, investors aspire to anchors in politics with both *relevant* and *current* information flowing among them. Accordingly, we identify the anchors in PAC contributions and the information flow in lobbying.

3.7.2 Political by birth & other tests

In a subsequent robustness exercise, we revisit the time dimension of PMC from a new perspective. Specifically, one may argue that time is not only important with regard to listing but also a firm's foundation. Indeed, our sample includes firms, such as Rex Energy and Molycorp, that commence contributions almost concurrently with their legal formation as corporate entities. This sense of urgency testifies to the existence of a group of *political by birth* firms that grow their political connections in parallel with the broader asset base and, therefore, appear to have politics deeply ingrained in their corporate culture. Thus, to the extent that the effect of PMC on IPO underpricing is conditioned upon the stage of the donor's life cycle, we would expect the relationship to be stronger for political by birth firms and questionable for more mature organizations.

To investigate this proposition, we rerun our main regressions, interacting PMC with an indicator variable for political by birth companies. Allowing for flexibility in the definition of the new factor, we reiterate the analysis by designating political by birth those firms of ages not exceeding: (1) the first quartile value of the full sample (PMC sample) of 4 years (5 years); (2) the median value of the full sample (PMC sample) of 8 years (11 years); and (3) an arbitrarily chosen threshold of 2 years. In all regressions the resulting coefficient on the interaction variable remains insignificant. In simple terms, this shows that an apolitical past, in reference to contributions, will not penalize or weigh adversely upon prospective issuers contemplating to practice PMC at an advanced stage in their corporate life cycle.

We challenge further our findings to address other probable sources of bias. This involves the following variations : (1) replacing the dependent variable of raw initial returns with market-adjusted returns based on the NYSE/AMEX/NASDAQ value-weighted index; (2) measuring underpricing to the end of the 11th trading day and 1st trading month (Chambers and Dimson, 2009); (3) excluding all IPOs in industries with SIC codes 6 (for example, as in Lowry and Shu, 2002); (4) winsorizing returns and contributions at the 1st and 99th as well as 5th and 95th percentiles; (5) scaling PMC amounts by IPO proceeds; (6) including dummy variables for IPOs occurring within years of Congressional and presidential elections; (7) adjusting contribution amounts and IPO proceeds for inflation; and (8) specifying the Heckman model in lieu of exclusion restrictions so that it becomes identified solely by the nonlinearity of the inverse Mills ratio. In all tests, the results remain qualitatively similar and, in the interest of brevity, are suppressed. Thus, there is robust evidence in support of the main

conclusion of the study: PMC systematically drive downwards first-day returns (and IPO offer price revisions).

3.8 Conclusion

In the first study to relate a firm's political donations to IPO underpricing, we argue that these cash flows can create value in the going-public process spearheading expectations of access to the upmost decision-making bodies. Indisputably, the ultimate mission of PMC is to foster a firm's perspective on issues pertinent to corporate strategy rather than the IPO event per se. Even so, a traceable and publicly available PMC record is capable of alleviating an important portion of issuer-specific uncertainty while conferring substantial power in pricing negotiations with the lead underwriter. Our empirical evidence lies at the intersection of demand and supply side reasons as: (1) market investors are shown to confide in a connected firm's ability to maneuver with less friction in the institutional environment and (2) the underwriter systematically commences the price-discovery process from a high starting point as evidenced by a pattern of downward offer price revisions. Overall, the opportune setting for maintaining first-day returns within range entails substantial implications for prospective issuers; all else being equal, an additional 10% PMC expenditure reduces IPO underpricing by 2.5%. With a median contribution of $ 71.5 thousand for the donor firms in our sample, PMC pose not only as a potent but also as a surprisingly cost-effective strategy.

In response to the questions raised in the introduction, the study shows that a PMC file constitutes a suitable proxy for a firm's 'political connectedness' on the premise that it is both substantial and traceable to specific politicians. To this end, we argue about the twofold nature of an effective PMC strategy as it necessitates lobbying expenditure for size and PAC contributions for identification. In devising the optimal spending pattern, we find that the effect on IPO return is maximized by targeting candidates identifying with the Democratic party and the House of Representatives. At the level of individual characteristics, lengthy tenures of accomplishment and home state candidacies come up as value-adding features. Importantly, the fundamentals of PMC firms show issuers of superior quality as demonstrated by market share, profitability, leverage and years of operational experience. Evidently, PMC firms, rather

than seeking a life jacket in politics, are involved in order to manage promptly the legal and institutional environment risks lying ahead. Newly founded issuers or those associated with a long apolitical past are equally entitled to PMC-stemming benefits with veterans in donations, attesting to the appeal of political connections even as a work in progress. With negligible barriers to entry, the ultimate challenge for issuers rests in synchronizing political expenditure with the listing endeavor. In this regard, our sensitivity analysis reveals the urgency for fulfilling a 6-month threshold trailing the IPO so as to constrain first-day return to the maximum extent.

We pave the way for follow-up investigation by offering a glimpse of the PMC-driven sentiment past the IPO event. Tracing the trades of PMC shares deeply into the aftermarket period, we document significantly lower volatility than a matched portfolio of non-PMC IPOs. A limitation of this research pertains to lobbying contributions that, subsequent to the Lobbying Disclosure Act of 1995, are available in databases from 1998 onwards. In conjunction with the overall number of PMC IPOs, a study on the long-term performance and survivorship is likely to encounter sample size as a challenge. However, as more of our identified PMC IPOs age, we anticipate, in the near future, research adding evidence from this alternate horizon.

Table 3.1: Summary statistics

This table presents statistics for a sample of 1,578 U.S. IPOs announced from 1 January, 1998 to 30 June, 2013 along with the sub-samples of IPOs with and without PMC activity. The IPOs are described by (1) the election cycle in which they occur, (2) the Standard Industrial Classification (SIC) division they belong, (3) company specific information, and (4) market value measures. All variables are defined in Appendix A. IPO deals are retrieved from the Securities Data Company (SDC) Database with all aftermarket data obtained from CRSP. PMC data comes from the OpenSecrets website for lobbying contributions and the Federal Election Commission (FEC) archive for PAC contributions. The book value of assets for Tobin's q is from Compustat.

	Full sample (N= 1,578)		IPOs with PMC (N = 273)		IPOs without PMC (N=1,305)	
Election cycle	No.	%	No.	%	No.	%
98-99	465	29.47	30	10.99	435	33.33
00-01	160	10.14	24	8.79	136	10.42
02-03	94	5.96	15	5.49	79	6.05
04-05	271	17.17	60	21.98	211	16.17
06-07	247	15.65	52	19.05	195	14.94
08-09	56	3.55	20	7.33	36	2.76
10-11	151	9.57	42	15.38	109	8.35
12-13	134	8.49	30	10.99	104	7.97
SIC division	No.	%	No.	%	No.	%
Agriculture, Forestry and fishing	4	0.25	1	0.37	3	0.23
Mining and construction industries	49	3.11	13	4.76	36	2.76
Manufacturing	535	33.90	95	34.80	440	33.72
Transp., commun., and utilities	122	7.73	35	12.82	87	6.67
Wholesale and retail trade	122	7.73	15	5.49	107	8.20
Finance, insurance and real estate	185	11.72	41	15.02	144	11.03
Service industries	559	35.42	73	26.74	486	37.24
Public administration	2	0.13	0	0.00	2	0.15
Company specifics		%		%		%
Regulated industry IPOs		21.4		29.3		19.7
Internet IPOs		12.6		9.5		13.9
Technology IPOs		37.9		27.8		40.1
VC Backed IPOs		47.2		35.5		49.7
NASDAQ IPOs		69.4		49.8		73.5
Market value	Mean	Median	Mean	Median	Mean	Median
	s.d.		s.d		s.d.	
Market cap. (in mil $)	834.51	322.91	2,441.55	708.08	498.33	285.55
	3,980.58		9,250.37		812.20	
Tobin's q	2.87	2.33	2.33	1.63	2.98	2.48
	3.06		2.65		3.13	

Table 3.2: Descriptive statistics of IPO firms

This table reports descriptive statistics for a sample of 1,578 U.S. IPOs announced from 1 January, 1998 to 30 June, 2013 along with the sub-samples of IPOs with and without PMC activity. All IPOs come from the Securities Data Company (SDC) database. The statistics provided include the mean, median, minimum, maximum and standard deviation for the dependent variables and all control variables used in the subsequent regressions. The presentation of each variable concludes with a test for difference in the sub-sample means. Panel A describes our main measures of IPO pricing, i.e. *underpricing* and *revisions.* Note that revisions, due to data availability limitations, engage a sample of 1,171 IPOs. Panel B describes the IPO firm characteristics which we control for in our analysis. Share price data is from CRSP; accounting data is from Compustat. All variables are defined in Appendix A

	Full Sample (N= 1,578)				IPOs with PMC (N = 273)				IPOs without PMC (N=1,305)			
	Mean	Median	Min	Max	Mean	Median	Min	Max	Mean	Median	Min	Max
	s.d.				s.d.				s.d.			
Panel A – IPO pricing												
First-day return	0.27	0.12	-0.71	6.84	0.19	0.09	-0.70	4.83	0.29	0.12	-0.37	6.84
	0.58				0.43				0.60			
Revisions	-0.01	0.00	-0.54	1.10	-0.02	0.00	-0.50	0.50	0.00	0.00	-0.54	1.10
	0.15				0.15				0.15			
Panel B– IPO characteristics												
Gross proceeds	137.66	66.04	0.86	11,805	354.11	121.36	9.35	11,805	92.39	60.81	0.86	14,266
	465.40				1,065				114.44			
Earnings per share	0.47	0.00	0.00	1.00	0.56	1.00	0.00	1.00	0.45	0.00	0.00	1.00
	0.50				0.50				0.50			
Leverage	1.50	0.94	0.00	81.50	1.17	0.91	0.00	6.78	1.56	0.95	0.00	81.50
	3.11				0.96				3.39			
Firm age	16.37	8.00	0.00	165.00	24.89	11.00	0.00	165.00	14.58	8.00	0.00	45.00
	23.15				32.05				20.39			
Venture capital	0.47	0.00	0.00	1.00	0.36	0.00	0.00	1.00	0.50	0.00	0.00	1.00
	0.50				0.48				0.50			
Underwriter ranking	0.62	1.00	0.00	1.00	0.82	1.00	0.00	1.00	0.58	1.00	0.00	1.00
	0.49				0.38				0.49			
Internet IPOs	0.13	0.00	0.00	1.00	0.10	0.00	0.00	1.00	0.13	0.00	0.00	1.00
	0.33				0.29				0.34			
Technology IPOs	0.38	0.00	0.00	1.00	0.28	0.00	0.00	1.00	0.40	0.00	0.00	1.00
	0.49				0.45				0.49			
NASDAQ	0.69	1.00	0.00	1.00	0.50	0.00	0.00	1.00	0.74	1.00	0.00	1.00
	0.46				0.50				0.44			
Dotcom period	0.37	0.00	0.00	1.00	0.15	0.00	0.00	1.00	0.42	0.00	0.00	1.00
	0.48				0.36				0.49			
Credit crunch	0.11	0.00	0.00	1.00	0.20	0.00	0.00	1.00	0.09	0.00	0.00	1.00
	0.31				0.40				0.29			
Share overhang	3.53	2.88	0.00	80.75	3.70	2.97	0.00	50.34	3.49	2.87	0.00	80.75
	3.41				3.67				3.35			

Table 3.3: Top-fifteen donors and recipients of IPO contributions

This table identifies, on a top-fifteen basis, cases of intense PMC activity. The sample consists of 1,578 U.S. IPOs announced from 1 January, 1998 to 30 June, 2013 which we retrieve from the Securities Data Company (SDC) database and manually search for evidence of lobbying or PAC contributions in the OpenSecrets website and the Federal Election Commission (FEC) archive, respectively. Panel A presents the IPO firms topping our list for largest contributions along with the first-day returns recorded. Panel B presents the most popular recipient candidates based on aggregate PAC funds raised and identifies them by race, political party, and U.S. state affiliations. All variables are defined in Appendix A

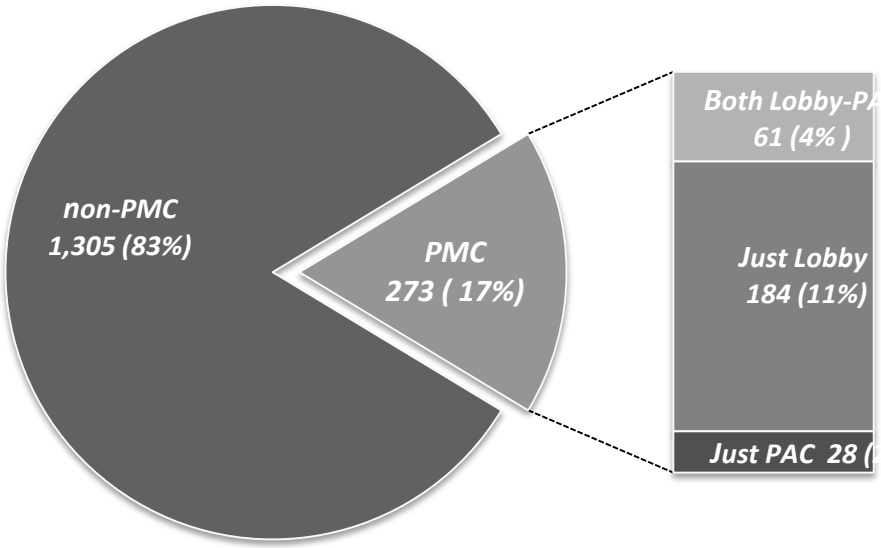
Panel A: Top-fifteen IPO donors of lobbying and PAC contributions

IPO date	Company	Age at IPO	1st-day return (annual avg.)	1st-day return (company)	Lobbying *(U.S. $)*	PAC *(U.S. $)*
11/17/2010	General Motors	102	9.30%	3.61%	9,570,000	284,500
10/26/1999	PentaStar Commun.	1	70.30%	7.50%	5,580,000	49,000
12/12/2001	Prudential Financial	100	14.30%	6.55%	4,110,000	187,200
02/04/1998	Vysis Inc (BP Amoco)	7	21.40%	0.52%	3,520,000	172,000
09/30/2009	Talecris Biotherapeutics	4	10.60%	11.32%	2,950,000	0
10/22/2001	Principal Financial Group	100	14.30%	13.51%	2,560,000	0
11/09/1999	UPS	92	70.30%	36.25%	2,480,000	15,000
04/04/2000	MetLife	132	7.20%	3.51%	1,840,000	595,525
11/14/2006	Emergent BioSolutions	8	11.60%	-6.40%	2,000,000	300,000
03/16/2005	PanAmSat Holding	1	10.10%	-3.61%	2,020,000	0
10/12/2006	SAIC	37	11.60%	21.20%	1,950,000	40,000
11/14/2007	EnergySolutions	19	14.30%	0.04%	1,020,000	780,000
12/13/2001	United Defense Industries	60	14.30%	1.42%	1,560,000	181,100
05/17/2012	Facebook	8	17.80%	0.61%	1,350,000	270,000
05/24/2006	MasterCard	40	11.60%	17.95%	1,420,000	186,973

Panel B: Top-fifteen recipient candidates of PAC contributions by funds raised

Election cycles	Candidate	Race	Party	State	PAC funds raised *(U.S. $)*
1998-2007	Santorum, Rick	Senate	Republican	Pennsylvania	109,450
1998-2007	Moran, Jim	House	Democratic	Virginia	102,850
1998-2013	Hoyer, Steny	House	Democratic	Maryland	101,500
1998-2009	Murtha, John	House	Democratic	Pennsylvania	92,500
1998-2013	McConnell, Mitch	Senate	Republican	Kentucky	91,300
1998-2007	Davis, Tom	House	Republican	Virginia	89,999
1998-2009	Wilson, Heather	House	Republican	New Mexico	85,000
1998-2009	Hastert, Dennis	House	Republican	Illinois	83,597
1998-2011	Lewis, Jerry	House	Republican	California	83,100
1998-2013	Dingell, John	House	Democratic	Michigan	82,570
2000-2013	Hatch, Orrin	Senate	Republican	Utah	81,500
1998-2009	Rangel, Charles	House	Democratic	New York	80,848
1998-2011	Barton, Joe	House	Republican	Texas	75,000
1998-2007	Johnson, Nancy	House	Republican	Connecticut	74,500
1998-2013	Blunt, Roy	Senate	Republican	Missouri	73,150

Figure 3.1: Breakdown of IPO PMC expenditure by type. This chart portrays IPOs with political money contributions (PMC) as a fraction of a total sample of 1,578 U.S. IPOs announced from 1 January, 1998 to 30 June, 2013; and contribution combinations as fractions of the PMC sample. *Both Lobby-PAC* refers to IPOs practicing both lobbying and PAC contributions; *Just Lobby* and *Just PAC* refer to IPOs practicing exclusive lobbying and PAC contributions, respectively. IPOs come from the Securities Data Company (SDC) Database. The lobbying data is from the OpenSecrets website; the PAC data is from the Federal Election Commission (FEC) archive.



PMC total: $ 81,038,007; Lobbying: $ 74,286,745; PAC: $ 6,751,262

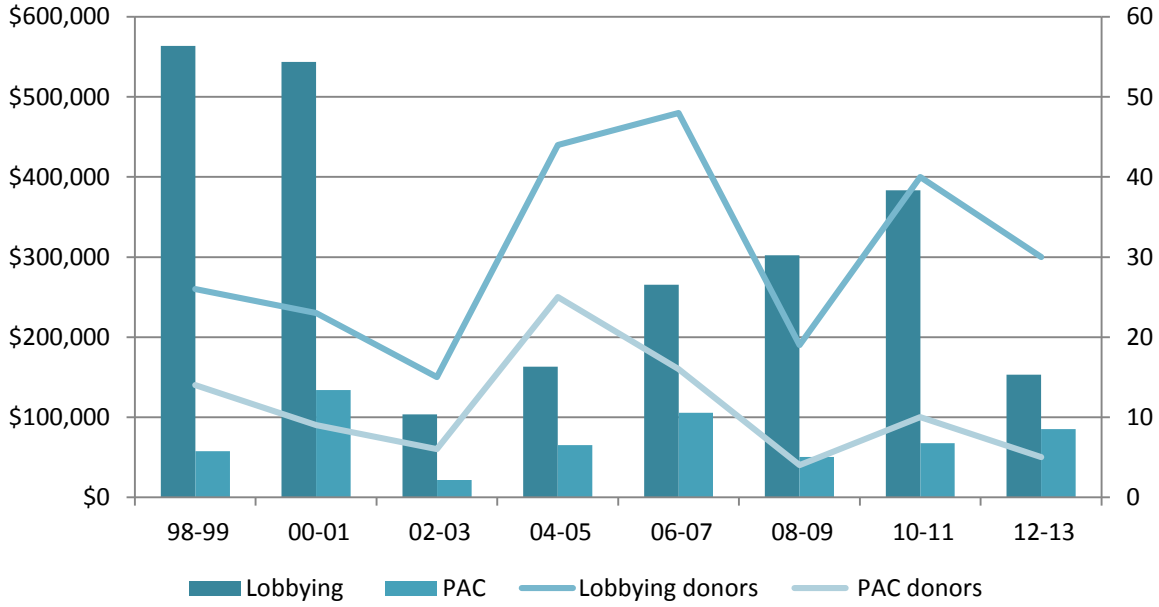
Table 3.4: Descriptive statistics of contributions

This table reports statistics of the annual political money contributions made by a sample of of 1,578 U.S. IPOs announced from 1 January, 1998 to 30 June, 2013. The contributions correspond to the recent-most year to IPO, with an oldness cutoff set at 5 years. The data for lobbying contributions is from the OpenSecrets website; the data for PAC contributions is from the Federal Election Commission (FEC) archive. *Political money* measures the aggregate annual contributions regardless of contribution type; *Lobby money* and *PAC money* measure the annual contributions for lobbying and PAC, respectively; *No. of candidates* corresponds to the number of candidates that received PAC money; *Incumbents* and *Challengers* measure the annual contributions targeted at incumbent and challenger candidates respectively; *House*, *Senate*, *Democrats* and *Republicans* refer to contributions targeted at House, Senate, Democrats and Republicans, respectively; *Committee chairs* and *Ranking members* refer to contributions targeted at candidates who have been committee chairs and ranking members in Congressional committees, respectively; *Home state candidates* refers to contributions targeted at candidates representing the state of firm's headquarters.

	Variable	N	Mean	Median	Std Dev	Minimum	Maximum
	Political money	273	296,843	71,500	863,193	1,500	9,854,500
	Lobby money	245	303,211	80,000	869,379	5,000	9,570,000
	PAC money	89	75,857	18,075	135,969	1,000	780,000
	No. of candidates		41	10	77	0	530
PAC specifics	Incumbents		69,762	16,000	128,980	500	775,000
PAC specifics	Challengers		6,095	1,000	12,808	0	78,207
PAC specifics	House		38,988	7,000	87,462	0	625,000
PAC specifics	Senate		36,869	10,000	67,992	0	780,000
PAC specifics	Democrats		33,121	10,000	49,841	0	299,730
PAC specifics	Republicans		42,489	4,000	101,464	0	600,000
PAC specifics	Committee chairs		17,278	3,500	36,581	0	282,500
PAC specifics	Ranking members		13,967	4,000	23,014	0	138,500
	Home state candidates		9,425	2,000	17,074	0	92,701

Figure 3.2: PMC sources and targets, election cycles 1998-2013. The data comes from the OpenSecrets website for lobbying contributions and the Federal Election Commission (FEC) archive for PAC contributions. The sample includes 273 IPOs that have practiced any contribution type over the election cycles 1998-2013. Panel A tracks the average lobbying and PAC expenditure as well as average number of lobbying and PAC donor IPOs, per election cycle. Panel B tracks the recipient candidates of PAC contributions and reports the average contributions that reach (1) the races for the U.S. Senate and House of Representatives, and (2) the Republican and Democratic parties, per election cycle.

Panel A: Contribution amounts and number of IPO donors by type



Panel B: Contribution amounts by Congress chamber & political party

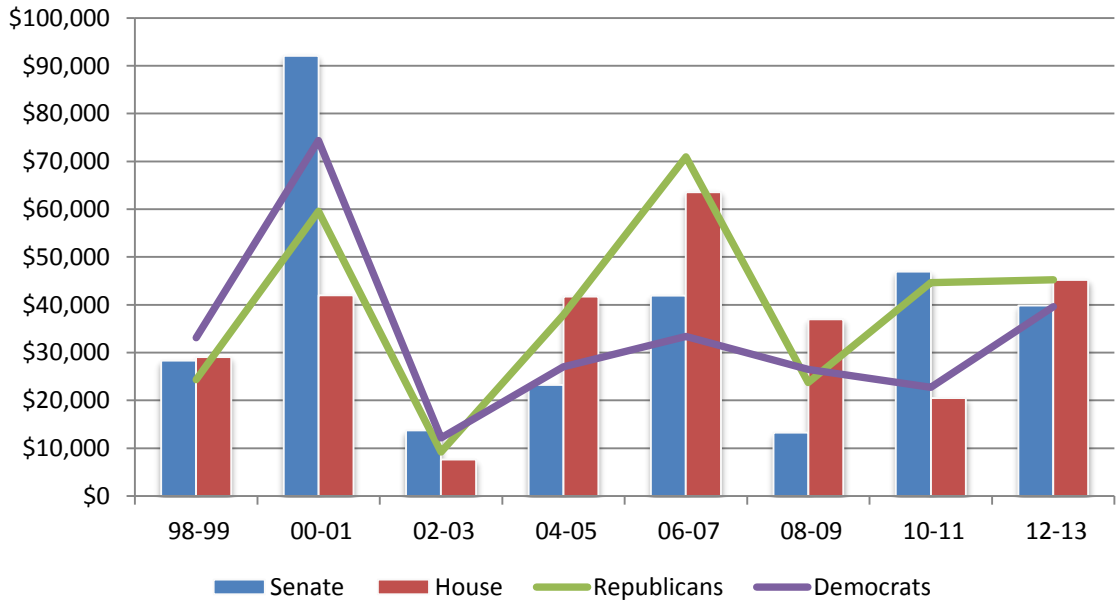


Table 3.5: Correlation matrix

This table reports pairwise correlations of variables used in the study. The sample includes 1,578 U.S. IPOs announced from 1 January, 1998 to 30 June, 2013. Panel A presents correlations of control variables; Panel B presents correlations of the PMC variables. All variables are fully defined in Appendix A. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 level, respectively.

	Panel A: IPO variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1.	Proceeds												
2.	Earnings per share	0.08***											
3.	Leverage	-0.04***	-0.18***										
4.	Firm age	0.19***	0.24***	-0.08***									
5.	Venture capital	-0.09***	-0.39***	0.08***	-0.29***								
6.	Dotcom period	-0.06***	-0.18***	-0.03	-0.14***	0.08***							
7.	Credit crunch	0.02***	0.06**	-0.01	0.03**	-0.01	-0.27***						
8.	Internet firm	0.01**	-0.19***	0.04	-0.16***	0.20***	0.22***	-0.06**					
9.	Technology firm	-0.05***	-0.22***	-0.01	-0.20***	0.32***	0.21***	-0.02	0.16***				
10.	Underwriter	0.14***	0.04**	-0.05*	0.10***	0.06**	-0.18***	0.13***	-0.02	0.04			
11.	Share overhang	0.03	-0.07*	-0.04	-0.08***	0.13***	0.14***	-0.05**	0.12***	0.13***	0.11*		
12.	NASDAQ	-0.16***	-0.22*	0.06**	-0.23***	0.32***	0.14***	-0.02	0.14***	0.19***	-0.19***	-0.01	
13.	Market return	-0.02	-0.02**	0.03	0.05	0.01	-0.01	-0.04	-0.04	-0.02	-0.04	-0.03	-0.01

	Panel B: PMC variables	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
14.	Political money									
15.	Lobby money	0.90***								
16.	PAC money	0.45***	0.36***							
17.	House money	0.29***	0.21***	0.91***						
18.	Senate money	0.53***	0.47***	0.86***	0.59***					
19.	Democrat money	0.52***	0.46***	0.82***	0.95***	0.89***				
20.	Republican money	0.35***	0.27***	0.95***	0.62***	0.73***	0.63***			
21.	$PI^{ABILITY}$	0.30***	0.27***	0.38***	0.23***	0.48***	0.50***	0.26***		
22.	$PI^{STRENGTH}$	0.69***	0.65***	0.60***	0.50***	0.59***	0.63***	0.50***	0.59***	
23.	PI^{POWER}	0.66***	0.63***	0.58***	0.47***	0.57***	0.61***	0.48***	0.40***	0.83***

Table 3.6: Determinants of PMC involvement for IPO firms

This table reports the results of a probit regression for the probability of PMC involvement on a list of identified PMC determinants. The sample consists of U.S. IPOs (N=1,578) announced over the period 1 January, 1998 to 30 June, 2013. The first column reports the resulting coefficients and the second the z-Statistics. All variables are defined in Appendix A. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 level, respectively.

	Coefficient	z-Statistic
Firm profile & visibility		
Assets	0.249***	6.96
Cash flow	0.057*	1.86
Firm age	-0.026	-0.62
Media coverage	0.310***	3.47
Internal politics		
Pre-IPO mgt ownership	0.590***	3.71
Unionized employees	-0.133	-0.27
Venture capital	0.186*	1.71
Political exposure		
Industry PMC	0.001***	2.8
HHI	-0.451	-0.74
Electoral College	-0.001	-0.13
Bills introduced	0.009***	7.33
Operational complexity		
R&D	0.720***	6.95
Regulated industry	0.341***	3.23
Government purchases	0.314**	2.52
Business segments	0.099**	2.4
Geographic segments	-0.011	-0.5
N		1,578
Pseudo-R^2		0.233

Table 3.7: Effect of PMC involvement on IPO underpricing

This table reports results of regressions of IPO underpricing (dependent variable) on a PMC dummy variable and other control variables for a sample of U.S. IPOs (N=1,578) over the period 1 January, 1998 to 30 June, 2013. The PMC variable assumes the value of 1 for any level of PMC activity, otherwise it is 0. All variables are defined in Appendix A. Four estimation procedures are used: Ordinary least-squares (column 1), Heckman two-stage (column 2), Maximum likelihood estimation (column 3) and generated IV approach (columns 4 and 5). The t-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity. The dependent variable is trimmed at the 1st and 99th percentiles. The lower part of the table provides the Wald and Hausman statistics based on the MLE and IV estimations, respectively, and the instrument t-statistics from the first-stage (full 1st stage results are on Appendix D). An asterisk indicates significance at the 10% level; two at the 5% level; and three at the 1% level.

	OLS (1)	Heckman (2)	MLE (3)	IV (4)	IV (5)
PMC	-0.033**	-0.135***	-0.161***	-0.141***	-0.143**
	(-2.08)	(-3.09)	(-4.65)	(-2.58)	(-2.49)
Firm age	-0.014**	-0.013*	-0.012*	-0.012**	-0.011
	(-2.55)	(-1.80)	(-1.74)	(-2.20)	(-1.64)
Venture capital	0.058***	0.055***	0.054***	0.055***	0.059***
	(3.60)	(3.58)	(3.52)	(3.37)	(3.17)
Proceeds	0.041***	0.051***	0.053***	0.051***	0.058***
	(5.31)	(5.87)	(6.36)	(5.54)	(5.00)
Earnings per share	0.016	0.014	0.014	0.014	0.026
	(1.24)	(0.97)	(0.93)	(1.07)	(1.64)
Leverage	0.001	-0.000	-0.001	-0.000	-0.001
	(0.13)	(-0.03)	(-0.07)	(-0.05)	(-0.77)
Dotcom period	0.166***	0.156***	0.154***	0.156***	0.198***
	(10.79)	(10.06)	(9.99)	(9.59)	(9.31)
Credit crunch	-0.013	-0.005	-0.003	-0.004	0.005
	(-0.69)	(-0.22)	(-0.12)	(-0.22)	(0.24)
Internet firm	0.097***	0.100***	0.101***	0.100***	0.070**
	(3.37)	(4.85)	(4.87)	(3.48)	(2.22)
Tech firm	0.077***	0.074***	0.073***	0.073***	0.062***
	(4.83)	(5.07)	(5.00)	(4.53)	(3.34)
NASDAQ	0.073***	0.067***	0.066***	0.067***	0.067***
	(5.40)	(4.21)	(4.12)	(4.81)	(4.05)
Underwriter rank	0.061***	0.063***	0.064***	0.064***	0.057***
	(3.76)	(4.12)	(4.15)	(3.89)	(3.04)
Share overhang	0.013***	0.013***	0.014***	0.013***	0.016**
	(3.01)	(6.82)	(6.87)	(3.00)	(2.42)
Market return	0.225***	0.237***	0.240***	0.238***	0.246***
	(5.78)	(7.14)	(7.22)	(6.04)	(5.03)
Revisions					0.315***
					(3.81)
Inverse Mills ratio		0.068***			
		(2.59)			
N	1,578	1,578	1,578	1,578	1,171
Adjusted-R^2 (OLS)	0.27				
T-stat instr., 1st stage		6.75***	6.30***	7.56***	7.02***
Wald test			17.55***		
Hausman test				4.75**	

Table 3.8: Effect of PMC level on IPO underpricing

This table reports results of the cross-sectional OLS regression analysis of IPO underpricing (dependent variable) on PMC level and other control variables. PMC level is defined as the aggregate U.S. dollar contributions resulting from: any combination of lobbying and PAC (Column 1), lobbying (Column 2), and PAC (Column 3). Our sample consists of U.S. IPOs announced over the period 1 January, 1998 to 30 June, 2013 with an extant record of PMC activity. All variables are defined in Appendix A. The dependent variable and dollar contributions variables are trimmed at the 1st and 99th percentiles. The t-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity. We use the symbols *, ** and *** for statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
Political money	-0.025***		
	(-3.60)		
Lobby money		-0.026***	
		(-3.25)	
PAC money			-0.040***
			(-4.83)
Proceeds	0.017	0.015	0.014
	(0.99)	(0.84)	(1.32)
Earnings per share	0.062**	0.064**	0.054***
	(2.29)	(2.22)	(2.71)
Leverage	-0.039***	-0.038**	-0.047
	(-2.61)	(-2.46)	(-1.00)
Firm age	-0.001	0.002	0.010
	(-0.08)	(0.25)	(1.30)
Venture capital	0.115***	0.122***	0.053
	(2.70)	(2.73)	(1.33)
Dotcom period	0.197***	0.227***	0.034
	(3.49)	(3.67)	(1.04)
Credit crunch	-0.055*	-0.058*	-0.069**
	(-1.87)	(-1.85)	(-2.42)
Internet firm	0.078	0.072	0.004
	(1.21)	(1.12)	(0.07)
Tech firm	0.038	0.029	0.039
	(1.26)	(0.93)	(0.85)
NASDAQ	0.102***	0.090**	0.037
	(2.93)	(2.34)	(1.08)
Underwriter rank	0.091**	0.102**	-0.024
	(1.99)	(2.16)	(-0.55)
Share overhang	0.007	0.005	0.003
	(1.44)	(1.22)	(1.52)
Market return	0.174**	0.213***	0.058
	(2.55)	(2.81)	(0.92)
N	273	245	89
Adjusted-R^2	0.351	0.363	0.462

Table 3.9: Underpricing and PAC recipient characteristics

The table reports results of the cross-sectional OLS regression analysis of IPO underpricing (dependent variable) on key PAC recipient characteristics for a sample of U.S. IPOs with a record of PMC activity announced over the period 1 January, 1998 to 30 June, 2013. The variables of interest in Columns 1, 2, 3 and 4 are the aggregate dollar contributions towards the House of Representatives, Senate, Democratic party and Republican party, respectively. Columns 5, 6 and 7 use the Cooper et al. (2010) measures for candidate strength, power and ability, respectively. In all regressions, the control variables of Tables 7 and 8 retain their position and are suppressed for simplicity. The dependent variable and aggregate dollar contributions variables are trimmed at the 1st and 99th percentiles. The t-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity. All variables are defined in Appendix A. We use the symbols *, ** and *** to denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Congress chamber		*Partisan identity*		*Candidate profile*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
House money	-0.0077***						
	(-3.17)						
Senate money		-0.006**					
		(-2.35)					
Democratic money			-0.0067***				
			(-2.74)				
Republican money				-0.0063**			
				(-2.42)			
$PI^{STRENGTH}$					-0.0168***		
					(-2.72)		
PI^{POWER}						-0.0355***	
						(-4.17)	
$PI^{ABILITY}$							-0.0199*
							(-1.70)
N	273	273	273	273	273	273	273
Adjusted-R^2	0.347	0.341	0.344	0.341	0.345	0.353	0.336

Table 3.10: Volatility profile of PMC and matched non-PMC IPOs

This table reports the mean, standard deviation, minimum and maximum statistics for a sample of 201 PMC IPOs and a matched sample of 201 non-PMC IPOs. A t-test is employed to compare the differences in sample means. The matching is based on the criteria of i) a common 2-digit SIC code ii) proximity in IPO proceeds and iii) a common listing year. The variable analyzed is the 60, 120 and 365 day volatility, defined as the standard deviation of daily returns over the aforementioned intervals. All returns are estimated from the 8th trading day following the IPO and onwards with data from the CRSP database. We use the symbol *** to denote statistical significance at the 1% level.

Variable	Sample	Mean	*Difference in mean t-statistics*	Standard Deviation	Minimum	Maximum
60-day volatility	PMC IPOs	0.031	-3.39***	0.013	0.009	0.078
	Matched IPOs	0.038		0.027	0.013	0.092
120-day volatility	PMC IPOs	0.033	-3.09***	0.013	0.010	0.085
	Matched IPOs	0.042		0.045	0.014	0.088
365-day volatility	PMC IPOs	0.035	-3.05***	0.014	0.011	0.087
	Matched IPOs	0.051		0.069	0.016	0.112

Table 3.11: Underwriters' behavior under a PMC regime

Columns 1 and 2 regress absolute offer price revisions and offer price revisions, respectively, on a PMC dummy and other covariates for a sample of U.S. IPOs (N=1,171) over the period 1 January, 1998 to 30 June, 2013. Columns 3 and 4 use IPO first-day returns as the dependent variable for a sample of U.S. IPOs (N=1,578) over the same time period. The unconnected dummy in Column 3 is set to 1 for underwriters which abstain from political contributions in the year that they underwrite a PMC IPO; in Column 4 the unconnected dummy is set to 1 for underwriters that underwrite no more than 1 PMC IPO in any given year. All other variables are defined in Appendix A. The estimation procedure used is the generated instrumental variables method. T-statistics in parentheses are based on standard errors adjusted for heteroskedasticity. The dependent variable is trimmed at the 1st and 99th percentiles. An asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

	Absolute revisions	*Revisions*	*First-day return*	
			Direct connections	*Indirect connections*
	(1)	(2)	(3)	(4)
PMC	0.013	-0.131***	-0.132**	-0.107**
	(0.06)	(-4.30)	(-2.39)	(-2.48)
PMC*unconnected			-0.071	-0.133**
			(-1.31)	(-2.04)
Firm age	-0.001	-0.004	-0.013**	-0.011**
	(-0.40)	(-0.97)	(-2.23)	(-1.98)
Venture capital	0.009	0.029***	0.053***	0.054***
	(1.28)	(2.85)	(3.27)	(3.30)
Proceeds	-0.003	0.048***	0.051***	0.051***
	(-0.72)	(8.42)	(5.54)	(5.70)
Earnings per share	-0.014**	0.025***	0.013	0.011
	(-2.08)	(2.70)	(0.98)	(0.85)
Leverage	-0.001	-0.001	-0.001	-0.001
	(-0.03)	(-0.55)	(-0.11)	(-0.11)
Dotcom period	0.002	0.051***	0.154***	0.156***
	(0.32)	(4.83)	(9.63)	(9.67)
Credit crunch	-0.014*	0.020*	-0.002	-0.002
	(-1.76)	(1.65)	(-0.13)	(-0.10)
Internet firm	0.002	0.044***	0.101***	0.097***
	(0.24)	(3.22)	(3.51)	(3.36)
Tech firm	0.018***	0.038***	0.072***	0.071***
	(2.73)	(3.98)	(4.48)	(4.36)
NASDAQ	0.004	0.002	0.067***	0.068***
	(0.67)	(0.21)	(4.84)	(4.89)
Underwriter rank	0.015**	0.008	0.063***	0.058***
	(1.97)	(0.77)	(3.83)	(3.48)
Share overhang	0.001	0.005***	0.013***	0.013***
	(0.45)	(2.65)	(2.96)	(2.96)
Market return	0.023	0.131***	0.240***	0.240***
	(1.43)	(5.77)	(6.12)	(6.08)
N	1,171	1,171	1578	1578

Table 3.12: Sensitivity analysis

This table provides a sensitivity analysis for the effect of PMC time and type on initial return and filing price revisions. We use the generated instrumental variables method and report in Panels A, B, and C the resulting coefficients, γ_1 and γ_2, for the return and revisions equations, respectively, along with the heteroskedasticity-robust standard errors. Panel A gives the resulting coefficients from the full PMC sample (i.e. any PMC combination with a cut-off at 5 years prior to IPO). Panel B limits the time window to produce subsamples of firms engaging in PMC i) within 6 months ii) older than 6 months and up to a year, and iii) older than 1 year and up to 5. Panel C distinguishes by PMC type to produce the subsamples of firms engaging in PMC via i) a combination of lobby and PAC contributions '*Both lobby – PAC*' ii) exclusive lobby contributions '*Just lobby*', and iii) exclusive PAC contributions '*Just PAC'*. In all regressions, the control variables of Tables 7and 8 retain their position and are suppressed for simplicity. The dependent variables in both equations are trimmed at the 1st and 99th percentiles. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 level, respectively.

	Coefficient (γ_1, γ_2) standard error	
	Underpricing equation	Revisions equation
	$UND = \beta_1 X + \gamma_1 PMC + \varepsilon_1$	$REV = \beta_2 X + \gamma_2 PMC + \varepsilon_2$
Panel A: PMC full sample		
Any PMC type within 5 years	-0.141***	-0.131***
	0.055	0.030
Panel B: PMC subsamples *by time*		
6-months or less	-0.361***	-0.339***
	0.136	0.094
Older than 6-mo & up to a year	-0.302**	-0.293***
	0.139	0.080
Older than 1 and up to 5 years	-0.300*	- 0.177*
	0.180	0.097
Panel C: PMC subsamples *by type*		
Both lobby - PAC	-0.365***	- 0.376***
	0.119	0.092
Just lobby	-0.200**	- 0.124**
	0.102	0.055
Just PAC	-0.578**	- 0.722***
	0.289	0.236

Chapter 4 - Political connections and IPO underpricing: An efficiency problem

4.1 Introduction

In 2014, ten years after its IPO (Initial Public Offering), Google surpassed Goldman Sachs in both lobbying and PAC (Political Action Committee) contributions11. Given the bank's traditional ties with government, this news drew considerable attention from the press. However, Google had initiated its Washington strategy just a few months before it went public in August 2004. Similarly, other corporate issuers exert great efforts to develop their political networks early, opting for a highly discretionary expense during a period of cash scarcity. While few would argue against the long-term benefits of staying in the good graces of politicians, this observed behavior begs the question of whether incremental benefits accrue to these early-birds based on the decision to proceed to an IPO 'connected'.

On balance, the odds of attaining a good pricing outcome rarely favor the issuer. The disparity in bargaining power with the lead underwriter and the liability of newness (Stinchcombe, 1965) result in the systematic dwarfing of the IPO offer price by first aftermarket close. The economic implications are colossal: over the period 1980-2014 alone, a total of 8,060 U.S. issuers realized an average first-day return of 18.6%. In dollar terms, the amassing of $805.8 billion in equity capital entailed an opportunity cost of $149.8 billion[12].

A politically connected issuer may be at an advantage compared to other IPO issuers for several reasons. First, the firm is in less need of an underwriter's reputation for the purpose of certification (Carter et al., 1998). Shares of an issuer known for its political ties should be easier to sell, obviating much of the marketing burden. Indeed, the increased publicity accompanying elite clientele adds to an underwriter's own reputational capital, so that the prestige spillovers cease to be unidirectional. Second, politically involved firms have been shown to enjoy preferential access to debt

[11] According to data from the Center for Responsive Politics (CRP), a non-profit U.S. research group, during 2014 Google spent $ 16,830,000 and $ 1,036,926 for lobbying and PAC contributions, respectively. Over the same period, Goldman Sachs was associated with a lobbying expenditure of $ 3,460,000 and PAC of $ 1,017,100.

[12] We rely for these estimates on data from Jay Ritter's website.

financing (Faccio, 2006; Boubakri et al., 2008; Houston et al., 2014), so these issuers encounter neither time nor liquidity constraints but instead they can afford to withhold listing until a satisfactory valuation arises. Third, connections mitigate the ex ante uncertainty surrounding a firm's intrinsic value by indicating a capability to extract economic rents or, at a minimum, protection against tail risk. This implicit assurance may replace a low offer price as a means of disseminating confidence in future prospects (c.f. signaling studies such as Allen and Faulhaber, 1989; Welch, 1989; Chemmanur, 1993).

Intangible assets such as a firm's political network are difficult to identify and cumbersome to model, with incremental information hidden in the possible nonlinearities We investigate a prospective issuer's potential to retain a larger portion of the surplus value created at an IPO, using lobbying and political action committee (PAC) campaigns as proxies for corporate political connections, but the challenge lies in defining a setting that caters appropriately to the different types of connectedness that they lead to. Therefore, rather than setting up a regression-based framework, we opt for a method that allows relationships to manifest themselves in a data-driven manner**.** We approach IPO pricing as an efficiency-analysis problem to be treated in a fully nonparametric procedure. Central to this framing is the issuers' abilities to minimize underpricing across a variety of settings.

Gondat-Larralde and James (2008) note the dearth of theory in explaining either IPO underpricing in equilibrium conditions or the average differences of IPO returns on the observed scales. As a consequence, some researchers (inter alia Benveniste and Spindt, 1989; Benveniste and Wilhelm, 1990) analyze IPO underpricing without taking into consideration the variation of the observed phenomenon while others presume its existence (Loughran and Ritter, 2002; Ljungqvist and Wilhelm, 2005). In a departure from these studies, we introduce a method for establishing comparability without determining a priori a direction (underpricing or other). This is a nonparametric frontier approach, known as data envelopment analysis (DEA), which features widely in Operations Research (Charnes et al., 1978; Banker et al., 1984; Sherman, 1984; Mahajan, 1991; Duzakin and Duzakin, 2007; Sueyoshi and Goto, 2009; Demerjian et al., 2012). Extending this technique to IPOs, we utilize the ratio of offer price to first aftermarket close in order to construct non-parametric piece-wise surfaces (i.e. frontiers) over the sample. Subsequently, we develop efficiency measures in relation to these surfaces by the application of linear programming. On this relative basis, we quantify an

issuer's ability to reduce IPO underpricing across industries, eliminating the methodological challenges raised by Gondat-Larralde and James (2008).

Most relative nonparametric efficiency studies (also called two-stage DEA studies) in Operations Research derive efficiency levels in the first stage and, subsequently, employ a regression-type framework (i.e. Tobit, OLS models, etc.) in order to explain observed variations (dependent variable) based on the exogenous terms (control variables)[13]. However, this route imposes unrealistic assumptions on the data-generating process leading to biased results (Simar and Wilson, 2011). In order to avoid such misspecifications, we apply the probabilistic method of efficiency estimation (Daraio and Simar, 2005; 2007) alongside the latest developments (Bădin et al., 2012) on the impact measurement of environmental factors. Consequently, we carry forward our second stage analysis in a completely nonparametric framework without relying on modeling assumptions which may not be supported by the data. This approach enables us to capture all potential nonlinearities in the relation between IPO returns and lobbying and PAC intensity. Apart from this benefit, the shift of focus from outcome prediction to efficiency evaluation renders our estimates immune to endogeneity[14]: a common source of bias in the IPO-return equation which can also arise from firms' self-selection into political contributions.

Nonlinearities in the association between IPO return and lobbying as well as PAC contributions are plausible because of the very nature of these strategies. As a means for establishing and nurturing connections, the political favoritism that donor firms aim at can hardly support a linear association with the hypothesized outcome (i.e. containment of IPO underpricing). Human relationships are dynamic and can manifest themselves in all conceivable directions. For example, donating PAC money at the legal ceiling of $ 5 thousand, or at any level below, is unlikely to have a material effect to a candidate's financing needs; the Center for Responsive Politics estimates the average political campaign cost for a seat in the U.S. Senate (House of Representatives) at $ 10,476,451 ($ 1,689,580). However, as a gesture of support, a PAC contribution can result in favouritism that far exceeds the value of donation in nominal terms. From a

[13] Refer to Simar and Wilson (2007, 2011) for an excellent analysis of the relevant studies.

[14] Also, as in Black and Smith (2004) and Frölich (2008), nonparametric estimators overcome the problems associated with endogenous control variables and remain consistent in lieu of instrumental variables.

complementary angle, one may ask how many candidates an issuer needs to support in order to transmit a signal of connectedness at IPO. Conceivably, after having created a sufficiently large network of political contacts (via PAC or lobbying money), channelling additional funds may result in a negligible marginal benefit for the donor firm. Then, the question comes down to pinpointing inflection points where the effect of the exogenous variables on IPO efficiency alters. In addressing this objective, therefore, a parametric, data-driven approach has a decisive advantage.

In order to conduct this work, we require a new and comprehensive database. We manually investigate U.S. IPO deals recorded in the Securities Data Company (SDC) database over the period from 1998 to 2014 for evidence of political contributions within the 12-month period prior to the issue day. This search involves scrutiny of two distinct sources. The data on PAC contributions come from the files of the Federal Election Commission, whereas for lobbying contributions we search the electronic archives of the Center for Responsive Politics (CRP). After merging the contributions databases with Center for Research in Security Prices (CRSP) data on aftermarket prices, we identify 379 unique IPOs which have exhibited either type of activity. These firms cover 12 out of the 14 Thomson Reuters proprietary macro-level industry classifications.

Our results do, indeed, reveal nonlinearities in the relationship of efficiency with the two contribution avenues (in itself justifying the fully nonparametric treatment) and, moreover, the relationship differs across business sectors. By and large, PAC contributions conform to their hypothesized role in reducing the amounts of money left on the table by prospective issuers. Market participants factor in direct, interpersonal relationships with policy makers. Evidence from lobbying contributions corroborates this conclusion. The majority of IPOs exhibiting efficiency take advantage of both lobbying and PAC contributions. Results for the complete dataset show lobbying versus IPO efficiency exhibiting an inverted "U"-shape which, however, changes to a "U"-shape when data are restricted to IPOs with positive returns that lie on the empirical frontier and are, therefore, efficient. The change in shape prompts a closer examination, combined with the thought that firms across the various economic sectors are likely to pursue heterogeneous political objectives. We compare Energy and Power, Financial, and Industrial sectors and find different (plausibly "strategically tailored") spending. Lobbying contributions in Energy and Power account for a positive nonlinear effect on IPOs' efficiency levels, whereas PAC money appears to erode value. This may be

explained by a heavy regulatory framework demanding quality communication between those setting policy and those affected by it. The reverse is observed in the Industrial sector, from which we surmise that PAC campaigns, as a superior means for networking, cajole decision makers into government purchases and favorable appropriations from the Federal budget for the industry. The Financial sector, in contrast, barely shows an economically meaningful association of either lobbying or PAC with IPO efficiency levels, perhaps because it already exerts a political role by virtue of its centrality to the economy.

The remainder of the chapter proceeds as follows. Section 4.2 provides a review of the relevant literature and develops our main conjecture. Section 4.3 describes the database assembly. We delve into the mechanics of the proposed methodology in Section 4.4. The empirical analysis is in Section 4.5. Section 4.6 offers a discussion and possible interpretations of key findings. Section 4.7 concludes the chapter.

4.2 Background and hypothesis development

4.2.1 Proximity to politics as a value-adding element

Political connections may be formed via sourcing managers and key executives who are well-connected themselves or through the corporate treasury for political contributions. International evidence traces connections from interpersonal networks into firm value. Fisman (2001), for example, documents the share price of connected firms in Indonesia swinging in line with news of President Suharto's health. Faccio (2006), exploring the interplay of business and politics in 47 countries, lists a number of benefits for organizations employing officials with an alleged political footprint. Specifically, connected firms are capable of maintaining larger market shares as well as bearing more leverage compared to their non-connected peers. An additional privilege comes in the form of systematic tax discounts. Notably, the greater the observed extent of connectedness, the more these features emerge. Faccio and Parsley (2009) follow the market reaction of firms headquartered in politicians' hometowns in 36 countries subsequent to their unexpected death announcements and find an economically sizeable 1.7% decline in value (across a wide spectrum of political and economic conditions, including the U.S.).

The bourgeoning Chinese IPO market, in conjunction with the high degree of interconnectedness between local businesses and the central government, has stimulated research on implications for newly listed equities. The limited underpricing of politically connected firms features in this literature. For instance, Fan et al. (2007) note the role of CEOs' links with government as both an asset during the IPO day (exactly because of the constraining effect on return) and a liability for significantly impairing firms' growth and earnings prospects over the long-run. In a similar spirit, Francis et al. (2009) using multiple proxies of political connections (directors' network, type of state ownership, and underwriter's ability to attract revenue from state-owned companies) corroborate the relationship with underpricing. Additionally, they associate connected issuers with larger P/E ratios and higher IPO offer prices so that proximity to politics emerges as a pivotal factor in raising greater amounts of capital. Of course, using the Chinese capital markets as laboratories for assessing the effect of political connections on IPO underpricing invites controversy. On the one hand, the peculiar economic model of China cripples the transferability of findings to a mature Western market setting. On the other, one may argue that if the effect is capable of manifesting itself in spite of the constant demand for Chinese equities, then a stringent robustness test has already been fulfilled.

U.S. evidence tracing connections that stem from political contributions also reports significant implications for firm value. Cooper et al. (2010) study the correlation of PAC contributions with the cross-section of future abnormal returns and document a positive association. Chen et al. (2015), substituting PAC data for lobbying, corroborate this relationship. In parallel, the authors complement market measures of performance with accounting elements such as net income and operating cash flow, thereby showing the effect to permeate into firm fundamentals. The value-enhancing element of contributions can equally manifest itself via the advancement of more dubious purposes. Thus, Yu and Yu (2011) attribute to firms remaining active in lobbying an interesting immunity from fraud detection. In particular, scrutiny by the relevant authorities lags by an average of 117 days while violators are 38% less likely to be held accountable for fraudulent actions in the first place. Similarly, Correia (2014) highlights the role of both lobbying and PAC contributions as powerful deterrents against SEC enforcement actions.

4.2.2 Political connections in the process of going public

Following the research of Stoll and Curley (1970) and Logue (1973) registering positive skewness of the IPO returns distribution, underpricing is frequently framed as a balance among conflicting incentives of the principal IPO participants. With underpricing arising from informational asymmetries, firms may forego some of the wealth created at the IPO by setting a lower price in an attempt to mitigate ex ante uncertainty. This behavior conforms to a signaling model and differentiates quality firms from other issuers (Allen and Faulhaber, 1989; Welch, 1989; and Chemmanur, 1993). In parallel with transmitting assurances matching their standing, issuers themselves require market feedback and predictions of demand. Sophisticated investors, mainly in the form of institutional investors, can be central in this respect. Therefore, a number of studies establish underpricing as a means of deferred compensation for information revelation (Benveniste and Spindt, 1989; Benveniste and Wilhelm, 1990; Spatt and Srivastava, 1991; Cornelli and Goldreich, 2001 and 2003). Ritter and Welch (2002) speculate that IPO subscription may be used as a tool for exerting influence on politicians without, however, providing further evidence.

A politically involved issuer is equipped to reduce the uncertainty surrounding an IPO. The connections formed via political donations can structure a network which facilitates information flow such as the exchange of issuer-specific information for forecasts of demand and market sentiment. To the extent that proximity to politics evidences a firm's capability to extract economic rents, there is less disagreement on the value of connected firms, thereby eliminating the need to signal quality via a low offer price.

In parallel, political connections reinforce an issuer's bargaining position in pricing negotiations with the lead underwriter. Rather than the issuer gaining benefits in prestige from the underwriter for legitimacy, this may be reversed; a feature especially desirable if the underwriters' market structure conforms to a model of oligopolistic competition as in Liu and Ritter (2010). The immediate prestige spillovers do not preclude long-run expectations of a recurring stream of revenue in the form of new issuance activity, business with the brokerage division and potential M&As. Conversely, connected firms have been associated with advantageous access to alternative means of financing such as bank loans (Houston et al., 2014). Attaching less urgency to the IPO funds, therefore, the issuer is able to negotiate a higher valuation. As

a result, the underwriter is incentivized to exert greater effort to retain a connected client at a time when the latter is able to be selective.

4.2.3 Lobbying and PAC: two distinct means for establishing connections

Lobbying and PAC contributions constitute a firm's primary vehicles for gaining access to the U.S. political system. To put this endeavor in perspective, 2014 saw a reported aggregate lobbying expenditure of $ 3.21 billion, whereas PAC contributions over the election cycle fell slightly short of $ 0.5 billion. The disparity in magnitudes is indicative of their different natures.

Lobbying aims to sway politicians to interventions that advance corporate interests. This may equally translate into refraining from action in cases where the optimal outcome lies with the status quo (defensive lobbying). The process is more elaborate than an exchange of money for political favors and constitutes an important input in the making of politics. The Lobbying Disclosure Act of 1995 (LDA) defines as a lobbying contact any oral or written interaction (inclusive of electronic communications) to an executive branch official or a legislative branch official made on behalf of a client with regard to the formulation, modification, or adoption of federal laws, executive orders, or government contracts, etc. As a communications endeavor, therefore, lobbying represents a valuable source of information for legislators, even more so for issues of an especially technical character. In-house or external specialists, commonly former Congress members themselves, spearhead the lobbying effort and attempt to pinpoint elements in proposed legislations which confer utility on more stakeholders (inclusive of the affected political constituencies) than the client firm. With the relevant research (see Leech et al., 2005 and Baumgartner et al., 2011) showing that salient issues demand frequent and targeted campaigns, corporate lobbying has more than doubled since 1998, the first year for which lobbying data are available in databases following the LDA. In the absence of a legal cap, firms' expenditures far exceed what is required for staff compensation and related overhead in order to cater to an increasing variety of incumbent politicians' private expenses (e.g. travel expenses, meals and events organization). The cash flows are disclosed, at an aggregate level only,

on standardized lobbying reports and identified by their subject matter, also designated as ‘lobby issue’.

PAC are commonly formed by corporations and special interest groups in order to support or sabotage the election of a specific candidate. Revolving around legislators rather than the legislative process, PAC contributions offer a firm first-order connections with people in power. This element of directness differs from lobbying, where a firm derives connectedness through lobbyists’ proprietary networks and relinquishes it by termination of the campaign. Additionally, PAC impose substantial limitations on contribution size and donors’ identity. In particular, even though corporate cash is eligible to cover a PAC’s operating costs, contributions beyond the break-even point should be sourced from third-party donors. To this end, firms routinely solicit financing from principal constituents such as directors, employees and their families and, given that no individual may exceed the legal ceiling of $ 5 thousand, mass participation becomes a matter of vital importance to a campaign’s success.

Firms select between the two contribution types based on their competitive environment and organizational idiosyncrasy. Large establishments which often attract public scrutiny (and increased litigation costs) are strongly incentivized to craft legislation on a bill-to-bill basis. In this respect, lobbying is essential. As an added benefit, campaign costs are a smaller consideration since they can be spread over an extended asset base. Market concentration has also been shown to relate positively to lobbying (e.g., Zardkoohi, 1985); conceivably, the fewer the participants in an industry, the larger the portion of the anticipated benefits that accrue to the donor firm as opposed to free-riders. To the extent that firms emphasize proprietary rights protection and securing concessions on the development of novel technologies, R&D intensity is another plausible factor for lobbying. Similarly, a heavy regulatory framework induces a firm to communicate its perspective to legislators. Conversely, PAC campaigns facilitate firms with a large percentage of unionized employees or a heavy reliance on government contracts as a superior means for networking and claiming favoritism on an interpersonal basis. Of course, this does not preclude the intrusion of non-economic factors into the PAC decision such as fads, internal politics, social norms and peer demand.

Lobbying may be framed as a conduit of information and PAC as an open reference for the entity transmitting this information, the two complementing one another (Langbein, 1986; Wright, 1990; Humphries, 1991; Austen-Smith, 1995; Milyo

et al., 2000; Ansolabehere et al., 2002). Langbein (1986) conducts surveys of legislators and their cabinets and finds that the former appropriate time to lobbyists according to the PAC intensity of their client firms. Milyo et al. (2000) go a step further by refuting altogether the influence potential of PAC. Instead, the authors reduce these campaigns to simple entry tickets for access and dialogue on an ad hoc basis. Formally, the symbiotic relationship is designated as the 'access-influence' hypothesis. Adhering to this framing, in developing the main conjecture in our study, we group both contribution types under the umbrella of political connections.

4.3 Data and methodology

Next, we describe the assembly of our database and how we construct a model in order to extract effects on IPOs without imposing a regression-based framework, allowing relationships (linear or otherwise) to arise from the data.

4.3.1 Data

Following the Lobbying Disclosure Act of 1995, databases are available covering lobbying activity from 1998. We retrieve the population of U.S. IPOs for the period January 1, 1998 to December 31, 2014 from the Securities Data Company (SDC) database. In line with the majority of IPO studies, we exclude deals with an offer price smaller than $5 per share (penny stocks), reverse LBOs, limited partnerships, American depositary receipts (ADRs) and foreign-based firms whose shares may already trade in their home markets. We eliminate real estate investment trusts (REITs), closed-end funds, royalty trusts and other special purpose investment vehicles. For this purpose, we exclude all SIC codes within the interval 6723-6999, inclusively. Special caution is exercised to identify and eliminate IPOs which, while bypassing Thomson Reuters' closed-end fund filter, still function in this manner. The last restriction involves corporate spin-offs; these IPOs have only recently acquired organizational autonomy from a mature and sizeable organization so that the reputation of the mother firm largely certifies the offering, alleviating a significant portion of the ex-ante uncertainty. These

interventions leave us with a sample of 379 unique IPOs.

The pricing data come from two distinct sources. While SDC is an excellent source for IPO offer prices, its coverage significantly deteriorates when it comes to aftermarket prices. For first trading day closes, we rely on the Center for Research in Security Prices (CRSP) and match the two databases. The sources for political contributions similarly diverge. We manually search each IPO company in the electronic platform of the Center for Responsive Politics (CRP) for evidence of lobbying activity. CRP sources data straight from the semi-annual lobbying reports submitted to the secretary of the Senate's Office of Republic Records (SORP). The PAC contributions are retrieved from the archives of the Federal Election Commission (FEC) where we reiterate the investigation for all IPOs in the sample. Notably, in cases of multiple lobbying or PAC activity, we consider the contributions exhibiting the closest time proximity to the issue date for plausibly dominating in value relevance over older cash flows. Thus, we assemble a new and comprehensive database of U.S. firms' political standpoint at the time of their transition into the public domain.

4.3.2 Sample description

Our dataset consists of 379 U.S. IPOs, 317 of which are underpriced and 62 are overpriced (refer to Table 4.1 for descriptive statistics and IPO identification by sector). In order to reinforce the robustness of our results, we seek in all of the analyses separate evidence from both the full and underpriced samples.

Figure 4.1 presents an overview of the percentages of total lobbying and PAC activity on a sectoral basis. In particular, subfigure 4.1a reveals that companies from the Energy and Power, Telecommunications, Industrials and Financials sectors account for the highest percentages of lobbying. Similarly, subfigure 4.1b indicates that the largest PAC donations come from companies operating within the sectors of Energy and Power, Industrials, Financials and Media and Entertainment. Conclusively, the Energy and Power, Industrials and Financials sectors allow almost equally for lobbying and PAC. However, preferences towards either spending manner can exist. For example, the Media and Entertainment sector donates primarily PAC money, whereas the Telecommunications sector is more heavily involved into lobbying.

4.4 Methodology

4.4.1 The model

Suppose that the issuer's ability to evaluate an IPO can be characterised by the pairs of the first aftermarket closing price $e \in \Re_+^p$ and the IPO offer price $b \in \Re_+^q$. Then, as per Farrell (1957), the process of the issuer's evaluation of the IPO can be characterised by the activity set Ω which is the support of the density of (E, B) defined as:

$$\Omega = \left\{ (e,b) \in \Re_+^{p+q} \middle| f_{EB}(e,b) > 0 \right\}, \quad (1)$$

where f_{EB} is the joint density of (E, B) with the probability function H_{EB} defined as:

$$H_{EB}(e,b) = P(E \le e, B \ge b). \quad (2)$$

From (1) and (2) we may then write:

$$\Omega = \left\{ (e,b) \in \Re_+^{p+q} \middle| H_{EB}(e,b) > 0 \right\}, \quad (3)$$

and therefore from (3) we assume free disposability of Ω. Then for any e such that $P(E \le e) > 0$,

$$H_{EB}(e,b) = H_{B|E}(b|e) F_E(e), \quad (4)$$

where $H_{B|E}(b|e) = P(B \ge b | E \le e)$ and $F_E(e) = P(E \le e)$. Then Ω can be defined as:

$$\Omega = \left\{ (e,b) \in \Re_+^{p+q} \middle| H_{B|E}(b|e) > 0 \right\}. \quad (5)$$

Given that the objective of an issuer is to reduce underpricing, we can determine the issuer's performance of evaluating an IPO at price levels (e_0, b_0) as follows:

$$\phi(e_0, b_0) = \sup \left\{ \phi > 0 \middle| H_{B|E}(\phi b_0 | e_0) > 0 \right\}. \quad (6)$$

Finally, the empirical version of $H_{B|E}$ can be stated as:

$$\hat{H}_{B|E}(b|e) = \frac{\sum_{i=1}^{n} I(E_i \le e, B_i \ge b)}{\sum_{i=1}^{n} I(E_i \le e)}. \quad (7)$$

In the spirit of other studies (Daraio and Simar, 2005 and 2007; Jeong et al., 2010; Bădin et al., 2012), let lobbying and PAC money be denoted by $M \in \Re^r$ which are the environmental/exogenous factors influencing the issuer's evaluation process. Given that $M = m_0$, then the conditional process of an issuer's evaluation of an IPO Ω_{m_0} is characterised as:

$$\Omega_{m_0} = \left\{ (e,b) \in \Re_+^{p+q} \,\middle|\, f_{E,B|M}(e,b|m_0) > 0 \right\}, \tag{8}$$

where $f_{E,B|M}(e,b|m)$ is the conditional density of (E,B) given $M = m$. Then,

$$H_{B|E,M}(b|e,m) = P(B \geq b | E \leq e, M = m), \tag{9}$$

And so Ω_{m_0} can be represented as:

$$\Omega_{m_0} = \left\{ (e,b) \in \Re_+^{p+q} \,\middle|\, H_{B|E,M}(b|e,m_0) > 0 \right\}. \tag{10}$$

Then the issuer's conditional efficiency score of IPO evaluation (e_0, b_0, m_0) is defined as:

$$\phi(e_0, b_0 | m_0) = \sup\left\{ \phi > 0 | (\phi b_0, e_0) \in \Omega_{m_0} \right\} = \sup\left\{ \phi > 0 \,\middle|\, H_{B|E,M}(\phi b_0 | e_0, m_0) > 0 \right\}. \tag{11}$$

4.4.2 The empirical estimation

4.4.2.1 Data envelopment analysis (DEA)

Grounded in the ideas of Farrell (1957), data envelopment analysis (DEA) is a linear programming formulation that describes a correspondence between multiple inputs and outputs. Unlike a production function which is defined by an equation, the DEA's envelope is data-driven. That is, DEA (and not the researcher) determines which input-output combinations are efficient and thereby shape the efficient frontier.

The DEA model compared to alternative methods claims a series of advantages. First, DEA assigns efficiency scores to decision making units in the sample while regression analysis relies on average values. This causes efficient firms to become easily identifiable as they fall along the efficient frontier (even though there is no way for further differentiation in case that numerous units lay on the frontier). Second, DEA is capable of processing simultaneously (multiple) input and output variables. A regression framework is less accommodating as it requires for a specification of a production function for the input and a cost function for the output variables. The

enhanced efficiency of the DEA estimation offers unbiased results even in cases where the variables under study are correlated or jointly determined by omitted variables Black and Smith (2004) and Frölich (2008). Third, the basic philosophy of DEA permits firms to obtain efficiency both through differentiation and superior performance on many dimensions. Fourth, DEA, in contrast with COLS (Corrected Ordinary Least Squares) and SFA (Stochastic Frontier Analysis), bears the added benefit that it obviates the need for imposing a functional form. Consequently, the method provides protection from misspecifying the frontier. Gong et al. (1992) employing simulation exercises have established the suitability of DEA over SFA in the case that functional form problems or collinear regressions are present. In contrast, the researchers argue that SFA may be preferable if the functional form approaches the actual data-generating process but this would be particularly challenging to prove. Outliers comprise yet another puzzle: under SFA they may mask inefficiency whereas under DEA they may result in attributing large inefficiencies to the units in the sample, even though this may not always be true. Contemplating treatments for this problem, the DEA method appears to have an easier fix in the sense that outliers can be discarded from the final sample.

Following the work of Charnes et al. (1978), DEA has been applied in operations management (see Banker et al., 1984; Sherman, 1984 and Mahajan, 1991) but is largely absent from the finance literature. Some traces can be found in Varian (1990) who argues for a nonparametric approach when measuring the optimal performance of customers, investors and other economic agents. Assigning a lesser priority to statistical significance, Varian holds that the economic significance of a deviation from the optimal behavior entails more relevance. Employing a set of variables (quantities demanded, price and output), he develops metrics relying on residuals which capture the difference of outputs over inputs. Seiford and Thrall (1990) rely on these measures in order to draw a direct link with efficiency scores derived from DEA.

In IPO research, DEA estimation remains in its infancy, which comes as a surprise given the perennial quest in this literature to overcome endogeneity concerns within the underpricing equation. The sole extant study is from Kooli (2006); however, with a theoretical framing that focuses on investors' ability to maximize realized returns on IPO shares, Kooli overlooks the big picture which rests upon the excessive amounts of capital foregone at listing - the decision making units are indicative, with the offer

price, number of shares and IPO proceeds comprising the inputs, whereas the first aftermarket price and quarterly return are outputs.

Our approach, in contrast, investigates IPO performance from the issuer's perspective. Given that IPOs are underpriced (Ritter, 1991; Loughran and Ritter, 1995 and Jain and Kini, 1994), the performance of an issuer can be evaluated on the basis that the phenomenon of underpricing is reduced. We can therefore apply the nonparametric methodology of DEA in order to measure the efficiency of the issuer's ability to evaluate better an IPO by leaving less money on the table. Figure 4.2 presents schematically two theoretical frontiers under the constant returns to scale (CRS) and variable returns to scale (VRS) assumptions.[15] The horizontal axis indicates the stock price at close of offer and the vertical one relates to the offer price. Consider four IPOs at points C, B, L and H. The frontier under the assumption of CRS (VRS) is represented by the straight solid (dashed) line. As it can be easily observed, under the assumption of CRS only the IPO at point B is efficient in maximizing the offer price under the stock price at close of offer (i.e. minimizing the underpricing effect). However, when the assumption alters to VRS, the IPOs at points C, B, and L are regarded as efficient. In both regimes, the IPO at point H remains inefficient; under the CRS assumption its efficiency relates to the distance from the observed data point to the CRS frontier and is equal to the ratio of GF/GH. Alternatively, as per the VRS assumption, its efficiency is given by GL/GH. Therefore, in our analysis we need to estimate these distances under the two different technologies.

In order to estimate the radial distances presented in Figure 4.2, we follow the estimators introduced by Charnes et al. (1978) by implying the CRS assumption (ϕ_{CRS}) and, subsequently, the estimators introduced by Banker et al. (1984) implying the VRS (ϕ_{VRS}) . Both estimators enable us to calculate the model presented in (6) and can be expressed as:

[15]The CRS assumption is the most common economic assumption and has greater discriminative power compared to the VRS assumption (Zelenyuk and Zelenyuk, 2014). In our case, CRS suggests that a proportionate increase in e results in the same proportionate increase in b . However, under the more flexible assumption of VRS, a frontier may also exhibit increasing and decreasing returns to scale in different regions. Since our sample contains U.S. IPOs from companies operating in different sectors and in different time periods, scale effects can be present and may mask the estimated efficiency levels. Therefore, this study measures IPO efficiency under both the CRS and VRS assumptions.

$$\hat{\phi}_{CRS}\left(e_0,b_0\right)=\sup\left\{\phi>0\middle|e_0\geq\sum_{i=1}^{n}\gamma_i E_i,\phi b_0\leq\sum_{i=1}^{n}\gamma_i B_i,\gamma_i\geq 0\right\}, \tag{12}$$

$$\hat{\phi}_{VRS}\left(e_0,b_0\right)=\sup\left\{\phi>0\middle|e_0\geq\sum_{i=1}^{n}\gamma_i E_i,\phi b_0\leq\sum_{i=1}^{n}\gamma_i B_i,\sum_{i=1}^{n}\gamma_i=1,\gamma_i\geq 0\right\}. \tag{13}$$

The DEA estimators described by equations 12 and 13 measure IPO efficiency relative to an estimate of an unobserved true frontier. Consequently, remaining conditional on our sample from an underlying data-generating process (DGP), these estimators are biased by construction. Simar and Wilson (1998, 2000a,b) have proposed bootstrap methods for inference and bias correction of the original DEA estimates in order to improve accuracy. In our setting, the magnitude of the bias can be calculated as:

$$BIAS\left(\hat{\phi}_{CRS}\left(e_0,b_0\right)\right)=E\left(\hat{\phi}_{CRS}\left(e_0,b_0\right)\right)-\phi_{CRS}\left(e_0,b_0\right), \tag{14}$$

$$BIAS\left(\hat{\phi}_{VRS}\left(e_0,b_0\right)\right)=E\left(\hat{\phi}_{VRS}\left(e_0,b_0\right)\right)-\phi_{VRS}\left(e_0,b_0\right). \tag{15}$$

Then the bootstrap bias estimate of the original estimators under the CRS and VRS assumptions is the empirical analog of equations (14) and (15):

$$\hat{BIAS}_B\left(\hat{\phi}_{CRS}\left(e_0,b_0\right)\right)=B^{-1}\sum_{b=1}^{B=2000}\hat{\phi}^*_{CRS,b}\left(e_0,b_0\right)-\hat{\phi}_{CRS}\left(e_0,b_0\right), \tag{16}$$

$$\hat{BIAS}_B\left(\hat{\phi}_{VRS}\left(e_0,b_0\right)\right)=B^{-1}\sum_{b=1}^{B=2000}\hat{\phi}^*_{VRS,b}\left(e_0,b_0\right)-\hat{\phi}_{VRS}\left(e_0,b_0\right). \tag{17}$$

As it has been demonstrated by Simar and Wilson (1998, 2000a,b), the bias-corrected estimators under the CRS and VRS assumptions can be computed as:

$$\begin{aligned}\hat{\hat{\phi}}_{CRS}\left(e_0,b_0\right)&=\hat{\phi}_{CRS}\left(e_0,b_0\right)-\hat{BIAS}_B\left(\hat{\phi}_{CRS}\left(e_0,b_0\right)\right)\\&=2\hat{\phi}_{CRS}\left(e_0,b_0\right)-B^{-1}\sum_{b=1}^{B=2000}\hat{\phi}^*_{CRS,b}\left(e_0,b_0\right),\end{aligned} \tag{18}$$

$$\begin{aligned}\hat{\hat{\phi}}_{VRS}\left(e_0,b_0\right)&=\hat{\phi}_{VRS}\left(e_0,b_0\right)-\hat{BIAS}_B\left(\hat{\phi}_{VRS}\left(e_0,b_0\right)\right)\\&=2\hat{\phi}_{VRS}\left(e_0,b_0\right)-B^{-1}\sum_{b=1}^{B=2000}\hat{\phi}^*_{VRS,b}\left(e_0,b_0\right).\end{aligned} \tag{19}$$

Then, the sample variance of the bootstrap values $\hat{\phi}^*_{CRS,b}\left(e_0,b_0\right)$, $\hat{\phi}^*_{VRS,b}\left(e_0,b_0\right)$ provides us with an estimate $\hat{\sigma}^2$ of the variance of $\hat{\phi}_{CRS}\left(e_0,b_0\right)$ and $\hat{\phi}_{VRS}\left(e_0,b_0\right)$:

$$\hat{\sigma}^2=B^{-1}\sum_{b=1}^{B=2000}\left[\hat{\phi}^*_{CRS,b}\left(e_0,b_0\right)-B^{-1}\sum_{b=1}^{B=2000}\hat{\phi}^*_{CRS,b}\left(e_0,b_0\right)\right]^2, \tag{20}$$

$$\hat{\sigma}^2 = B^{-1}\sum_{b=1}^{B=2000}\left[\hat{\phi}^*_{VRS,b}\left(e_0,b_0\right) - B^{-1}\sum_{b=1}^{B=2000}\hat{\phi}^*_{VRS,b}\left(e_0,b_0\right)\right]^2. \quad (21)$$

Finally, we can construct the confidence intervals of the two estimators by using the empirical bootstrap distribution of the pseudo estimates $\hat{\phi}^*_{CRS,b}, \hat{\phi}^*_{VRS,b}, b = 1,...,2000$ in order to find the interval values of $\hat{\alpha}_\alpha$ and $\hat{b}_\alpha$. Then the $(1-\alpha)$ percent confidence interval can be expressed as:

$$\hat{\phi}_{CRS}\left(e_0,b_0\right) + \hat{\alpha}_\alpha \le \phi_{CRS}\left(e_0,b_0\right) \le \hat{\phi}_{CRS}\left(e_0,b_0\right) + \hat{b}_\alpha, \quad (22)$$

$$\hat{\phi}_{VRS}\left(e_0,b_0\right) + \hat{\alpha}_\alpha \le \phi_{VRS}\left(e_0,b_0\right) \le \hat{\phi}_{VRS}\left(e_0,b_0\right) + \hat{b}_\alpha. \quad (23)$$

4.4.2.2 Second stage analysis

Subsequently, in order to incorporate the effect of political donations into our measurement (equation 11), we need to adopt smoothing techniques. Therefore, let $I\left(m_0,h\right)$ be the indices defined as $I\left(m_0,h\right) = \left\{i \middle| \left\|M_i - m_0\right\| \le h/2\right\}$. The empirical version of $H_{B|E,M}\left(\cdot\middle|\cdot,\cdot\right)$ can be estimated as:

$$\hat{H}_{B|E,M}\left(b\middle|e,m\right) = \frac{\sum_{i=1}^{n} I\left(E_i \le e, B_i \ge b, \left\|M_i - m\right\| \le h/2\right)}{\sum_{i=1}^{n} I\left(E_i \le e, \left\|M_i - m\right\| \le h/2\right)} = \frac{\sum_{i\in I(m_0,h)}\left(E_i \le e, B_i \ge b\right)}{\sum_{i\in I(m_0,h)}\left(E_i \le e\right)}, \quad (24)$$

where h is bandwidth applied using the procedure described by Bădin et al. (2010) and based on the least squares cross-validation data driven method (Hall *et al.*, 2004). The IPO performance from the issuers' point of view taking into consideration the influence of lobby and PAC money can then be written as:

$$\hat{\phi}_{CRS}\left(e_0,b_0\middle|m_0\right) = \sup\left\{\phi > 0 \middle| e_0 \ge \sum_{i\in I(m_0,h)}\gamma_i E_i, \phi b_0 \le \sum_{i\in I(m_0,h)}\gamma_i B_i, \gamma_i \ge 0\right\}, \quad (25)$$

$$\hat{\phi}_{VRS}\left(e_0,b_0\middle|m_0\right) = \sup\left\{\phi > 0 \middle| e_0 \ge \sum_{i\in I(m_0,h)}\gamma_i E_i, \phi b_0 \le \sum_{i\in I(m_0,h)}\gamma_i B_i, \sum_{i\in I(m_0,h)}\gamma_i = 1, \gamma_i \ge 0\right\}. \quad (26)$$

Clearly, the LPs presented in equations 12, 13, 25 and 26 suggest that the IPO efficiency scores are measured on the basis that we try to maximize the IPO offer price given the stock price at close of offer. The above estimators are also called output-oriented DEA models. The choice of orientation is crucial and relies on the pre-investigation of those parameters/variables that the decision maker has greater control

over (Coelli et al., 2005). Since we study IPO performance from the issuer's perspective, the decision maker (that is the issuer) can determine to a larger extent the IPO offer price rather than the stock price at close of offer. Accordingly, the above LPs minimize underpricing by indicating the efficient IPOs with efficiency scores equal to 1 $\left(\text{i.e. } \hat{\phi}=1\right)$. Respectively, the inefficient IPOs assume scores of $0 \le \hat{\phi} < 1$.

As a further step, we apply the latest developments by Bădin *et al.* (2012). In this regard, we need to create ratios of conditional to unconditional efficiency scores as:

$$\hat{Q} = \frac{\hat{\phi}\left(e_0, b_0 \middle| m_0\right)}{\hat{\phi}\left(e_0, b_0\right)} \tag{27}$$

Then, by using a nonparametric regression we are able to analyze the behavior of $\hat{Q}$ as a function of lobby and PAC money. Let the nonparametric regression smoothing be presented as:

$$Q_i = g\left(M_i\right) + \varepsilon_i, i = 1, ..., n, \tag{28}$$

where ε_i is the error term with $E\left(\varepsilon_i \middle| M_i\right) = 0$, and g is the mean regression function, since $E\left(Q_i \middle| M_i\right) = g\left(M_i\right)$. In order to estimate the regression function, we follow Jeong et al. (2010) and apply a local linear estimator which is less sensitive to edge effects. Then, the presentation of three-dimensional pictures will reveal the combined effect of lobby and PAC money on IPOs' efficiency levels. An increasing nonparametric regression will indicate a positive effect, whereas a decreasing a negative effect. Overall, the adoption of the fully nonparametric approach offers two main advantages. First, it does not impose any prior assumptions on the functional forms of the examined relationships and, secondly, it enables us to reveal any nonlinear relationships.

4.5 Empirical results

Figure 4.3 presents the empirical frontiers for the offer price versus closing price based on the two samples under the CRS and VRS assumptions. In particular, subfigure 4.3a indicates the empirical frontiers for the full sample (i.e. including overpriced IPOs, N=379); the straight solid (dashed) line represents the empirical frontier under the CRS (VRS) assumption. As expected, overpriced firms have higher efficiency scores and lie

on the two frontiers[16]. Since the assumption of CRS has higher discriminative power than VRS, fewer IPOs are on the CRS frontier. Conversely, under the VRS assumption, we account for scale and heterogeneity effects. As a consequence, more IPOs are deemed efficient and lie on the frontier[17]. Subfigure 4.3b illustrates the empirical frontiers when overpriced IPOs are eliminated from the sample (N=317). The slope of the CRS frontier becomes considerably smaller compared to the previous CRS frontier (subfigure 4.3a, which includes overpriced IPOs).[18] Moreover, in this case, we observe that more IPOs lie on both the CRS and VRS frontiers. This, again, is attributed to the exclusion of the overpriced IPOs. Since in our analysis the minimization of underpricing suggests efficiency, the overpriced IPOs envelope the performance of the other IPOs and are always deemed efficient.

Assessing unconditional efficiency estimates[19] from the full sample, we find that 233 out of the 379 IPOs have efficiency scores above the sample mean (0.706) in the CRS regime. However, under VRS, 222 out of the 379 IPOs exceed the average efficiency score (0.770). Table 4.2 presents the top and lowest 30 performers under the two regimes. The mean efficiency score of the top group under CRS is 0.8426, whereas under VRS it becomes 0.9556. Furthermore, under CRS, only 1 company is deemed to be efficient; under VRS 6 IPOs have an efficiency score equal to 1. The top 30 performers represent 9 different sectors (Consumer Products and Services, Consumer Staples, Energy and Power, Financials, Healthcare, High Technology, Industrials, Materials, Telecommunications). Among these companies, 11 have donated both lobby and PAC money. Looking at the lowest 30 performers, the mean efficiency score under CRS (VRS) is 0.3804 (0.459). Notably, the majority of these issuers operate in the "High Technology" sector. In this respect, our findings complement evidence by Lowry and Schwert (2002) suggesting that high-technology firms tend to experience higher first-day returns. From our efficiency point of view, because such issuers increase the

[16]An IPO which is efficient under the CRS assumption is also efficient under the VRS assumption. However, an IPO efficient under the VRS assumption may not be efficient under the CRS assumption.
[17]The CRS frontier is more robust compared to the VRS frontier and, therefore, fewer IPOs under the CRS assumption are deemed efficient.
[18]Since in our analysis efficiency is represented by the minimization of IPO underpricing, overpriced IPOs will always be efficient and shape the efficient frontier under both the CRS and VRS assumptions.
[19]As has been pointed by Bădin et al. (2012) and Mastromarco and Simar (2014), it is not meaningful to examine the classification of decision making units (DMUs) using conditional efficiency estimates since they are obtained accounting directly for the effect of the exogenous variables. Consequently, we present the original efficiency scores. However, all the results obtained are available on request.

underpricing effect, they significantly impair their efficiency levels. Finally, we note that these 30 IPOs have mostly donated lobby and not PAC money.

Similarly, Table 4.3 presents the top and lowest 30 IPOs from the reduced sample (excluding overpriced IPOs, N=317). Under the VRS assumption, all IPOs lie on the VRS frontier and exhibit an efficiency score of 1. Under CRS, only 3 IPOs are deemed inefficient with the majority of the top performers lying on the CRS frontier. This group comprises 9 sectors (Consumer Staples, Energy and Power, Financials, Healthcare, High Technology, Industrials, Materials, Media and Entertainment and Telecommunications) which appear almost identical to those featured in the full sample. Under the CRS (VRS) assumption, the lowest 30 IPOs have a mean efficiency score of 0.4653 (0.4877). The majority of these issuers come from the 'High Technology' sector, corroborating our previous findings[20]. Again, we observe that among the top performers 10 out of 30 companies have donated PAC money. The respective proportion for the lowest group is only 4 out of 30. This provides further evidence that IPOs with limited underpricing tend to rely on PAC campaigns. However, it should be emphasized that the top performers in the reduced sample include fewer companies which combine lobbying and PAC compared to the full sample. This, in turn, suggests that it is mainly the overpriced IPOs that employ both contribution types.

We subject our findings to an extended sensitivity analysis. Specifically, we apply bootstrap-based inference algorithms, as per Simar and Wilson (1998, 2000b), in order to compute the bias-corrected efficiency estimates alongside with the 95% bootstrap confidence intervals. This approach allows us to capture any variations in the baseline results once the sample bias has been eliminated (Simar and Wilson 2000a). Tables 4.4 and 4.5 report the new estimates under CRS and VRS, respectively, for the top and lowest 30 IPOs in the full sample (N=379), whereas Tables 4.6 and 4.7 extend this analysis to the reduced sample (excluding overpriced IPOs, N= 317)[21]. In an important divergence from the figures presented in Tables 4.2 and 4.3, efficiency may not take the value of 1. Rather, the IPO performance is determined based on the bias-corrected efficiency score; the higher the estimate, the greater the performance.

[20] The majority of high performers within the reduced sample come from companies operating in the "High Technology" sector. This contradicts our previous findings. However, we identify the cause in the exclusion of overpriced IPOs.

[21] For our analysis we have applied 2,000 replications as sugessted by Simar and Wilson (1998, 2000b). Due to the large volume, these results are not tabulated. However, they remain available upon request. Finally, for our bootstrap calculations, we acknowledge the use of the 'FEAR' – package which is integrated in the R-programming language (Wilson, 2008).

More closely, within the full sample and under the CRS assumption (Table 4.4), the highest performers comprise IPOs from 8 different sectors (Consumer Products and Services, Energy and Power, Financials, Healthcare, High Technology, Industrials, Materials and Telecommunications). The lowest performing group also involves 8 sectors (Consumer Products and Services, Financials, Healthcare, High Technology, Industrials, Media and Entertainment, Retail and Telecommunications) with 'High Technology' accounting for the majority of the IPOs. On average, the top (lowest) 30 performers have a bias-corrected efficiency score of 0.8758 (0.3682). In a similar spirit with our previous analysis, 6 out of the 30 top performing companies have donated PAC money; the respective proportion for the lowest performers is only 2 out of 30.

Under the VRS assumption (Table 4.5), the highest performing group includes IPOs from 10 sectors (Financials, Energy and Power, Consumer Staples, Consumer Products and Services, Telecommunications, Real Estate, Materials, Industrials, High Technology and Healthcare). Appearing less diverse, the lowest performing group comprises 7 sectors (Consumer Products and Services, Telecommunications, Retail, Industrials, High Technology, Healthcare and Financials). The top (lowest) 30 performers have a mean value of bias-corrected efficiency score of 0.9216 (0.4389). Importantly, 11 of the top IPOs have been active in both lobbying and PAC. This comes in striking contrast to the bottom group whereby 1 company employs both contribution types out of a total of 3 PAC donors. Finally, the VRS regime confirms that the lowest efficiency levels come from companies in the High Technology sector.

Table 4.6 presents the bias-corrected results under the CRS assumption for the top and lowest 30 IPOs of the reduced sample (excluding overpriced IPOs, N=317). With a slightly broader scope than the respective full sample group, the highest performers now include IPOs from 9 sectors (Consumer Staples, Energy and Power, Financials, Healthcare, High Technology, Industrials, Materials, Media and Entertainment and Telecommunications), whereas the group of the lowest performers comprises 8 sectors (Consumer Products and Services, Financials, Healthcare, High Technology, Industrials, Media and Entertainment, Retail and Telecommunications). In addition, the top 30 performers have a mean bias-corrected efficiency score of 0.9993; the respective statistic for the lowest 30 is 0.4647. Again, PAC donors and companies that complement lobbying with PAC campaigns appear more likely to be listed within the top 30 rather than in the bottom group.

Under the VRS assumption (Table 4.7), the group of the highest performers includes IPOs from 10 sectors (Consumer Staples, Energy and Power, Financials, Healthcare, High Technology, Industrials, Materials, Media and Entertainment, Retail and Telecommunications), whereas the bottom group is associated with 7 sectors (Consumer Products and Services, Financials, Healthcare, High Technology, Industrials, Retail, and Telecommunications). On average, the top 30 performers exhibit a bias-corrected efficiency score of 0.9969; the lowest 30 a score of 0.4809. Invariably, the top group outnumbers the bottom one in firms donating PAC money with 12 and 4 IPOs, respectively. It becomes also evident that the lowest efficiency levels systematically relate to High Technology. Overall, the bias-corrected results for both samples and returns to scale assumptions lend strong support to our baseline findings.

Conceivably, setting off to analyze the differential effect of lobbying and PAC on IPO performance is a meaningful endeavour only to the extent that the above efficiency scores would differ in the absence of either type of expenditure. To elucidate the association with the issuer's ability to minimize underpricing, we conduct the bootstrap-based nonparametric test proposed by Li et al. (2009) and report the results in Table 4.8[22]. The upper part of the table engages the full sample for the CRS and VRS assumptions. With $f(\cdot)$ and $g(\cdot)$ denoting the density functions of unconditional and conditional efficiency estimates, respectively, contributions are shown to produce an effect that fulfils all conventional levels of significance. The lower part extends this analysis to the reduced sample and corroborates further the relationship. Evidently, lobby and PAC money alter issuers' ability to evaluate IPOs and this reflects upon the estimated efficiency levels. Given the strength of the association, we can now turn to disentangling the effect by donation type and investigate the optimal appropriation of an issuer's political budget.

Figure 4.4 illustrates graphically the effect of lobby and PAC contributions on IPO efficiency levels as surfaces in a three-dimensional space (c.f. Bădin *et al.*, 2012). Drawing evidence from the full sample (N=379 IPOs), subfigures "a", "c", "e" and "g" present the results from the nonparametric regression analysis under the CRS assumption; subfigures "b", "d", "f" and "h" portray the respective findings under

[22] Following Simar and Zelenyuk (2006), we trim the estimates that are equal to unity (Algorithm I) and perform the bootstrap Li et al. (2009) test. Hence, our results are unaffected by sampling variation or noise from the DEA estimation.

VRS[23]. Subfigure "a" reveals a nonlinear relationship between lobbying and IPO performance, resembling an inverted "U"-shape. For lower levels of lobbying money, the effect on efficiency is positive up to a certain threshold value. Beyond that point a negative association arises, indicated by a downwards slopping nonparametric regression line. An inverted "U"-shape relationship[24] is also evident in VRS (subfigure "b"). In the case of PAC, we observe an increasing nonlinear nonparametric regression line (subfigure "a"), showing a positive influence on IPO efficiency levels. Under VRS, the effect is more pronounced, indicated by a steeper increasing nonparametric regression line. Modifying further our sampling to account for an issuer's particular economic sector, new interesting patterns emerge.

Indeed, focusing on IPOs from the "Energy and Power" sector, we observe that the effects are not uniform. Under both CRS (subfigure "c") and VRS (subfigure "d"), PAC donations have a nonlinear negative effect on efficiency levels. However, lobby money appears to exert a highly positive influence. In both cases, the nonlinearities suggest that companies operating in this sector are better off with lobbying rather than PAC expenditure. In the Financial sector, under the CRS assumption (subfigure "e") lobbying has a "U"-shape association with efficiency level, whereas PAC accounts for a positive effect, indicated by a nonlinear increasing nonparametric regression line. However, when we assume VRS (subfigure "f"), the effect of lobbying turns to neutral, while the effect of PAC exhibits a light form of an inverted "U"-shape relationship. Therefore, the influence of the exogenous factors is also attributable to scale effects[25]. Accordingly, lobby and PAC contributions may have different implications for larger companies in the sector compared to smaller ones. Finally, the Industrial sector, under both CRS (subfigure "g") and VRS (subfigure "h") reveals a positive effect for PAC contributions.[26] However, lobbying gives rise to heterogeneous patterns. Specifically, the CRS assumption yields a negative effect, whereas under VRS there is a "U"-shape relationship, suggesting that when we account for offer price levels the effect can vary.

In a similar approach, Figure 4.5 describes the effect of lobby and PAC on IPO efficiency based on the reduced sample (N=317). Subfigures "a" and "b" present the

[23] Subfigures "a" and "b" present the effect of lobby and PAC money for all IPOs of the full sample. The rest subfigures illustrate the effect based on sub-sampling analysis for three sectors (Financials, Energy and Power and Industrials). The choice is based on the fact that the highest levels of donations for lobby and PAC money come from companies operating in these sectors (see also Figure 1).

[24] Since the CRS measurement has a higher discriminative power than VRS, the examined effects in some cases may be more emphatic under the CRS assumption.

[25] In our case, the different size is attributed to differences in IPO offer price.

[26] This positive effect is more pronounced under CRS.

overall results. Under CRS, lobbying produces a "U"-shape relationship, whereas under VRS the association becomes negative. This suggests that scale effects can drastically alter the impact on issuers' efficiency. Conversely, the overall PAC effect remains positive under both assumptions, indicated by an increasing nonlinear regression line. This is consistent with the full sample results which are proven robust to the inclusion/exclusion of overpriced IPOs.

Drawing separate evidence from the Energy and Power sector, we observe that political expenditure exerts a similar influence under both CRS (subfigure "c") and VRS (subfigure "d"). In particular, lobby money has a nonlinear positive effect on IPO efficiency levels, whereas PAC has a nonlinear negative effect. The Financial sector (subfigure "f") demonstrates that under VRS the effects of both lobby and PAC money are almost identical with those previously examined for the full sample. However, under CRS (subfigure "e") lobbying gives rise to an inverted "U"-shape, whereas previously it formed a "U"-shape. In this case, the lobbying influence remains conditional on sampling and implies that the CRS assumption in some industries may be unrealistic. Finally, subfigure "g" engages firms operating in the Industrial sector. In overall terms, the results are robust since they agree with our earlier evidence, suggesting a negative association with lobbying and a positive one with PAC money. In addition, under the assumption of VRS (subfigure "h") the effect of PAC money is positive as it has also been for the full sample; however, lobbying leads to a "U"-shape relationship, suggesting a negative effect for lower levels of lobbying contributions and a positive effect for higher levels. This contradicts our previous findings which portrayed a monotonically negative effect for lobbying. Once again, the assumption of VRS does not produce robust results.

Conclusively, the evidence from both samples converges on the positive influence of PAC; the dollar intensity of these campaigns tends to constrain underpricing. Given that IPO firms channel significantly larger amounts towards lobbying than PAC, our findings suggest that the effects of such donations are not deterministic to IPO performance and depend heavily on the particular sectors that the companies operate in. Likewise, scale effects can determine the effect of lobby and PAC money on IPO efficiency levels. Invariably, the relationships are highly nonlinear, justifying our fully nonparametric treatment.

4.6 Discussion

Overall, our results show that IPOs with reduced underpricing tend to come from companies which have employed PAC campaigns and that companies with overpriced IPOs are mainly those that donate both lobby and PAC money. There is a nonlinear relationship between lobby money and IPO performance (the inverted "U"-shape).

PAC contributions produce a robustly positive effect across both full and reduced samples; the inclusion/exclusion of overpriced IPOs does not alter the effect of PAC money. This is apparent in the IPOs of Industrial firms (where, in contrast, the influence of lobbying assumes a variety of patterns). Non-coincidentally, this sector includes industries known for their high political expenditure such as transport equipment and defense system manufacturers, for which historically the U.S. government is the single most influential buyer.[27]

Lobbying, as a message-oriented activity, lends itself to circumstances where the elements of communication and timely interactions with legislators are crucial. The Energy and Power sector, which is extensively regulated, illustrates this notion by a decisive advantage for lobbying IPOs. Commonly under public scrutiny for safety and environmental concerns, these firms must produce compelling arguments about the way that their operations affect other stakeholders - especially if, as noted by Milyo (2001), an incumbent's objective function revolves around the issues of re-election, career progression within Congress and ideology promotion. Where discontent is caused among a candidate's constituents, a firm not only depletes its political capital but may also trigger enactment of constraining legislation.

For the Financial sector, however, the analysis reveals patterns which lack robustness as well as a definite direction. This is intriguing, given the large amounts that many of these firms spend[28], the complex institutional framework and the massive assistance which the federal government has provided during periods of turbulence. The idiosyncrasy of financial organizations may account for the blurred effect. Notwithstanding the high degree of regulation and frequent government intervention,

[27] IBISWorld reports that in 2013, the top contributing defence and aerospace firms had 56.1% of turnover coming from federal contracts, while in some cases the figure is around 90%.

[28] Approximately 16.5% of total political expenditure over the last five years, though because this sector mainly comprises large businesses, political expenditure is not a large proportion of each company's expenditure.

operators in this sector are not as dependent on political favoritism for the success of their businesses as is the case, for example, with regulated industries from the Industrial sector. Financial institutions are essential to economic activity and exert de facto political influence, obviating the need for contributions.

4.7 Conclusion

Political connections formed via monetary contributions constitute a potentially powerful mechanism for reducing IPO underpricing. To evaluate this proposition, we require that the methodological tools in the pertinent literature be upgraded. Our contribution, in this respect, is twofold. First, we show how traditional shortcomings of IPO performance assessment can be overcome through the application of a relative efficiency measure in a probabilistic framework. Having resolved the problem of comparability among IPO returns, we subsequently analyze the influence of lobbying and PAC contributions in a fully nonparametric manner.

We find a robustly positive effect of PAC money on IPO efficiency levels whereas the effect of lobbying is more nuanced. Our sector analysis pinpoints circumstances under which contributions intensity can not only squander corporate cash but also impair efficiency levels. The implications for prospective issuers are clear: political donations do not constitute a one-size-fits-all solution but can be effective when the distinct type of connectedness reinforces the firm's position within its competitive environment, as with the lobbying contributions of Energy and Power firms.

Overall, there are unique patterns for each economic sector but a common theme emerges in the important nonlinearities in the relationship of political contributions with IPO efficiency. On this basis, the nonparametric frontier analysis offers a decisive advantage by allowing the effects to unfold in an unbiased manner. Finally, although our interest here is in IPOs, the approach is more generally applicable in finance where relationships of influence are suspected.

Table 4.1: Summary statistics and IPO sample description

Our sample consists of 379 U.S. IPOs for the period January 1, 1998 to December 31, 2014 extracted from the Securities Data Company (SDC) database. IPOs with an offer price smaller than $ 5 per share (penny stocks), reverse leveraged buyouts, limited partnerships, American depositary receipts (ADRs), foreign-based firms, real estate investment trusts (REITs), closed-end funds, royalty trusts and other special purpose investment vehicles are excluded from the sample. The issuing firms have been manually investigated in the electronic platform of the Center for Responsive Politics and the archives of the Federal Election Commission for evidence of lobbying and PAC contributions, respectively. All figures are in 12/2014 U.S. dollars. We rely on the SDC database for IPO offer prices, whereas aftermarket prices are sourced from CRSP. The lower part of the table distributes the IPOs across the 12 (out of 14) Thomson Reuters' proprietary macro-level industry classifications which we have been able to associate with political expenditure.

Variable	Mean	Median	Std Dev	Minimum	Maximum	*N*	Percentage (%)
Offer price	17.29	16.00	8.81	5.00	97.00		
1st aftermarket close	21.56	18.11	18.55	5.00	280.00		
Lobby money	279,268	80,000	788,021	0.00	9,570,000		
PAC money	26,292	0.00	84,326	0.00	780,000		
High Technology						78	21
Healthcare						72	19
Financials						49	13
Energy and Power						27	7
Materials						27	7
Industrials						33	9
Consumer Products & Services						27	7
Media and Entertainment						17	4
Retail						14	4
Real Estate						3	1
Telecommunications						21	6
Consumer Staples						11	3
Total						379	100

Figure 4.1: Distribution of lobby and PAC money per sector

Subfigure 1a presents the per sector percentages of lobbying contributions made by 379 U.S. IPO firms over the period January 1, 1998 to December 31, 2014. Subfigure 1b presents the respective percentages for PAC money.

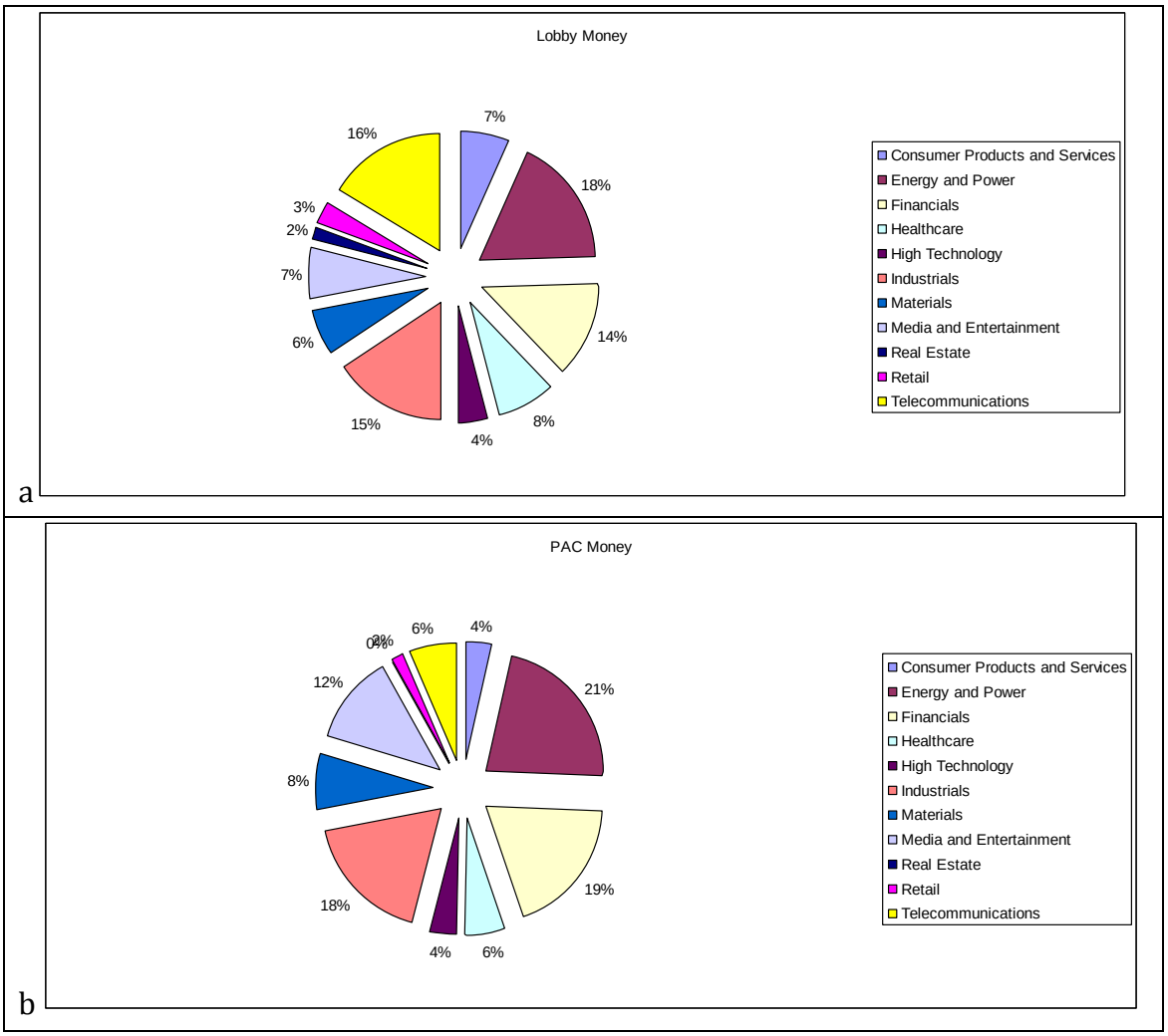


Figure 4.2: Graphical representation of the theoretical frontiers

The solid line presents the IPOs' theoretical frontier under CRS. The dashed line presents the IPOs' theoretical frontier under VRS. The black dots indicated by the letters C, B, L and H refer to the theoretical positions of hypothetical IPOs. The letters F and G represent distance points.

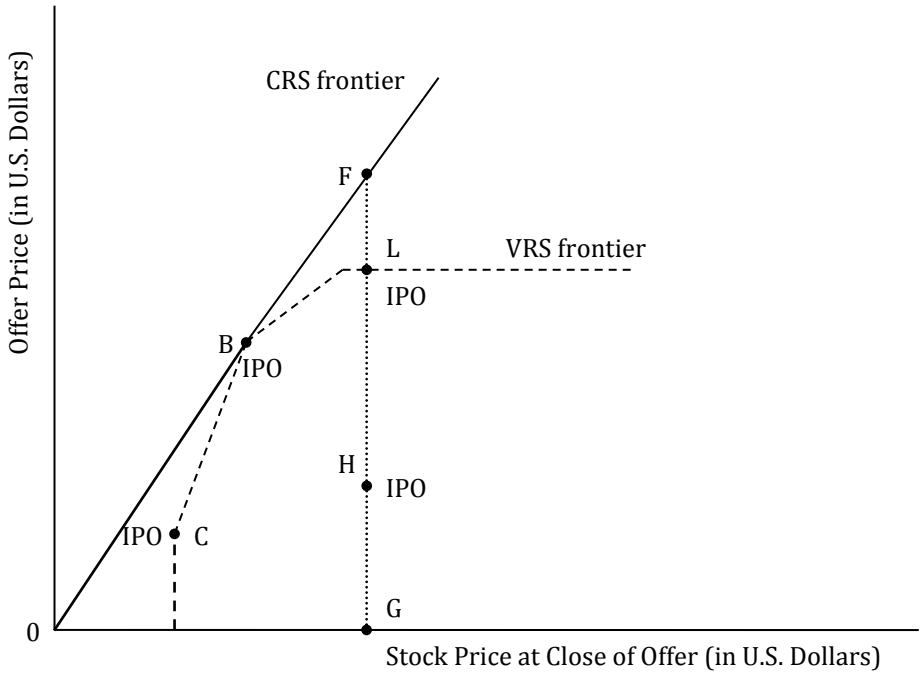
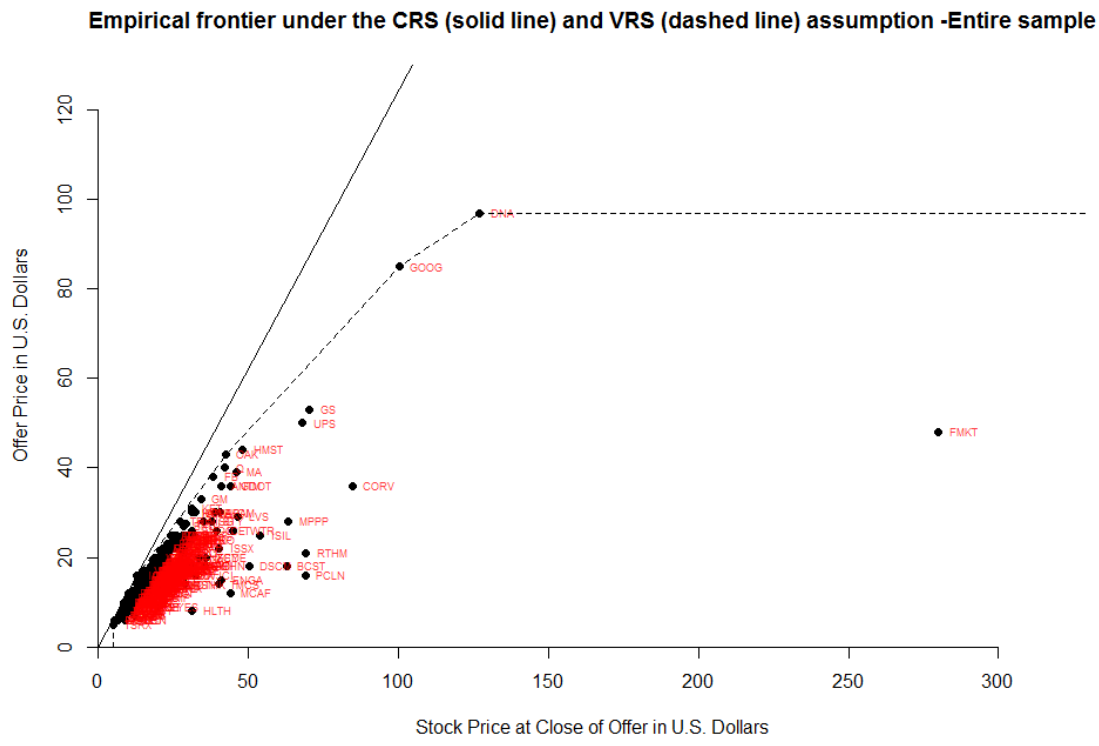
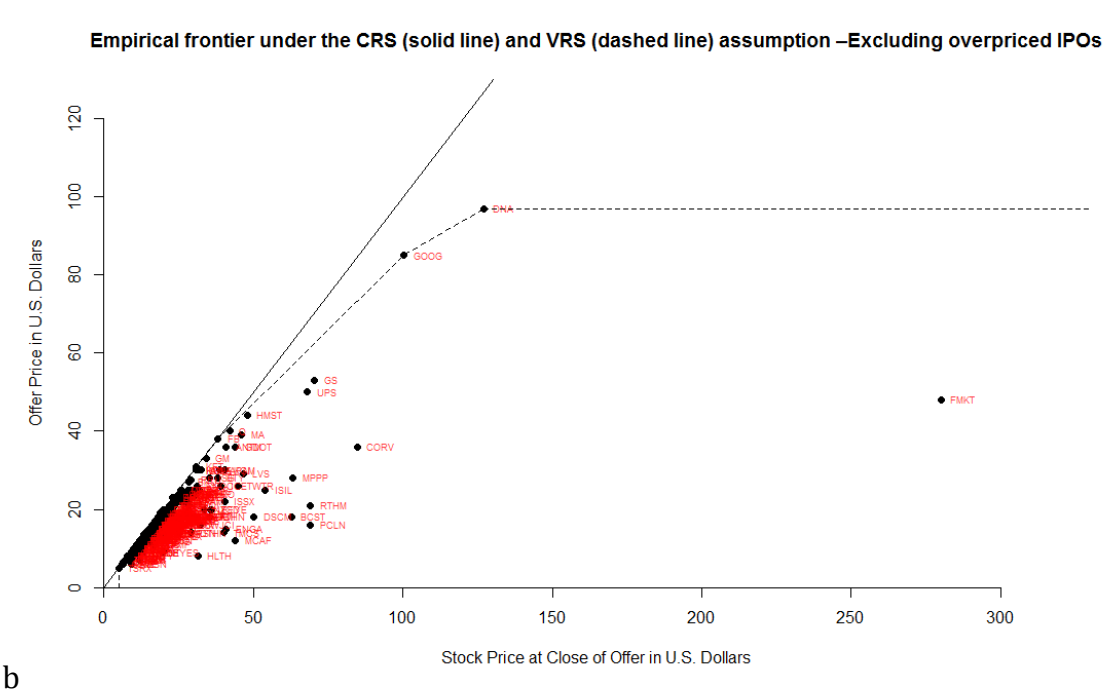


Figure 4.3: Graphical representation of the empirical frontiers

Subfigure 3a presents the estimated empirical frontier for all 379 IPOs in our sample. Subfigure 3b presents the empirical frontier for the 317 IPOs (i.e. we have excluded the overpriced IPOs). The solid line indicates the empirical frontier under the CRS assumption, whereas the dashed line indicates the empirical frontier under the VRS assumption.

a





b

Table 4.2: Efficiency analysis- 379 IPOs: top and worst performers

We present the top and worst 30 IPOs for the full sample (N=379) in terms of their ability to minimize underpricing. We sort the IPOs based on their efficiency performance under the VRS assumption in order to account for differences between sectors. When an IPO is efficient (i.e. efficiency score equal to 1.000) under the CRS assumption, it is also efficient under the VRS assumption. Additionally, we identify the IPO firm's sector alongside with the lobby and PAC donation amounts. The main descriptive statistics for the efficiency estimates, lobby and PAC amounts are tabulated below each IPO group.

Listing Date	Company	Ticker	CRS	VRS	Lobby Money	PAC Money	Sector
07/29/2014	ContraFect Corp	CFRXU	0.9249	1.0000	20000	0	Healthcare
04/12/2012	Oaktree Capital Group	OAK	0.8147	1.0000	260000	0	Financials
08/03/2010	Trius Therapeutics	TSRX	0.8031	1.0000	60000	0	Healthcare
11/08/2007	ICx Technologies	ICXT	1.0000	1.0000	1420000	85000	High Technology
08/19/2004	Google	GOOG	0.6803	1.0000	180000	0	High Technology
07/20/1999	Genentech	DNA	0.6134	1.0000	1040000	5000	Healthcare
05/10/2013	BioAmber	BIOA	0.9561	0.9828	80000	0	Materials
07/24/2014	Pfenex	PFNX	0.9092	0.9807	180000	0	Healthcare
10/28/2009	Addus HomeCare	ADUS	0.9460	0.9715	40000	0	Healthcare
05/18/2012	Facebook	FB	0.7983	0.9694	1350000	270000	High Technology
02/03/2004	TRW Automotive Holdings	TRW	0.8298	0.9647	0	675000	Industrials
04/10/2014	Ally Financial	ALLY	0.8373	0.9552	2110000	0	Financials
05/05/2005	Lazard	LAZ	0.8366	0.9545	290000	0	Financials
05/24/2006	Vonage Holdings	VG	0.9194	0.9536	805000	150000	Telecommunications
07/30/1999	Biopure	BPUR	0.9402	0.9526	20000	0	Healthcare
06/12/2001	Kraft Foods	KFT	0.8031	0.9512	0	59500	Consumer Staples
06/19/2001	The Princeton Review	REVU	0.9299	0.9470	60000	0	Consumer Products and Services
10/08/2009	Omeros	OMER	0.9200	0.9427	60000	0	Healthcare
04/10/2014	Adamas Pharmaceuticals	ADMS	0.9172	0.9379	10000	0	Healthcare
05/09/2013	Quintiles Transnational	Q	0.7629	0.9358	40000	0	Consumer Products and Services
02/10/2012	Homestreet	HMST	0.7362	0.9349	5000	2350	Financials
03/08/2007	Clearwire	CLWR	0.8155	0.9343	80000	0	High Technology
04/23/2008	American Water Works	AWK	0.8382	0.9314	300000	100000	Energy and Power
03/22/2013	West Corp	WSTC	0.8517	0.9305	40000	0	Consumer Products and Services
11/18/2010	General Motors	GM	0.7752	0.9294	9570000	284500	Industrials
11/17/2011	Delphi Automotive	DLPH	0.8284	0.9263	396429	40500	Industrials
05/03/1999	CONSOL Energy	CNX	0.9018	0.9259	550000	226250	Materials
03/09/2011	HCA Holdings	HCA	0.7767	0.9200	200000	268250	Healthcare
02/11/2011	Kinder Morgan	KMI	0.7760	0.9193	190000	0	Energy and Power
12/13/2013	Cheniere Energy Partners	CQH	0.8357	0.9165	2630000	201800	Energy and Power
	mean		*0.8426*	*0.9556*	*732,880.9667*	*78,938.3333*	
	std		*0.0860*	*0.0284*	*1,793,480.2481*	*147,547.0496*	
	min		*0.6134*	*0.9165*	*0.0000*	*0.0000*	
	max		*1.0000*	*1.0000*	*9,570,000.0000*	*675,000.0000*	
07/18/2014	SAGE Therapeutics	SAGE	0.4803	0.5666	70000	0	Healthcare
06/22/1999	Ramp Networks	RAMP	0.5274	0.5622	20000	0	High Technology
03/09/2005	International Sec Exchange	ISE	0.4755	0.5618	0	6000	Financials
06/17/1998	software.net	SWNT	0.5455	0.5499	20000	0	High Technology

07/24/2013	Agios Pharmaceuticals	AGIO	0.4622	0.5480	40000	0	Healthcare
12/13/2012	SolarCity	SCTY	0.5450	0.5475	230000	2000	Industrials
12/19/2007	Orion Energy Systems	OESX	0.4877	0.5457	100000	0	Industrials
07/20/2011	Zillow	Z	0.4490	0.5413	40000	0	High Technology
05/29/2014	Resonant	RESN	0.5295	0.5409	40000	0	High Technology
09/20/2013	FireEye	FEYE	0.4462	0.5382	120000	0	High Technology
03/23/1998	ISS Group	ISSX	0.4376	0.5345	80000	0	High Technology
01/30/1998	VeriSign	VRSN	0.4409	0.5079	60000	0	High Technology
12/10/1999	Freemarkets	FMKT	0.1377	0.4948	80000	0	Consumer Products and Services
09/25/2013	Foundation Medicine	FMI	0.4089	0.4923	80000	0	Healthcare
09/20/2007	athenahealth	ATHN	0.4072	0.4904	40000	0	High Technology
07/27/2000	Corvis	CORV	0.3413	0.4886	40000	0	Telecommunications
02/25/2000	Intersil Holding	ISIL	0.3718	0.4862	80000	0	High Technology
07/22/1999	MP3.COM	MPPP	0.3552	0.4814	40000	0	High Technology
08/18/2000	WJ Communications	WJCI	0.3984	0.4743	0	1500	High Technology
12/12/2013	Kindred Biosciences	KIN	0.4704	0.4723	1940000	0	Healthcare
02/25/2000	DigitalThink	DTHK	0.3877	0.4551	40000	0	Consumer Products and Services
11/19/2014	Second Sight Med Prod	EYES	0.3619	0.3999	10000	0	Healthcare
07/28/1999	drugstore.com	DSCM	0.2877	0.3696	140000	0	Retail
07/20/1999	Engage Technologies	ENGA	0.2938	0.3595	20000	0	High Technology
12/03/1998	Ticketmaster Online-CitySearch	TMCS	0.2793	0.3411	36000	0	High Technology
04/07/1999	Rhythms NetConnections	RTHM	0.2440	0.3366	20000	0	Telecommunications
07/17/1998	Broadcast.Com	BCST	0.2304	0.3117	20000	0	High Technology
12/01/1999	McAfee.com	MCAF	0.2190	0.2717	20000	0	High Technology
03/29/1999	priceline.com	PCLN	0.1862	0.2569	80000	0	High Technology
02/10/1999	Healtheon	HLTH	0.2047	0.2429	30000	0	Healthcare
	mean		*0.3804*	*0.4590*	*117,866.6667*	*316.6667*	
	std		*0.1152*	*0.1005*	*347,410.0959*	*1,163.2545*	
	min		*0.1377*	*0.2429*	*0.0000*	*0.0000*	
	max		*0.5455*	*0.5666*	*1,940,000.0000*	*6,000.0000*	

Table 4.3: Efficiency analysis- 317 IPOs: top and worst performers

We present the top and worst 30 IPOs for the reduced sample (317 underpriced IPOs) in terms of their ability to minimize underpricing. We sort the IPOs based on their efficiency performance under the VRS assumption in order to account for differences between sectors. When an IPO is efficient (i.e. efficiency score equal to 1.000) under the CRS assumption, it is also efficient under the VRS assumption. Additionally, we identify the IPO firm's sector alongside with the lobby and PAC donation amounts. The main descriptive statistics of the efficiency estimates, lobby and PAC amounts are tabulated below each IPO group.

Listing Date	Company	Ticker	CRS	VRS	Lobby Money	PAC Money	Sector
07/31/2014	Marinus Pharmaceuticals	MRNS	1.0000	1.0000	40000	0	Healthcare
12/12/2013	Kindred Biosciences	KIN	1.0000	1.0000	1940000	0	Healthcare
03/20/2013	Tetraphase Pharmaceuticals	TTPH	1.0000	1.0000	60000	0	Healthcare
05/18/2012	Facebook	FB	0.9940	1.0000	1350000	270000	High Technology
06/24/2011	KiOR	KIOR	1.0000	1.0000	120000	0	Energy and Power
12/17/2010	Fortegra Financial	FRF	1.0000	1.0000	150000	0	Financials
11/19/2010	Aeroflex Holding	ARX	1.0000	1.0000	8700	0	High Technology
08/03/2010	Trius Therapeutics	TSRX	1.0000	1.0000	60000	0	Healthcare
04/22/2010	Codexis	CDXS	1.0000	1.0000	190000	0	Materials
11/16/2007	Internet Brands	INET	1.0000	1.0000	80000	0	High Technology
02/09/2007	VeriChip	CHIP	1.0000	1.0000	120000	0	Telecommunications
12/14/2006	NewStar Financial	NEWS	1.0000	1.0000	0	15000	Financials
11/02/2005	Cbeyond Communications	CBEY	1.0000	1.0000	100000	0	Telecommunications
08/17/2005	Rockwood Holdings	ROC	1.0000	1.0000	140000	0	Materials
06/14/2005	Premium Standard Farms	PORK	1.0000	1.0000	40000	18075	Consumer Staples
02/10/2005	Nasdaq Stock Market	NDAQ	1.0000	1.0000	0	51400	Financials
01/21/2005	ViaCell	VIAC	1.0000	1.0000	20000	0	Healthcare
08/19/2004	Google	GOOG	0.8471	1.0000	180000	0	High Technology
08/05/2004	RightNow Technologies	RNOW	1.0000	1.0000	110000	0	High Technology
07/30/2004	EnerSys	ENS	1.0000	1.0000	0	150000	High Technology
05/24/2004	Genworth Financial	GNW	1.0000	1.0000	180000	0	Financials
08/02/2001	Bunge	BG	1.0000	1.0000	120000	0	Consumer Staples
06/12/2001	Kraft Foods	KFT	1.0000	1.0000	0	59500	Consumer Staples
03/15/2001	SureBeam Corp(Titan Corp)	SURE	1.0000	1.0000	220000	500	Industrials
07/29/1999	Lennox International	LII	1.0000	1.0000	0	8000	Industrials
07/28/1999	American Nat. Can Group	CAN	1.0000	1.0000	0	7300	Materials
07/20/1999	Engage Technologies	ENGA	0.7638	1.0000	20000	0	High Technology
07/22/1998	USEC	USU	1.0000	1.0000	60000	0	Materials
05/27/1998	Capstar Broadcasting	CRB	1.0000	1.0000	60000	0	Media and Entertainment
05/11/1998	MGC Communications	MGCX	1.0000	1.0000	0	5500	Telecommunications
	mean		*0.9868*	*1.0000*	*178,956.6667*	*19,509.1667*	
	std		*0.0505*	*0.0000*	*411,343.9300*	*55,975.2033*	
	min		*0.7638*	*1.0000*	*0.0000*	*0.0000*	
	max		*1.0000*	*1.0000*	*1,940,000.0000*	*270,000.0000*	
02/08/2007	Accuray	ARAY	0.6322	0.6322	200000	0	Healthcare
10/06/1999	PlanetRx.com	PLRX	0.6154	0.6154	30000	0	Retail

12/19/2007	Orion Energy Systems	OESX	0.6072	0.6072	100000	0	Industrials
11/07/2013	Twitter	TWTR	0.5791	0.6040	90000	0	High Technology
05/17/1999	Nextcard	NXCD	0.5970	0.5984	20000	0	Financials
07/18/2014	SAGE Therapeutics	SAGE	0.5980	0.5980	70000	0	Healthcare
03/09/2005	International Sec Exchange	ISE	0.5921	0.5921	0	6000	Financials
12/12/2013	ARAMARK Holdings	ARMK	0.5858	0.5858	200000	2000	Retail
07/24/2013	Agios Pharmaceuticals	AGIO	0.5754	0.5756	40000	0	Healthcare
07/20/2011	Zillow	Z	0.5591	0.5615	40000	0	High Technology
09/20/2013	FireEye	FEYE	0.5556	0.5580	120000	0	High Technology
03/23/1998	ISS Group	ISSX	0.5448	0.5552	80000	0	High Technology
01/30/1998	VeriSign	VRSN	0.5490	0.5490	60000	0	High Technology
09/25/2013	Foundation Medicine	FMI	0.5092	0.5112	80000	0	Healthcare
09/20/2007	athenahealth	ATHN	0.5070	0.5091	40000	0	High Technology
02/25/2000	Intersil Holding	ISIL	0.4630	0.5007	80000	0	High Technology
08/18/2000	WJ Communications	WJCI	0.4961	0.4967	0	1500	High Technology
12/10/1999	Freemarkets	FMKT	0.1714	0.4948	80000	0	Consumer Products and Services
07/27/2000	Corvis	CORV	0.4249	0.4919	40000	0	Telecommunications
07/22/1999	MP3.COM	MPPP	0.4423	0.4914	40000	0	High Technology
02/25/2000	DigitalThink	DTHK	0.4828	0.4828	40000	0	Consumer Products and Services
11/19/2014	Second Sight Med Prod	EYES	0.4507	0.4507	10000	0	Healthcare
07/28/1999	drugstore.com	DSCM	0.3582	0.3822	140000	0	Retail
07/20/1999	Genentech	DNA	0.3659	0.3741	1040000	5000	Healthcare
12/03/1998	Ticketmaster Online	TMCS	0.3478	0.3542	36000	0	High Technology
04/07/1999	Rhythms NetConnections	RTHM	0.3038	0.3421	20000	0	Telecommunications
07/17/1998	Broadcast.Com	BCST	0.2869	0.3183	20000	0	High Technology
12/01/1999	McAfee.com	MCAF	0.2727	0.2832	20000	0	High Technology
03/29/1999	priceline.com	PCLN	0.2319	0.2611	80000	0	High Technology
02/10/1999	Healtheon	HLTH	0.2549	0.2550	30000	0	Healthcare
	mean		*0.4653*	*0.4877*	*94,866.6667*	*483.3333*	
	std		*0.1331*	*0.1142*	*185,565.8138*	*1,441.2838*	
	min		*0.1714*	*0.2550*	*0.0000*	*0.0000*	
	max		*0.6322*	*0.6322*	*1,040,000.0000*	*6,000.0000*	

Table 4.4: Bootstrap efficiency analysis - 379 IPOs: top and worst performers (CRS assumption)

We present the top and worst 30 IPOs for the full sample (N=379) in terms of their ability to minimize underpricing. We sort the IPOs based on their bootstrap efficiency performance under the CRS assumption. High bootstrap efficiency levels indicate high IPO performance. Additionally, we identify the IPO firm's sector alongside with the lobby and PAC donation amounts. Also we present the 95% bootstrap confidence intervals of the estimations alongside with the estimated bias and its standard deviation. Finally, the main descriptive statistics are tabulated below each IPO group.

Listing Date	Company	Ticker	Bias Corrected CRS	Estimated Bias	STD of the estimated Bias	Lower Bound	Upper Bound	Lobby Money	PAC Money	Sector
11/08/2007	ICx Technologies	ICXT	0.9861	0.0139	0.0002	0.9583	0.9997	1420000	85000	High Technology
05/10/2013	BioAmber	BIOA	0.9428	0.0133	0.0001	0.9162	0.9558	80000	0	Materials
10/28/2009	Addus HomeCare	ADUS	0.9327	0.0132	0.0001	0.9064	0.9455	40000	0	Healthcare
07/30/1999	Biopure	BPUR	0.9271	0.0131	0.0001	0.9009	0.9399	20000	0	Healthcare
06/19/2001	The Princeton Review	REVU	0.9170	0.0129	0.0001	0.8911	0.9296	60000	0	Consumer Products and Services
07/29/2014	ContraFect	CFRXU	0.9121	0.0128	0.0001	0.8863	0.9246	20000	0	Healthcare
10/08/2009	Omeros	OMER	0.9071	0.0128	0.0001	0.8815	0.9196	60000	0	Healthcare
05/24/2006	Vonage Holdings	VG	0.9067	0.0127	0.0001	0.8810	0.9191	805000	150000	Telecommunications
04/10/2014	Adamas Pharmaceuticals	ADMS	0.9045	0.0127	0.0001	0.8789	0.9169	10000	0	Healthcare
07/24/2014	Pfenex	PFNX	0.8964	0.0127	0.0001	0.8711	0.9087	180000	0	Healthcare
05/03/1999	CONSOL Energy	CNX	0.8891	0.0126	0.0001	0.8640	0.9014	550000	226250	Materials
05/02/2014	SCYNEXIS	SCYX	0.8799	0.0124	0.0001	0.8550	0.8920	40000	0	Healthcare
09/29/2005	Avalon Pharmaceuticals	AVRX	0.8763	0.0123	0.0001	0.8515	0.8883	120000	0	Healthcare
06/27/2007	AuthenTec	AUTH	0.8711	0.0123	0.0001	0.8465	0.8831	36000	0	High Technology
02/05/2014	Genocea Biosciences	GNCA	0.8639	0.0122	0.0001	0.8395	0.8758	110000	0	Healthcare
10/12/2009	RailAmerica	RA	0.8639	0.0122	0.0001	0.8395	0.8758	120000	51635	Industrials
07/29/2010	Molycorp	MCP	0.8629	0.0121	0.0001	0.8385	0.8747	290000	0	Materials
07/25/2007	Rex Energy	REXX	0.8600	0.0121	0.0001	0.8357	0.8718	80000	0	Energy and Power
06/18/2010	Motricity	MOTR	0.8553	0.0120	0.0001	0.8311	0.8670	40000	0	High Technology
10/03/2012	LifeLock	LOCK	0.8526	0.0120	0.0001	0.8285	0.8643	240000	0	High Technology
11/15/2006	Emergent BioSolutions	EBS	0.8461	0.0119	0.0001	0.8222	0.8577	2000000	300000	Healthcare
10/25/2013	Endurance Intl Grp Hldg	EIGI	0.8447	0.0119	0.0001	0.8208	0.8563	120000	0	High Technology
05/15/2007	Continental Resources	CLR	0.8424	0.0119	0.0001	0.8186	0.8539	60000	0	Energy and Power
02/01/2012	US Silica Holdings	SLCA	0.8415	0.0118	0.0001	0.8177	0.8530	20000	0	Materials
03/22/2013	West Corp	WSTC	0.8397	0.0119	0.0001	0.8160	0.8513	40000	0	Consumer Products and Services
10/04/2012	Berry Plastics Group	BERY	0.8335	0.0118	0.0001	0.8099	0.8449	160000	0	Materials
11/18/2011	Intermolecular	IMI	0.8335	0.0118	0.0001	0.8099	0.8449	30000	0	High Technology
05/15/2007	Pinnacle Gas Resources	PINN	0.8297	0.0117	0.0001	0.8062	0.8411	20000	0	Energy and Power
07/24/2013	Heat Biologics	HTBX	0.8276	0.0116	0.0001	0.8042	0.8389	20000	0	Healthcare
03/29/2011	Apollo Global Management	APO	0.8268	0.0116	0.0001	0.8034	0.8381	932984	118100	Financials
	mean		*0.8758*	*0.0123*	*0.0001*	*0.8510*	*0.8878*	*257466.1333*	*31032.8333*	
	std		*0.0400*	*0.0006*	*0.0000*	*0.0389*	*0.0406*	*460060.5601*	*73961.0203*	
	min		*0.8268*	*0.0116*	*0.0001*	*0.8034*	*0.8381*	*10000.0000*	*0.0000*	
	max		*0.9861*	*0.0139*	*0.0002*	*0.9583*	*0.9997*	*2000000.0000*	*300000.0000*	
12/15/2004	Las Vegas Sands	LVS	0.4932	0.0070	0.0000	0.4793	0.5000	60000	0	Media and Entertainment
10/06/1999	PlanetRx.com	PLRX	0.4873	0.0069	0.0000	0.4736	0.4940	30000	0	Retail
12/19/2007	Orion Energy Systems	OESX	0.4808	0.0068	0.0000	0.4672	0.4874	100000	0	Industrials
07/18/2014	SAGE Therapeutics	SAGE	0.4735	0.0067	0.0000	0.4601	0.4800	70000	0	Healthcare

05/17/1999	Nextcard	NXCD	0.4727	0.0067	0.0000	0.4593	0.4792	20000	0	Financials
03/09/2005	International Sec Exchange	ISE	0.4689	0.0066	0.0000	0.4556	0.4753	0	6000	Financials
12/12/2013	Kindred Biosciences	KIN	0.4638	0.0066	0.0000	0.4507	0.4702	1940000	0	Healthcare
11/07/2013	Twitter	TWTR	0.4585	0.0065	0.0000	0.4455	0.4648	90000	0	High Technology
07/24/2013	Agios Pharmaceuticals	AGIO	0.4556	0.0065	0.0000	0.4428	0.4619	40000	0	Healthcare
07/20/2011	Zillow	Z	0.4427	0.0063	0.0000	0.4302	0.4488	40000	0	High Technology
09/20/2013	FireEye	FEYE	0.4398	0.0063	0.0000	0.4274	0.4459	120000	0	High Technology
01/30/1998	VeriSign	VRSN	0.4348	0.0061	0.0000	0.4225	0.4407	60000	0	High Technology
03/23/1998	ISS Group	ISSX	0.4314	0.0061	0.0000	0.4192	0.4373	80000	0	High Technology
09/25/2013	Foundation Medicine	FMI	0.4032	0.0057	0.0000	0.3918	0.4087	80000	0	Healthcare
09/20/2007	athenahealth	ATHN	0.4015	0.0057	0.0000	0.3902	0.4071	40000	0	High Technology
08/18/2000	WJ Communications	WJCI	0.3928	0.0056	0.0000	0.3817	0.3982	0	1500	High Technology
02/25/2000	DigitalThink	DTHK	0.3823	0.0054	0.0000	0.3715	0.3876	40000	0	Consumer Products and Services
02/25/2000	Intersil Holding	ISIL	0.3666	0.0052	0.0000	0.3563	0.3717	80000	0	High Technology
11/19/2014	Second Sight Med Prod	EYES	0.3568	0.0051	0.0000	0.3468	0.3617	10000	0	Healthcare
07/22/1999	MP3.COM	MPPP	0.3501	0.0050	0.0000	0.3402	0.3549	40000	0	High Technology
07/27/2000	Corvis	CORV	0.3364	0.0048	0.0000	0.3269	0.3410	40000	0	Telecommunications
07/20/1999	Engage Technologies	ENGA	0.2897	0.0041	0.0000	0.2815	0.2937	20000	0	High Technology
07/28/1999	drugstore.com	DSCM	0.2835	0.0041	0.0000	0.2755	0.2874	140000	0	Retail
12/03/1998	Ticketmaster Online-CitySearch	TMCS	0.2754	0.0039	0.0000	0.2676	0.2792	36000	0	High Technology
04/07/1999	Rhythms NetConnections	RTHM	0.2404	0.0035	0.0000	0.2337	0.2438	20000	0	Telecommunications
07/17/1998	Broadcast.Com	BCST	0.2270	0.0033	0.0000	0.2206	0.2301	20000	0	High Technology
12/01/1999	McAfee.com	MCAF	0.2159	0.0031	0.0000	0.2098	0.2189	20000	0	High Technology
02/10/1999	Healtheon	HLTH	0.2018	0.0029	0.0000	0.1961	0.2046	30000	0	Healthcare
03/29/1999	priceline.com	PCLN	0.1836	0.0026	0.0000	0.1784	0.1861	80000	0	High Technology
12/10/1999	Freemarkets	FMKT	0.1356	0.0020	0.0000	0.1318	0.1375	80000	0	Consumer Products and Services
	mean		*0.3682*	*0.0052*	*0.0000*	*0.3578*	*0.3733*	*114200.0000*	*250.0000*	
	std		*0.1051*	*0.0015*	*0.0000*	*0.1022*	*0.1066*	*346576.6970*	*1119.9600*	
	min		*0.1356*	*0.0020*	*0.0000*	*0.1318*	*0.1375*	*0.0000*	*0.0000*	
	max		*0.4932*	*0.0070*	*0.0000*	*0.4793*	*0.5000*	*1940000.0000*	*6000.0000*	

Table 4.5: Bootstrap efficiency analysis - 379 IPOs: top and worst performers (VRS assumption)

We present the top and worst 30 IPOs of the full sample (379 IPOs) in terms of their ability to minimize underpricing. We sort the IPOs based on their bootstrap efficiency performance under the VRS assumption in order to account for differences between sectors. High bootstrap efficiency levels indicate high IPO performance. Additionally, we identify the IPO firm's sector alongside with the lobby and PAC donation amounts. Also we present the 95% bootstrapped confidence intervals of the estimations alongside with the estimated bias and its standard deviation. Finally, the main descriptive statistics are tabulated below each IPO group.

Listing Date	Company	Ticker	Bias Corrected VRS	Estimated Bias	STD of the estimated Bias	Lower Bound	Upper Bound	Lobby Money	PAC Money	Sector
11/08/2007	ICx Technologies	ICXT	0.9684	0.0316	0.0002	0.9440	0.9956	1420000	85000	High Technology
05/10/2013	BioAmber	BIOA	0.9553	0.0274	0.0003	0.9224	0.9792	80000	0	Materials
02/03/2004	TRW Automotive Holdings	TRW	0.9518	0.0128	0.0001	0.9301	0.9636	0	675000	Industrials
04/10/2014	Ally Financial	ALLY	0.9458	0.0093	0.0000	0.9295	0.9541	2110000	0	Financials
04/12/2012	Oaktree Capital Group	OAK	0.9455	0.0545	0.0008	0.9080	0.9902	260000	0	Financials
10/28/2009	Addus HomeCare	ADUS	0.9454	0.0261	0.0003	0.9131	0.9681	40000	0	Healthcare
05/05/2005	Lazard	LAZ	0.9453	0.0092	0.0000	0.9289	0.9536	290000	0	Financials
05/24/2006	Vonage Holdings	VG	0.9399	0.0136	0.0001	0.9202	0.9525	805000	150000	Telecommunications
07/30/1999	Biopure	BPUR	0.9324	0.0202	0.0002	0.9068	0.9497	20000	0	Healthcare
06/12/2001	Kraft Foods	KFT	0.9321	0.0191	0.0002	0.9060	0.9499	0	59500	Consumer Staples
05/18/2012	Facebook	FB	0.9309	0.0385	0.0005	0.8973	0.9662	1350000	270000	High Technology
06/19/2001	The Princeton Review	REVU	0.9263	0.0207	0.0002	0.9001	0.9441	60000	0	Consumer Products and Services
03/08/2007	Clearwire	CLWR	0.9248	0.0095	0.0001	0.9077	0.9335	80000	0	High Technology
04/23/2008	American Water Works	AWK	0.9240	0.0073	0.0000	0.9115	0.9305	300000	100000	Energy and Power
03/22/2013	West Corp	WSTC	0.9233	0.0072	0.0000	0.9110	0.9298	40000	0	Consumer Products and Services
04/10/2014	Adamas Pharmaceuticals	ADMS	0.9201	0.0177	0.0001	0.8981	0.9365	10000	0	Healthcare
10/08/2009	Omeros	OMER	0.9192	0.0235	0.0002	0.8887	0.9399	60000	0	Healthcare
11/17/2011	Delphi Automotive	DLPH	0.9188	0.0074	0.0000	0.9060	0.9253	396429	40500	Industrials
05/03/1999	CONSOL Energy	CNX	0.9099	0.0160	0.0001	0.8888	0.9247	550000	226250	Materials
12/13/2013	Cheniere Energy Partners	CQH	0.9093	0.0071	0.0000	0.8972	0.9156	2630000	201800	Energy and Power
12/09/2004	Foundation Coal Holdings	FCL	0.9041	0.0074	0.0000	0.8913	0.9106	0	74000	Materials
11/18/2010	General Motors	GM	0.9032	0.0262	0.0003	0.8748	0.9274	9570000	284500	Industrials
03/29/2011	Apollo Global Management	APO	0.9022	0.0073	0.0000	0.8896	0.9088	932984	118100	Financials
03/09/2011	HCA Holdings	HCA	0.9015	0.0185	0.0002	0.8762	0.9187	200000	268250	Healthcare
11/15/2007	EnergySolutions	ES	0.9014	0.0081	0.0000	0.8874	0.9086	1020000	780000	Energy and Power
02/11/2011	Kinder Morgan	KMI	0.9006	0.0186	0.0002	0.8753	0.9179	190000	0	Energy and Power
06/10/2004	CB Richard Ellis Group	CBG	0.8963	0.0072	0.0000	0.8839	0.9027	10000	0	Real Estate
05/02/2014	SCYNEXIS	SCYX	0.8908	0.0215	0.0002	0.8628	0.9096	40000	0	Healthcare
02/01/2012	US Silica Holdings	SLCA	0.8908	0.0096	0.0000	0.8751	0.8996	20000	0	Materials
03/15/2012	Allison Transmission Hldg	ALSN	0.8887	0.0082	0.0000	0.8745	0.8960	240000	0	Industrials
	mean		*0.9216*	*0.0170*	*0.0001*	*0.9002*	*0.9368*	*757480.4333*	*111096.6667*	
	std		*0.0215*	*0.0110*	*0.0002*	*0.0199*	*0.0267*	*1790773.6903*	*192603.8139*	
	min		*0.8887*	*0.0071*	*0.0000*	*0.8628*	*0.8960*	*0.0000*	*0.0000*	
	max		*0.9684*	*0.0545*	*0.0008*	*0.9440*	*0.9956*	*9570000.0000*	*780000.0000*	
07/18/2014	SAGE Therapeutics	SAGE	0.5562	0.0104	0.0001	0.5413	0.5658	70000	0	Healthcare
03/09/2005	International Sec Exchange	ISE	0.5510	0.0107	0.0001	0.5360	0.5609	0	6000	Financials
11/07/2013	Twitter	TWTR	0.5487	0.0314	0.0003	0.5256	0.5756	90000	0	High Technology
12/19/2007	Orion Energy Systems	OESX	0.5412	0.0044	0.0000	0.5336	0.5451	100000	0	Industrials
07/24/2013	Agios Pharmaceuticals	AGIO	0.5366	0.0114	0.0001	0.5213	0.5472	40000	0	Healthcare
06/17/1998	software.net	SWNT	0.5354	0.0145	0.0001	0.5218	0.5482	20000	0	High Technology

12/13/2012	SolarCity	SCTY	0.5338	0.0136	0.0001	0.5196	0.5459	230000	2000	Industrials
05/29/2014	Resonant	RESN	0.5284	0.0125	0.0001	0.5120	0.5393	40000	0	High Technology
07/20/2011	Zillow	Z	0.5236	0.0176	0.0001	0.5062	0.5397	40000	0	High Technology
09/20/2013	FireEye	FEYE	0.5204	0.0178	0.0001	0.5030	0.5367	120000	0	High Technology
03/23/1998	ISS Group	ISSX	0.5095	0.0249	0.0002	0.4895	0.5316	80000	0	High Technology
01/30/1998	VeriSign	VRSN	0.5022	0.0057	0.0000	0.4922	0.5074	60000	0	High Technology
09/25/2013	Foundation Medicine	FMI	0.4768	0.0154	0.0001	0.4612	0.4911	80000	0	Healthcare
09/20/2007	athenahealth	ATHN	0.4748	0.0156	0.0001	0.4592	0.4892	40000	0	High Technology
08/18/2000	WJ Communications	WJCI	0.4633	0.0110	0.0001	0.4495	0.4734	0	1500	High Technology
12/12/2013	Kindred Biosciences	KIN	0.4601	0.0121	0.0000	0.4479	0.4708	1940000	0	Healthcare
02/25/2000	Intersil Holding	ISIL	0.4554	0.0308	0.0003	0.4349	0.4810	80000	0	High Technology
02/25/2000	DigitalThink	DTHK	0.4477	0.0074	0.0000	0.4365	0.4546	40000	0	Consumer Products and Services
07/22/1999	MP3.COM	MPPP	0.4448	0.0366	0.0004	0.4238	0.4777	40000	0	High Technology
07/27/2000	Corvis	CORV	0.4212	0.0674	0.0010	0.4037	0.4811	40000	0	Telecommunications
12/10/1999	Freemarkets	FMKT	0.3988	0.0960	0.0026	0.3821	0.4880	80000	0	Consumer Products and Services
11/19/2014	Second Sight Med Prod	EYES	0.3967	0.0031	0.0000	0.3913	0.3995	10000	0	Healthcare
07/28/1999	drugstore.com	DSCM	0.3479	0.0217	0.0001	0.3324	0.3660	140000	0	Retail
07/20/1999	Engage Technologies	ENGA	0.3418	0.0176	0.0001	0.3284	0.3571	20000	0	High Technology
12/03/1998	Ticketmaster Online-CitySearch	TMCS	0.3252	0.0158	0.0001	0.3124	0.3392	36000	0	High Technology
04/07/1999	Rhythms NetConnections	RTHM	0.3072	0.0294	0.0003	0.2923	0.3340	20000	0	Telecommunications
07/17/1998	Broadcast.Com	BCST	0.2881	0.0235	0.0002	0.2747	0.3093	20000	0	High Technology
12/01/1999	McAfee.com	MCAF	0.2568	0.0148	0.0001	0.2462	0.2693	20000	0	High Technology
02/10/1999	Healtheon	HLTH	0.2376	0.0052	0.0000	0.2308	0.2423	30000	0	Healthcare
03/29/1999	priceline.com	PCLN	0.2344	0.0224	0.0002	0.2231	0.2548	80000	0	High Technology
	mean		*0.4389*	*0.0207*	*0.0002*	*0.4244*	*0.4574*	*120200.0000*	*316.6667*	
	std		*0.1020*	*0.0189*	*0.0005*	*0.1005*	*0.1012*	*346964.9093*	*1163.2545*	
	min		*0.2344*	*0.0031*	*0.0000*	*0.2231*	*0.2423*	*0.0000*	*0.0000*	
	max		*0.5562*	*0.0960*	*0.0026*	*0.5413*	*0.5756*	*1940000.0000*	*6000.0000*	

Table 4.6: Bootstrap efficiency analysis - 317 IPOs: top and worst performers (CRS assumption)

We present the top and worst 30 IPOs of the reduced sample (317 IPOs) in terms of their ability to minimize underpricing. We sort the IPOs based on their bootstrap efficiency performance under the CRS assumption. High bootstrap efficiency levels indicate high IPO performance. Additionally, we identify the IPO firm's sector alongside with the lobby and PAC donation amounts. Also we present the 95% bootstrap confidence intervals of the estimations alongside with the estimated bias and its standard deviation. Finally, the main descriptive statistics are tabulated below each IPO group.

Listing Date	Company	Ticker	Bias Corrected CRS	Estimated Bias	STD of the estimated Bias	Lower Bound	Upper Bound	Lobby Money	PAC Money	Sector
07/31/2014	Marinus Pharmaceuticals	MRNS	0.9994	0.0006	0.0000	0.9977	1.0001	40000	0	Healthcare
12/12/2013	Kindred Biosciences	KIN	0.9994	0.0006	0.0000	0.9977	1.0001	1940000	0	Healthcare
03/20/2013	Tetraphase Pharmaceuticals	TTPH	0.9994	0.0006	0.0000	0.9977	1.0001	60000	0	Healthcare
08/03/2010	Trius Therapeutics	TSRX	0.9994	0.0006	0.0000	0.9977	1.0001	60000	0	Healthcare
11/16/2007	Internet Brands	INET	0.9994	0.0006	0.0000	0.9977	1.0001	80000	0	High Technology
02/09/2007	VeriChip	CHIP	0.9994	0.0006	0.0000	0.9977	1.0001	120000	0	Telecommunications
08/05/2004	RightNow Technologies	RNOW	0.9994	0.0006	0.0000	0.9977	1.0001	110000	0	High Technology
06/24/2011	KiOR	KIOR	0.9994	0.0006	0.0000	0.9977	1.0001	120000	0	Energy and Power
12/17/2010	Fortegra Financial	FRF	0.9994	0.0006	0.0000	0.9977	1.0001	150000	0	Financials
11/19/2010	Aeroflex Holding	ARX	0.9994	0.0006	0.0000	0.9977	1.0001	8700	0	High Technology
04/22/2010	Codexis	CDXS	0.9994	0.0006	0.0000	0.9977	1.0001	190000	0	Materials
12/14/2006	NewStar Financial	NEWS	0.9994	0.0006	0.0000	0.9977	1.0001	0	15000	Financials
11/02/2005	Cbeyond Communications	CBEY	0.9994	0.0006	0.0000	0.9977	1.0001	100000	0	Telecommunications
08/17/2005	Rockwood Holdings	ROC	0.9994	0.0006	0.0000	0.9977	1.0001	140000	0	Materials
06/14/2005	Premium Standard Farms	PORK	0.9994	0.0006	0.0000	0.9977	1.0001	40000	18075	Consumer Staples
02/10/2005	Nasdaq Stock Market	NDAQ	0.9994	0.0006	0.0000	0.9977	1.0001	0	51400	Financials
01/21/2005	ViaCell	VIAC	0.9994	0.0006	0.0000	0.9977	1.0001	20000	0	Healthcare
07/30/2004	EnerSys	ENS	0.9994	0.0006	0.0000	0.9977	1.0001	0	150000	High Technology
05/24/2004	Genworth Financial	GNW	0.9994	0.0006	0.0000	0.9977	1.0001	180000	0	Financials
08/02/2001	Bunge	BG	0.9994	0.0006	0.0000	0.9977	1.0001	120000	0	Consumer Staples
03/15/2001	SureBeam Corp(Titan Corp)	SURE	0.9994	0.0006	0.0000	0.9977	1.0001	220000	500	Industrials
07/29/1999	Lennox International	LII	0.9994	0.0006	0.0000	0.9977	1.0001	0	8000	Industrials
07/28/1999	American National Can Group	CAN	0.9994	0.0006	0.0000	0.9977	1.0001	0	7300	Materials
07/22/1998	USEC	USU	0.9994	0.0006	0.0000	0.9977	1.0001	60000	0	Materials
05/27/1998	Capstar Broadcasting	CRB	0.9994	0.0006	0.0000	0.9977	1.0001	60000	0	Media and Entertainment
05/11/1998	MGC Communications	MGCX	0.9994	0.0006	0.0000	0.9977	1.0001	0	5500	Telecommunications
06/12/2001	Kraft Foods	KFT	0.9994	0.0006	0.0000	0.9977	1.0001	0	59500	Consumer Staples
11/15/2007	EnergySolutions	ES	0.9988	0.0007	0.0000	0.9971	0.9995	1020000	780000	Energy and Power
10/01/2014	Vivint Solar	VSLR	0.9986	0.0007	0.0000	0.9969	0.9993	40000	0	Energy and Power
05/28/2004	Alnylam Pharmaceuticals	ALNY	0.9977	0.0006	0.0000	0.9960	0.9983	40000	0	Healthcare
	mean		*0.9993*	*0.0006*	*0.0000*	*0.9976*	*1.0000*	*163956.6667*	*36509.1667*	
	std		*0.0004*	*0.0000*	*0.0000*	*0.0004*	*0.0004*	*382799.2196*	*143574.3383*	
	min		*0.9977*	*0.0006*	*0.0000*	*0.9960*	*0.9983*	*0.0000*	*0.0000*	
	max		*0.9994*	*0.0007*	*0.0000*	*0.9977*	*1.0001*	*1940000.0000*	*780000.0000*	
12/15/2004	Las Vegas Sands	LVS	0.6224	0.0004	0.0000	0.6213	0.6228	60000	0	Media and Entertainment
10/06/1999	PlanetRx.com	PLRX	0.6149	0.0004	0.0000	0.6138	0.6153	30000	0	Retail
12/19/2007	Orion Energy Systems	OESX	0.6066	0.0005	0.0000	0.6056	0.6070	100000	0	Industrials
07/18/2014	SAGE Therapeutics	SAGE	0.5976	0.0004	0.0000	0.5966	0.5980	70000	0	Healthcare
05/17/1999	Nextcard	NXCD	0.5966	0.0004	0.0000	0.5956	0.5970	20000	0	Financials
03/09/2005	International Sec Exchange	ISE	0.5917	0.0004	0.0000	0.5907	0.5921	0	6000	Financials

12/12/2013	ARAMARK Holdings	ARMK	0.5853	0.0004	0.0000	0.5843	0.5857	200000	2000	Retail
11/07/2013	Twitter	TWTR	0.5786	0.0004	0.0000	0.5776	0.5790	90000	0	High Technology
07/24/2013	Agios Pharmaceuticals	AGIO	0.5750	0.0004	0.0000	0.5740	0.5754	40000	0	Healthcare
07/20/2011	Zillow	Z	0.5587	0.0004	0.0000	0.5578	0.5591	40000	0	High Technology
09/20/2013	FireEye	FEYE	0.5551	0.0004	0.0000	0.5542	0.5555	120000	0	High Technology
01/30/1998	VeriSign	VRSN	0.5487	0.0003	0.0000	0.5477	0.5490	60000	0	High Technology
03/23/1998	ISS Group	ISSX	0.5445	0.0003	0.0000	0.5435	0.5448	80000	0	High Technology
09/25/2013	Foundation Medicine	FMI	0.5087	0.0004	0.0000	0.5078	0.5090	80000	0	Healthcare
09/20/2007	athenahealth	ATHN	0.5067	0.0003	0.0000	0.5058	0.5070	40000	0	High Technology
08/18/2000	WJ Communications	WJCI	0.4958	0.0003	0.0000	0.4949	0.4961	0	1500	High Technology
02/25/2000	DigitalThink	DTHK	0.4824	0.0003	0.0000	0.4815	0.4827	40000	0	Consumer Products and Services
02/25/2000	Intersil Holding	ISIL	0.4626	0.0003	0.0000	0.4618	0.4629	80000	0	High Technology
11/19/2014	Second Sight Med Prod	EYES	0.4503	0.0003	0.0000	0.4495	0.4506	10000	0	Healthcare
07/22/1999	MP3.COM	MPPP	0.4419	0.0003	0.0000	0.4411	0.4422	40000	0	High Technology
07/27/2000	Corvis	CORV	0.4246	0.0003	0.0000	0.4239	0.4249	40000	0	Telecommunications
07/20/1999	Genentech	DNA	0.3655	0.0003	0.0000	0.3649	0.3658	1040000	5000	Healthcare
07/28/1999	drugstore.com	DSCM	0.3580	0.0002	0.0000	0.3574	0.3582	140000	0	Retail
12/03/1998	Ticketmaster Online-CitySearch	TMCS	0.3476	0.0002	0.0000	0.3470	0.3478	36000	0	High Technology
04/07/1999	Rhythms NetConnections	RTHM	0.3034	0.0003	0.0000	0.3029	0.3036	20000	0	Telecommunications
07/17/1998	Broadcast.Com	BCST	0.2866	0.0002	0.0000	0.2861	0.2868	20000	0	High Technology
12/01/1999	McAfee.com	MCAF	0.2725	0.0002	0.0000	0.2720	0.2727	20000	0	High Technology
02/10/1999	Healtheon	HLTH	0.2547	0.0002	0.0000	0.2543	0.2549	30000	0	Healthcare
03/29/1999	priceline.com	PCLN	0.2316	0.0002	0.0000	0.2312	0.2317	80000	0	High Technology
12/10/1999	Freemarkets	FMKT	0.1713	0.0001	0.0000	0.1710	0.1714	80000	0	Consumer Products and Services
	mean		*0.4647*	*0.0003*	*0.0000*	*0.4639*	*0.4650*	*90200.0000*	*483.3333*	
	std		*0.1327*	*0.0001*	*0.0000*	*0.1324*	*0.1327*	*184588.5266*	*1441.2838*	
	min		*0.1713*	*0.0001*	*0.0000*	*0.1710*	*0.1714*	*0.0000*	*0.0000*	
	max		*0.6224*	*0.0005*	*0.0000*	*0.6213*	*0.6228*	*1040000.0000*	*6000.0000*	

Table 4.7: Bootstrap efficiency analysis - 317 IPOs: top and worst performers (VRS assumption)

We present the top and worst 30 IPOs of the reduced sample (317 IPOs) in terms of their ability to minimize underpricing. We sort the IPOs based on their bootstrap efficiency performance under the VRS assumption in order to account for differences between sectors. High bootstrap efficiency levels indicate high IPO performance. Additionally, we identify the IPO firm's sector alongside with the lobby and PAC donation amounts. Also, we present the 95% bootstrap confidence intervals of the estimations alongside with the estimated bias and its standard deviation. Finally, the main descriptive statistics are tabulated below each IPO group.

Listing Date	Company	Ticker	Bias Corrected VRS	Estimated Bias	STD of the estimated Bias	Lower Bound	Upper Bound	Lobby Money	PAC Money	Sector
07/28/1999	American National Can Group	CAN	0.9988	0.0012	0.0000	0.9964	0.9999	0	7300	Materials
05/11/1998	MGC Communications	MGCX	0.9988	0.0012	0.0000	0.9964	0.9999	0	5500	Telecommunications
07/29/1999	Lennox International	LII	0.9988	0.0012	0.0000	0.9962	0.9999	0	8000	Industrials
05/27/1998	Capstar Broadcasting	CRB	0.9988	0.0012	0.0000	0.9962	0.9999	60000	0	Media and Entertainment
02/10/2005	Nasdaq Stock Market	NDAQ	0.9988	0.0012	0.0000	0.9963	0.9999	0	51400	Financials
01/21/2005	ViaCell	VIAC	0.9988	0.0012	0.0000	0.9963	0.9999	20000	0	Healthcare
08/02/2001	Bunge	BG	0.9988	0.0012	0.0000	0.9963	0.9999	120000	0	Consumer Staples
08/17/2005	Rockwood Holdings	ROC	0.9987	0.0013	0.0000	0.9960	0.9999	140000	0	Materials
05/24/2004	Genworth Financial	GNW	0.9987	0.0013	0.0000	0.9960	0.9999	180000	0	Financials
06/24/2011	KiOR	KIOR	0.9987	0.0013	0.0000	0.9960	0.9999	120000	0	Energy and Power
04/22/2010	Codexis	CDXS	0.9987	0.0013	0.0000	0.9960	0.9999	190000	0	Materials
07/22/1998	USEC	USU	0.9985	0.0015	0.0000	0.9954	0.9999	60000	0	Materials
11/19/2010	Aeroflex Holding	ARX	0.9983	0.0017	0.0000	0.9949	0.9999	8700	0	High Technology
10/01/2014	Vivint Solar	VSLR	0.9980	0.0013	0.0000	0.9955	0.9991	40000	0	Energy and Power
06/14/2005	Premium Standard Farms	PORK	0.9980	0.0020	0.0000	0.9938	0.9998	40000	18075	Consumer Staples
07/30/2004	EnerSys	ENS	0.9980	0.0020	0.0000	0.9938	0.9998	0	150000	High Technology
11/02/2005	Cbeyond Communications	CBEY	0.9977	0.0023	0.0000	0.9930	0.9998	100000	0	Telecommunications
11/15/2007	EnergySolutions	ES	0.9977	0.0018	0.0000	0.9941	0.9994	1020000	780000	Energy and Power
12/17/2010	Fortegra Financial	FRF	0.9970	0.0030	0.0000	0.9906	0.9998	150000	0	Financials
05/22/2002	Liquidmetal Technologies	LQMT	0.9967	0.0013	0.0000	0.9940	0.9979	120000	0	Materials
12/14/2006	NewStar Financial	NEWS	0.9960	0.0040	0.0000	0.9872	0.9997	0	15000	Financials
03/15/2001	SureBeam Corp(Titan Corp)	SURE	0.9960	0.0040	0.0000	0.9872	0.9997	220000	500	Industrials
06/22/2011	Vanguard Health Systems	VHS	0.9960	0.0012	0.0000	0.9935	0.9971	120000	123000	Healthcare
12/11/2009	KAR Auction Services	KAR	0.9952	0.0023	0.0000	0.9906	0.9973	53000	0	Retail
05/23/2002	Eon Labs	ELAB	0.9952	0.0014	0.0000	0.9925	0.9964	20000	0	Healthcare
06/29/1999	Seminis	SMNS	0.9947	0.0013	0.0000	0.9920	0.9959	20000	0	Consumer Staples
06/12/2001	Kraft Foods	KFT	0.9930	0.0070	0.0000	0.9828	0.9991	0	59500	Consumer Staples
02/05/1998	Vysis (BP Amoco)	VYSI	0.9927	0.0023	0.0000	0.9882	0.9948	3520000	172000	Healthcare
02/02/2007	Molecular Insight Pharm	MIPI	0.9921	0.0015	0.0000	0.9891	0.9935	105000	0	Healthcare
07/31/2014	Marinus Pharmaceuticals	MRNS	0.9906	0.0094	0.0001	0.9710	0.9996	40000	0	Healthcare
	mean		*0.9969*	*0.0022*	*0.0000*	*0.9926*	*0.9989*	*215556.6667*	*46342.5000*	
	std		*0.0023*	*0.0018*	*0.0000*	*0.0054*	*0.0017*	*651009.0151*	*145988.4131*	
	min		*0.9906*	*0.0012*	*0.0000*	*0.9710*	*0.9935*	*0.0000*	*0.0000*	
	max		*0.9988*	*0.0094*	*0.0001*	*0.9964*	*0.9999*	*3520000.0000*	*780000.0000*	
02/08/2007	Accuray	ARAY	0.6295	0.0027	0.0000	0.6250	0.6320	200000	0	Healthcare
10/06/1999	PlanetRx.com	PLRX	0.6135	0.0018	0.0000	0.6103	0.6151	30000	0	Retail
12/19/2007	Orion Energy Systems	OESX	0.6061	0.0010	0.0000	0.6043	0.6070	100000	0	Industrials
11/07/2013	Twitter	TWTR	0.5968	0.0071	0.0000	0.5861	0.6032	90000	0	High Technology
07/18/2014	SAGE Therapeutics	SAGE	0.5945	0.0035	0.0000	0.5891	0.5977	70000	0	Healthcare

05/17/1999	Nextcard	NXCD	0.5928	0.0056	0.0000	0.5854	0.5977	20000	0	Financials
03/09/2005	International Sec Exchange	ISE	0.5884	0.0037	0.0000	0.5829	0.5917	0	6000	Financials
12/12/2013	ARAMARK Holdings Corp	ARMK	0.5843	0.0014	0.0000	0.5815	0.5855	200000	2000	Retail
07/24/2013	Agios Pharmaceuticals	AGIO	0.5715	0.0041	0.0000	0.5655	0.5750	40000	0	Healthcare
07/20/2011	Zillow	Z	0.5544	0.0071	0.0000	0.5457	0.5607	40000	0	High Technology
09/20/2013	FireEye	FEYE	0.5506	0.0074	0.0000	0.5420	0.5571	120000	0	High Technology
01/30/1998	VeriSign	VRSN	0.5476	0.0014	0.0000	0.5450	0.5489	60000	0	High Technology
03/23/1998	ISS Group	ISSX	0.5474	0.0077	0.0000	0.5374	0.5544	80000	0	High Technology
09/25/2013	Foundation Medicine	FMI	0.5049	0.0062	0.0000	0.4973	0.5105	80000	0	Healthcare
09/20/2007	athenahealth	ATHN	0.5027	0.0063	0.0000	0.4950	0.5083	40000	0	High Technology
02/25/2000	Intersil Holding	ISIL	0.4932	0.0074	0.0000	0.4809	0.4997	80000	0	High Technology
08/18/2000	WJ Communications	WJCI	0.4927	0.0040	0.0000	0.4873	0.4961	0	1500	High Technology
07/22/1999	MP3.COM	MPPP	0.4819	0.0095	0.0001	0.4650	0.4906	40000	0	High Technology
02/25/2000	DigitalThink	DTHK	0.4804	0.0023	0.0000	0.4766	0.4825	40000	0	Consumer Products and Services
07/27/2000	Corvis	CORV	0.4646	0.0273	0.0004	0.4304	0.4905	40000	0	Telecommunications
12/10/1999	Freemarkets	FMKT	0.4505	0.0443	0.0017	0.4015	0.4936	80000	0	Consumer Products and Services
11/19/2014	Second Sight Med Prod	EYES	0.4499	0.0007	0.0000	0.4487	0.4505	10000	0	Healthcare
07/28/1999	drugstore.com	DSCM	0.3773	0.0049	0.0000	0.3692	0.3816	140000	0	Retail
07/20/1999	Genentech	DNA	0.3692	0.0049	0.0000	0.3624	0.3737	1040000	5000	Healthcare
12/03/1998	Ticketmaster Online-CitySearch	TMCS	0.3491	0.0050	0.0000	0.3427	0.3536	36000	0	High Technology
04/07/1999	Rhythms NetConnections	RTHM	0.3337	0.0084	0.0000	0.3203	0.3416	20000	0	Telecommunications
07/17/1998	Broadcast.Com	BCST	0.3121	0.0061	0.0000	0.3013	0.3177	20000	0	High Technology
12/01/1999	McAfee.com	MCAF	0.2798	0.0034	0.0000	0.2748	0.2829	20000	0	High Technology
03/29/1999	priceline.com	PCLN	0.2546	0.0064	0.0000	0.2444	0.2606	80000	0	High Technology
02/10/1999	Healtheon	HLTH	0.2531	0.0019	0.0000	0.2504	0.2547	30000	0	Healthcare
	mean		*0.4809*	*0.0068*	*0.0001*	*0.4716*	*0.4872*	*94866.6667*	*483.3333*	
	std		*0.1147*	*0.0085*	*0.0003*	*0.1164*	*0.1142*	*185565.8138*	*1441.2838*	
	min		*0.2531*	*0.0007*	*0.0000*	*0.2444*	*0.2547*	*0.0000*	*0.0000*	
	max		*0.6295*	*0.0443*	*0.0017*	*0.6250*	*0.6320*	*1040000.0000*	*6000.0000*	

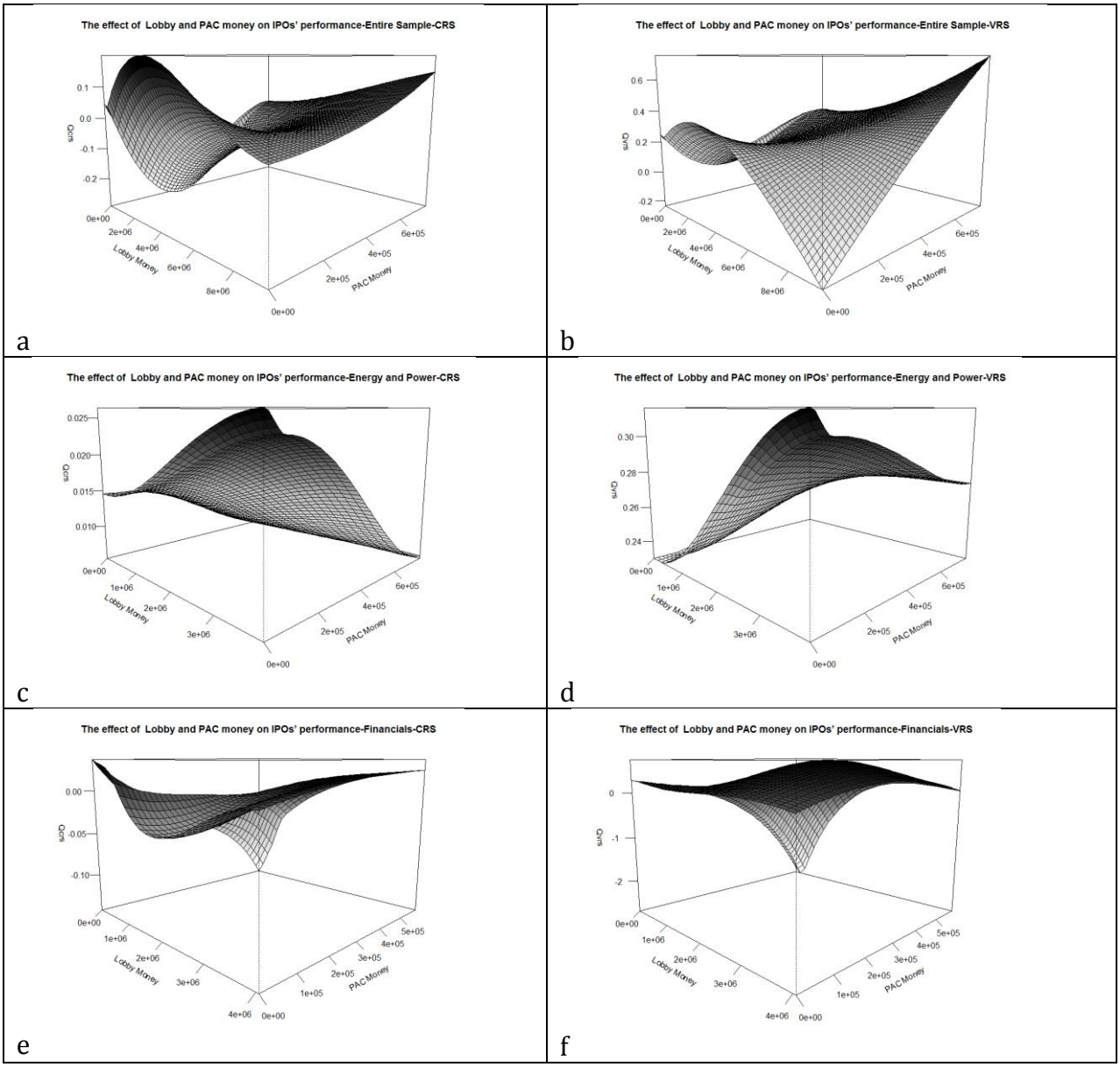
Table 4.8: Kernel consistent density equality tests

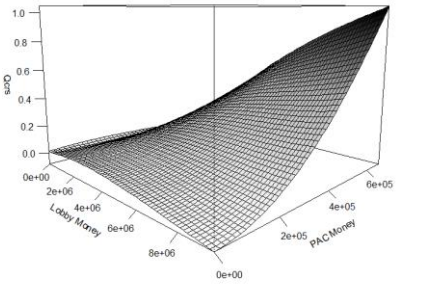
We implement a consistent integrated squared differences test for the equality of densities of conditional and unconditional efficiencies under the CRS and VRS assumptions in the full and reduced IPO samples. Following Simar and Zelenyuk (2006), we trim the DEA-estimates from values equal to unity and conduct the Li et al. (2009) test applying the least-squares cross validation criterion and bootstrap methods for the null distribution of the statistic (1,000 replications have been applied).

Full sample (including overpriced IPOs)		
	Test Statistic	*p-value*
$H_0 : f(CRS) = g(CRS \mid M)$		
$H_1 : f(CRS) \neq g(CRS \mid M)$	286.2809	0.0000
$H_0 : f(VRS) = g(VRS \mid M)$		
$H_1 : f(VRS) \neq g(VRS \mid M)$	175.7127	0.0000
Reduced sample (excluding overpriced IPOs)		
	Test Statistic	*p-value*
$H_0 : f(CRS) = g(CRS \mid M)$		
$H_1 : f(CRS) \neq g(CRS \mid M)$	226.1246	0.0000
$H_0 : f(VRS) = g(VRS \mid M)$		
$H_1 : f(VRS) \neq g(VRS \mid M)$	131.1409	0.0000

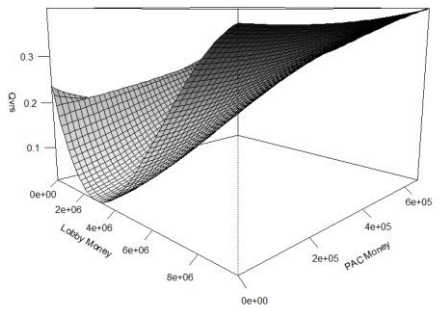
Figure 4.4: The effect of lobby and PAC money on IPO performance (full sample -379 IPOs): Nonparametric regression

The three-dimensional graphs represent the results of local constant estimators indicating the effect of PAC and lobby money on IPO performance (efficiency). These regressions apply for bandwidth selection the least-squares cross validation criterion. The vertical axes indicate the ratio of conditional to unconditional measures, whereas the horizontal axes represent the amounts of lobby and PAC money donated by IPO firms. Subfigures 4a, 4c, 4e and 4g illustrate the effect of lobby and PAC money under the CRS assumption, and subfigures 4b, 4d, 4f and 4h show the effect under the VRS assumption.




The effect of Lobby and PAC money on IPOs' performance-Industrials-CRS
Qcrs
1.0
0.8
0.6
0.4
0.2
0.0
0e+00
2e+06
4e+06
6e+06
8e+06
Lobby Money
0e+00
2e+05
4e+05
6e+05
PACMoney

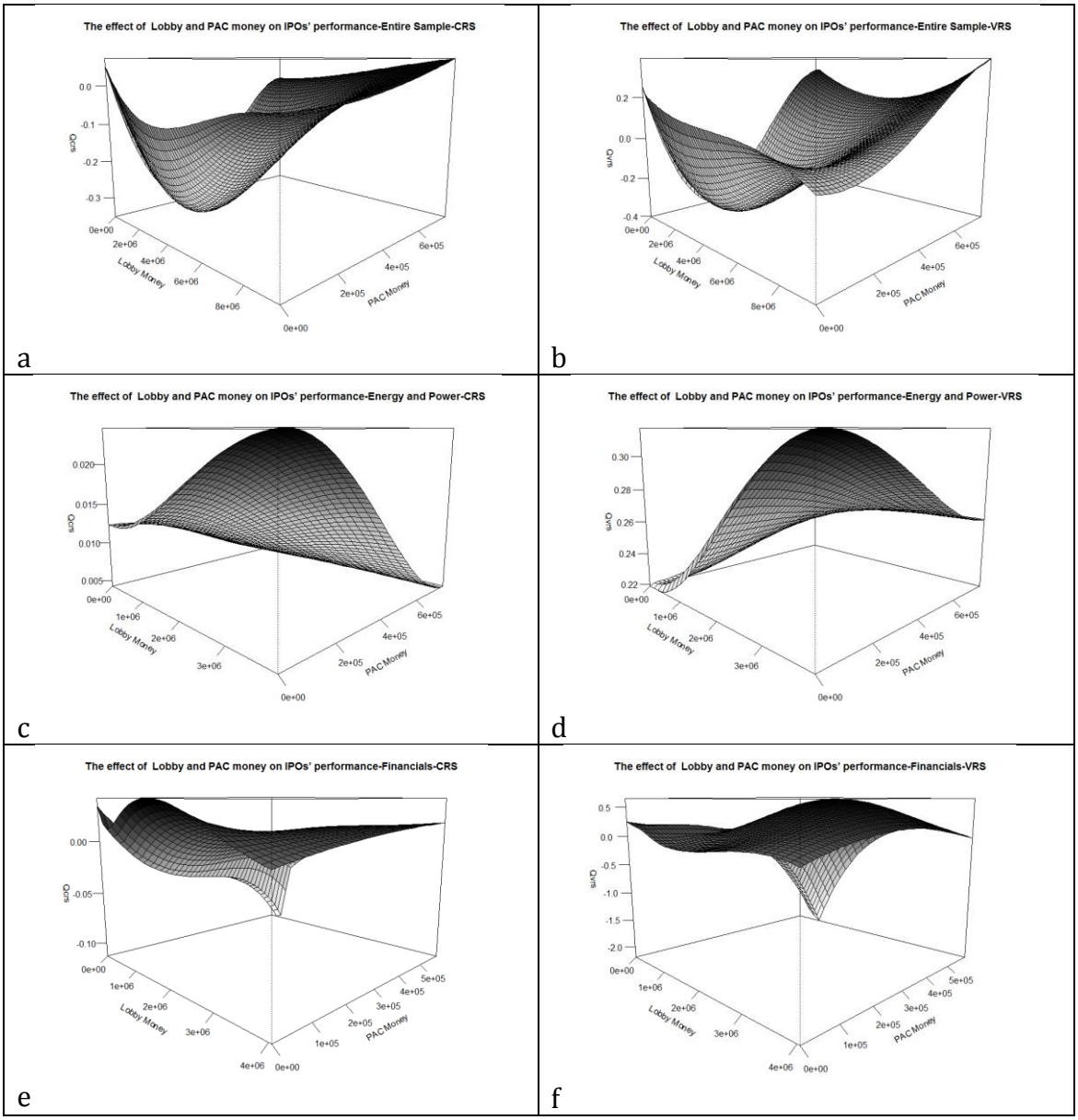
g

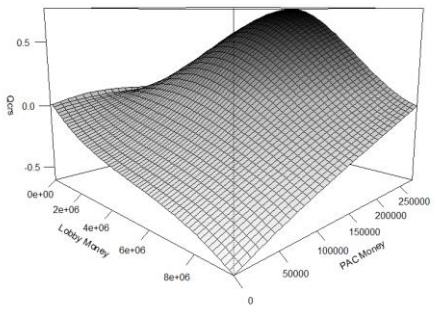

The effect of Lobby and PAC money on IPOs' performance-Industrials-VRS
Qvrs
0.3
0.2
0.1
0e+00
2e+06
4e+06
6e+06
8e+06
Lobby Money
0e+00
2e+05
4e+05
6e+05
PACMoney

h

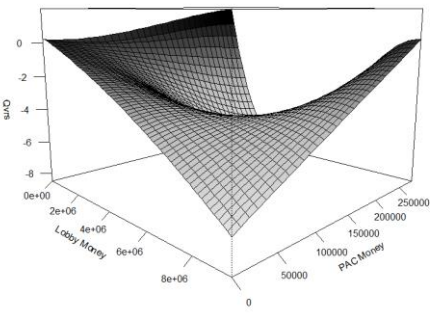
Figure 4.5
The effect of lobby and PAC money on IPO performance (reduced sample-317 IPOs): Nonparametric regression

The three-dimensional graphs represent the results of local constant estimators indicating the effect of PAC and lobby money on IPO performance (efficiency). These regressions apply for bandwidth selection the least-squares cross validation criterion. The vertical axes indicate the ratio of conditional to unconditional measures, whereas the horizontal axes represent the amounts of lobby and PAC money donated by IPO firms. Subfigures 4a, 4c, 4e and 4g illustrate the effect of lobby and PAC money under the CRS assumption, and subfigures 4b, 4d, 4f and 4h show the effect under the VRS assumption.




The effect of Lobby and PAC money on IPOs' performance-Industrials-CRS
CRS
0.5
0.0
-0.5
0e+00
2e+06
4e+06
6e+06
8e+06
Lobby Money
0
50000
100000
150000
200000
250000
PAC Money

g


The effect of Lobby and PAC money on IPOs' performance-Industrials-VRS
VRS
0
-2
-4
-6
-8
0e+00
2e+06
4e+06
6e+06
8e+06
Lobby Money
0
50000
100000
150000
200000
250000
PAC Money

h

Chapter 5 - The influence of political connections on new ventures: From inception to peril

5.1 Introduction

When an entrepreneur launches a new venture inevitably endows the emerging organization with her political network among all other forms of relationship capital. Consequently, as individuals may or may not be actively involved in politics, immense heterogeneity is observed in the extent of firms' interference with the political process. In this regard, the aim of our study is to investigate the value-relevance of this special endowment and its continuity throughout the later stages in corporate life cycle.

A popular notion holds that a firm with ties to politicians is capable of realizing a multitude of benefits which would otherwise remain unattainable. Supporting empirical evidence can be found in the studies of Hart (2001), Faccio (2006), Boubakri et al. (2008), Cooper et al. (2010), Chaney et al. (2011), and Houston et al. (2014). Though, this notion might as well backfire on connected organizations. For example, it can constitute a source of animosity for a number of stakeholders and result in increased litigation risk or scrutiny which obstructs the day-to-day operations. In this respect, Masters and Keim (1985) warn that a firm which can temporarily extract economic benefits is incentivized to abstain from any political action as this may jeopardize its competitive position, even more so when the business model resembles to a monopolistic market structure.

Whether proximity to politics ultimately represents an asset or a liability, the extant literature on corporate political connections invariably draws evidence from adequately established and long-tenured organizations. In such cases the business reputation of the entity precedes and generally supersedes the effect of corporate political activities. In contrast, commencing the empirical investigation from company inception, our study provides a more complete view on a spectrum of events. Sequentially assessing the interplay of connections with milestone organizational outcomes, we shed light on the various functions that political contributions can serve over the course of a venture's life. Ultimately, we ask: To what extent an entrepreneur's

political orientation may be passed on to a new firm and if so, can political connections act as a red carpet towards the venture's growth and survival prospects?

Political connections appear as a valuable endowment to a start-up company for a number of reasons. First, connected firms have been documented to sustain larger market shares without, nevertheless, the increased turnover to result in a commensurate increase in profitability (Boubakri et al., 2008). Because at inception the viability of the organization is primarily dependent on issues of recognition and market penetration the certification implications of political ties are critical as a means of reference to the marketplace. At the same time, concerns on other dimensions of operating performance such as the accounting bottom line assume a lesser priority (also as in Trueman et al., 2000). Second, the mounting capital expenditure and working capital needs of the embryonic phase require access to a steady source of external financing. In this respect, Houston et al. (2014) attest to the advantageous provisions of bank loans towards politically connected firms in terms of both lower rates and lax covenants. Third, the new firm is capable of better coping with a lack of structure and formal operational processes; it also appears less likely to be penalized for such deficiencies. For example, Chaney et al. (2011) document that politically involved firms tend to systematically underperform in accounting quality, though this entails no economically significant consequences. Abusively, this immunity could extend to situations of malpractices, improper business conduct and fraudulent activity (Yu and Yu 2011; Correia, 2014). Overall, early political ties pose as a compelling and holistic treatment of the market newness liability (Stinchcombe, 1965). In fact, the earlier stage a company appears to be at, the more beneficial the effect is expected to emerge.

The foremost challenge residing in the research of original endowments pertains to the fact that a significant number of non-surviving firms abandon the sample before being able to produce a significant corporate footprint (for example, refer to Shane and Stuart, 2002). The present study, though not completely immune to this persistent problem, traces firms at strategically early stages in the corporate life cycle when founders' legacy is still a dominant determinant of corporate behavior. For a holistic picture, we broaden our scope to encompass the effect of political connections deeply in the public domain. Consequently, the investigation extends to firms that obtain their connections at any point in time along with those that inherit them from founders,

therefore allowing for the possibility of a differential effect between various means of connectedness and across different life cycle stages.

The empirical analysis engages a large and comprehensive dataset. The database assembly comprises a number of steps. First, we read the directors' biographical information in IPO prospectuses (S-1) documents to isolate founders from later additions to the management team. Second, we trace the political activity of these individuals within the electronic archive of the Federal Election Committee (FEC). Third, we search for contributions taking place at the corporate level in the form of lobbying and PAC (Political Action Committee) campaigns. As a final step, we merge this data with IPO-specific information provided by the SDC portal, and aftermarket information from CRSP, for total a sample of 1,769 U.S firms that undertook an IPO during the period 1998 to 2014.

Overall, the findings reveal that political connections may exert a multifaceted influence on a new venture's life. A common theme emerges in their value-added element. Some benefits are immediately apparent such as the longevity of politically connected firms and the increased turnover activity. Others are more subtle but equally salient. Specifically, we provide robust results showing political connections to significantly delay an IPO. As this relationship may invite conflicting interpretations, we draw auxiliary evidence from a related financing event, the access to angel or venture capital. By and large, politically active firms appear reluctant to share ownership with this type of investors. Taken together, these findings converge on the financial autonomy of connected firms which can withstand the cash scarcity of the pre-IPO regime for a longer time. Furthermore, we show that the effect of political contributions, as a proxy for political connections, varies considerably with contributors' identity. While founders' activity remains vital to the sequence of events until listing, it claims minimal explanatory power in the public domain. At that mature time of the corporate life cycle, whereby a clear organizational identity has evolved, means of involvement which rely on mass participation and central planning (i.e. lobbying and PAC) result in a superior political outreach compared to individual contributions from prominent insiders.

Our study has close theoretical links to the work of Miner et al.(1990), Shane and Stuart (2002), Fischer and Pollock (2004), Fan et al. (2007), Faccio and Parsley

(2009), Francis et al. (2009), Cooper et al. (2010) and Chen et al. (2015). Miner et al. (1990) examine the correlation between the political connections of a sample of Finish publishing groups and their ability to cope with organizational change. We update their research by providing evidence from the world's largest equity market and across a spectrum of industries. Shane and Stuart (2002) and Fischer and Pollock (2004) converge on the conclusion that founders' social capital enhances the likelihood of survival. We corroborate this association centering on a niche of social capital that is of mounting public interest. As an additional contribution, we shed light on the interplay of politics with other important milestones in a new venture's life (i.e. time to VC financing and time to IPO) which have largely been neglected by the relevant literature. Thus, while the area of corporate political connections is a well-researched one (Cooper et al., 2010; Yu and Yu, 2011; Correia, 2014; and Chen et al., 2015) and with the economies in transition of Southeast Asia to spearhead this endeavor (for example, Fan et al., 2007 ; and Francis et al., 2009), our study is to the best of our knowledge the first to consider the transferability and endowment effects of founders' political connections.

The rest of the chapter proceeds as follows: Section 5.2 presents key studies on political connections. We develop our main research hypotheses in Section 5.3. Section 5.4 describes the database assembly and sample selection criteria. The empirical analysis is in Section 5.5. We test the robustness of our findings in Section 5.6. Finally, Section 5.7 concludes the chapter.

5.2 Related literature

The symbiotic relationship between business and politics features extensively in the corporate finance literature. To shed light on their between interdependencies, Faccio (2006) conducts a twofold exercise: the author records the stock price reaction to the announcement of: (1) a firm's offering a directorship to a politician and (2) a corporate insider commencing a political career. The result marks an average increase in market value of 2%. Chen et al. (2010) and Cooper et al. (2010) tracing lobbying and PAC contributions, respectively, document a strong association with the variation in both abnormal market returns and accounting measures of performance. Controlling for a likely differential outcome across partisan sidelines, Shon (2010) frames the 37-day Florida recount term of the 2004 election as a natural experiment. Indeed, throughout

this period the researcher reveals an economically significant positive (negative) effect on the share price of firms which had supported the Bush (Gore) presidential race.

The correlation between business activity and politics has also given impetus to interdisciplinary research on firms' economic rationale for diverting capital from productive uses to candidates' coffers. The seminal study of Masters and Keim (1985) is the first to show firms spending for quid pro quos. In line with the intuitive notion that organizations frequently interacting with the federal government, either as a consequence of their business model (i.e. the state is the buyer) or the institutional framework (i.e. the state is the regulator), possess a greater incentive to cajole politicians, the authors document a positive association with campaign contributions. Firm-specific characteristics are similarly related: size, cash-generating ability, R&D investment, and diversification in product as well as geographic base all claim some explanatory power. Grier and Munger (1993) employing a similar set of covariates, also correcting for selectivity, update the work of Masters and Keim. In doing so, the researchers observe that collective action obstacles can nullify in practice the benefits bestowed on corporate donors. Zardkoohi (1985) and Hart (2001) add to the side-effects the rise of free-riders which, while remaining absent in the effort to increase federal budget appropriations, they inevitably profit from the enlargement of the pie for the industry as a whole.

Notably, politics is a force potent enough to claim an effect even upon those organizations that opt to abstain from active involvement. Roberts (1990) and Faccio and Parsley (2009) illustrate the notion of how firms can be inertly affected by political change and converge on the futility of the quest for a perfect hedge against institutional risk. Accordingly, the share price reaction in the aftermath of an exogenous shock, i.e. a local politician's death, is marked by a sharp decline leading to an instant impairment of shareholders' wealth. A (limited) number of studies refuting altogether the covariance between corporate interference in state affairs and firm value (e.g. Ansolabehere et al., 2002; Goldman et al., 2009) are barely popular as the majority of researchers recognize at least some causal relationship between the two dimensions.

That is even more apparent in an IPO, whereby proximity to politics serves an important certification function, especially for international investors. In this respect, the evidence from the bourgeoning market for Chinese equities is compelling (also refer

to Fan et al., 2007 and Francis et al., 2009). From a different angle, international privatization studies (Jenkinson and Mayer, 1988; Perroti and Guney, 1993; and Dewenter and Malatesta, 1997) debate as to whether ex ante uncertainty is lower for previously state-owned enterprises. Notably, while disagreeing on the direction, this research unanimously supports the strong association. A further common theme in the extant works (inclusive of the Southeastern studies) emerges in that they revolve around the valuation experience of issuers, thereby conforming in essence to the broader literature of IPO underpricing. Justifiably, the question of the extent of funds that is left on the table during the day of listing is core to both the company's sellers and buyers. Though, it is unlikely to warrant an important determinant of the company's foundation decision.

The reason lies in the intuition that an IPO appears as a remote event for an entrepreneur that is just embarking on a new venture. Other matters such as sourcing capital and sustaining a growth course claim a higher priority. When the venture matures to the point that an IPO appears as a possibility, time to listing becomes critical both for the entrepreneur's personal objective function and the firm's ability to connect with a superior source of capital compared to what is available in the pre-IPO regime, i.e. angel and venture capital financing. Finally, with the median U.S. issuer to possess no more than 7 years of operational experience (as Jay Ritter estimates on his website), viability is an ongoing concern in the post-IPO regime. Conclusively, while the present study does not relegate the pricing dimension of an IPO, it emphasizes the role of political connections on the road towards an IPO and beyond. This framework is in line with Liu and Ritter (2010) showing issuers to strategically undertake the cost of a discounted offer price when the non-pricing dimensions of an IPO deal appear attractive.

5.3 Hypotheses development

While literature is characterized by an abundance of corporate aspects co-varying with actions alluding to politics (the evidence in the previous section is by no means exhaustive), the challenge resides in attaching causality to the observed phenomenon. Cooper et al. (2010) recommend vigilance for confounding factors that may ultimately account for the effect. Even though the problems of self-selection and

omitted variables are pervasive, we believe that our methodological choice to trace observations over the full time period for which they remain in the sample alleviates related concerns. In this respect, we describe three distinct organizational outcomes upon which a political record can exert influence.

Angel or 1st round of venture capital (VC) financing can frequently be vital to a new venture's transition from the seed to an expansionary stage. Beyond the obvious capital providing function, a VC firm may add value in non-financial ways (Hsu, 2004). In particular, the business acumen acquired through industry expertise, and evidenced by a prior record of successful IPOs, can assist an entrepreneur to evolve into an efficient manager. Alternatively, reinforcing structure and competitive strategy is possible through the appointment of VC-affiliated directors in the management team. This addition also disseminates a signal of managerial sophistication and organizational competence to IPO investors (Megginson and Weiss, 1991). After all, a reputable VC firm or one that is in the process of establishing a reputation would abstain from aligning forces with an issuer of low potential, also as per the grandstanding theory of VCs (Gompers, 1996).

However, do these benefits pose equally appealing to entrepreneurs who are in position to exert political influence? Prior research associates politically connected firms with greater ease to attracting external funds (e.g Faccio, 2006; Boubakri et al., 2008). The main reason is that expectations of political favoritism or protection from tail risk are factored into a lower discount rate. Houston et al. (2014) narrowing this privilege down to the level of bank loans offer compelling empirical support: S&P 500 firms with politically related boards, over the 2003-2008 period, not only do they incur lower rates on their debt but also considerably flexible covenants. The banks, in this case, appear to attach increased creditworthiness to their connected customers compared to otherwise similar firms. Because debt capital, as in the form of bank loans, is a less complicated and more expedient means of financing, entrepreneurs have a plausible incentive to substitute venture capital. Non-financial objectives such as the certification function can likewise subside. Arguably, proximity to political elites is a notion that appeals to both informed and uninformed investors underscoring a capability to extract economic rents.

H.1. A firm's likelihood to resort to angel or VC financing is inversely related to founders' political contributions

The time to IPO also conforms to this line of argument. In less need of the IPO proceeds, the connected firm can withhold listing until the economic and business conditions appear most opportune. This extends to the interactions with the involved agents (for example, auditors, legal intermediaries and underwriters' syndicate). Averting a premature IPO is likely to confer a multitude of advantages. First, it is conducive to maximizing the proceeds raised for the equity foregone. Lending support to this view, the evidence from China attests to the limited underpricing of politically connected firms (Fan et al., 2007; Francis et al., 2009). Second, it results in less litigation risk (Lowry and Shu, 2002). Third, it implies that the firm does not assume the burden of a public company's statutory and reporting obligations until it has at least developed the internal processes to carry out the transition with less friction. Taken together, a politically connected firm encounters no apparent economic reason to fast-forward to an IPO.

H.2. A firm's time to IPO increases with the intensity of political contributions

Profitability for the majority of start-ups appears to be more of a long-term objective. Because fueling growth frequently marks the only path to survival, the mounting capital expenditure combined with the burden of the market newness liability rarely allow for a positive accounting bottom line. Political connections have been shown to draw increased turnover and reinforce a firm's competitive position (Faccio, 2006). Yet, they have also been associated with the connected entity's failure to reap the benefits by successfully converting a hefty market share to a commensurately large profit (Boubakri et al. 2008). Apparently, the steady stream of revenues invites a certain degree of managerial entrenchment. This agency conflict induces self-serving behaviors which reflect on profit margins and systematically erodes shareholders' wealth. On balance, as the capitalization of the significant upward potential of politically connected firms depends on internal governance mechanisms and incentives' alignment, we leave the direction of the relationship up to empirical investigation.

H.3. A firm's likelihood to report positive earnings per share relates to political contributions

IPO survival requires that a firm exhausts all conceivable means in order to preserve the resources that it has been both endowed and subsequently developed or acquired (Shane and Stuart, 2002). Under circumstances of distress (or near distress) the flexibility to maneuver on the verge of the legal and institutional framework may largely determine the sustainability of future operations. In this respect, powerful acquaintances in politics have been shown to insulate firms from the associated compliance burden. For example, Chaney et al. (2011) document no negative implications for the fact that connected firms ignore or partially satisfy numerous requirements of statutory reporting. Notably, these firms remain relatively intact even in incidents of material omissions or fraudulent behavior as in Correia (2014) and Yu and Yu (2011), respectively. Though these ethically questionable practices can have a profound effect on the likelihood of survival, they come second to the possibility that an organization extracts economic rents simply by staying in the good graces of politicians. In turn, institutional and market imperfections underscore our last testable hypothesis.

H.4. A firm's survival likelihood is an increasing function of its political contributions

5.4 Data and sample

The time horizon of this study is conditional on the data availability of our proxies for political connections; i.e. lobbying, PAC and individual contributions. While the archive of the Federal Election Committee allows the tracing of campaign financing over several decades, a reliable database for lobbying contributions emerged in 1998 as a belated response to the Lobbying Disclosure Act of 1995. Accordingly, we use the website of the Center for Responsive Politics (CRP) as a portal to corporate lobbying activity and set the time period of the study from 1998 to 2014[29]. Because our interest spans numerous corporate events, we scrutinize both founders and organizations in the above sources for evidence of political donations. Adhering to an arbitrarily imposed cut-off, founders' and TMT contributions dating older than 5 years from the company

[29] Chapter 3 draws evidence from firms going public during the period 1 January, 1998 to 30 June, 2013. Chapter 4 and 5 use a slightly broader period (i.e. 1 January, 1998 to 31 December 2014). The starting point, common for all studies, is the date when lobbying data become available in databases subsequent to the passage of the Lobbying Disclosure Act of 1995. The end point is 6 months later in Chapter 4 and Chapter 5 for not any other reason apart from the fact that the chapter order reflects the actual order they were written. As a result, Chapter 3 engages a total of 1,578 IPOs while extending to the end of 2014 results in 1,769 IPOs. In both cases, the sample size is sufficiently large for satisfying the central limit theorem assumptions and thereby making valid statistical inferences.

inception and corporate contributions older than 5 years from post-IPO failure are discarded.

We rely on the SDC database, accessed via Thompsonone, for our IPO companies. Initially, we retrieve the population of U.S. IPOs for the period whereby coverage by the political contributions' databases is possible. Subsequently, we introduce the conventional sample restrictions prevailing in the IPO literature (Welch, 1989; Megginson and Weiss, 1991; Chemmanur, 1993; Hsu, 2004; Loughran and Ritter, 2002, 2004; Derrien, 2005). To this end, we exclude penny stocks (i.e. IPOs with an offer price less than $5), foreign issuers, corporate spin-offs and reverse leveraged buyouts (LBO). Our filter also prohibits American depositary receipts (ADR), real estate investment trusts (REIT), special purpose investment vehicles, unit offerings, royalty trusts, limited partnerships, and financial firms within the SIC codes of 6723 to 6999 which all barely resemble a typical corporate issuer. Some closed-end funds bypass the Thomson Reuters' flag. In such cases, we resort directly to the IPO prospectus (S-1 form) for calling a decision on the actual corporate character. Other databases used include U.S. COMPUSTAT for accounting elements and the Center for Research in Security Prices (CRSP) for all aftermarket prices.

After merging the contributions and IPO databases, our special sample of interest comes down to 1,769 unique IPO deals.

5.5 Empirical analysis

5.5.1 Variables identification

A number of well-established covariates in the IPO literature are employed into the baseline specifications. *IPO proceeds* are a common proxy for size (Beatty, 1989; Megginson and Weiss, 1991; Carter et al., 1998; Loughran and Ritter, 2002). A firm's resource availability can claim significant explanatory power over the various organizational outcomes. For example, larger establishments may be slower in transitioning from a private to public domain, realizing a positive accounting bottom line and experiencing failure (as in non-survivor IPOs). An investigation of the liabilities' side of the balance sheet is also in order. Overly aggressive *leverage* may

trigger a sequence of value eroding events: a premature equity sell-off to a venture capitalist of dubious quality or an excessively underpriced IPO while undermining viability over the long-run. To control for this dimension, we broadly use the ratio of total liabilities to total assets in the last reporting period prior to going public. *Earnings per share* often is not as much of a priority to a growth firm as, for instance, is market share expansion and competitive positioning (Trueman et al., 2000). However, we include this covariate (in the form of an indicator variable) as we expect positive profitability in the pre-IPO period to give an impetus for superior performance and financial standing in the post-IPO period. *Firm age* evidences cumulative organizational and industry experience (Ritter, 1991; Schultz, 1993; and Carter et al., 1998). Plausibly, a firm that has survived for a longer time in the pre-IPO period can similarly claim increased chances of survival after the IPO event, unless the opacity of the private regime has been among the very causes of the longevity. *Venture capital* (VC) is often reported as a make-or-break factor in the course of a new venture with the outcome being conditional on the investment objectives of the VC firm. If, as per the grandstanding theory, VCs center on a mass IPO production in order to build a reputation, the portfolio firms should struggle with a multitude of shortcomings (Loughran and Ritter, 2004). On the other hand, a VC which joins as a long-term business partner, and does not fixate on IPO as an exit strategy, has to offer a lot in terms of financial and non- financial functionally equivalent support (Hsu, 2004). In our setting, we may not rule out the possibility that this non-financial value can also be derived by the firm's political network, therefore mitigating the need to invite a VC in the capital structure. The *top management team* (TMT) can have a profound effect on the decision to go public and, similar to VCs, may pressure for an early IPO in order to promote self-serving objectives (Lowry and Murphy, 2007). We account for this factor, expecting this concern to subside with a greater number of executives, whereby at least some of them are likely to remain committed to their principals and resist to compromise firm value. Finally, a *technology firm* indicator variable enters all of the models in order to capture the incremental risk of the pertinent industries (Aggarwal, 2002).

Table 5.1 reports key descriptive statistics on the above covariates. As evidenced, the average issuer: (i) raises $ 123.1 million in IPO proceeds; (ii) possesses about 16 years of operating experience; (iii) reports a negative accounting bottom line;

(iv) exhibits a leverage ratio in excess of 1; (v) is more likely than not to advance to an IPO without making use of venture capital; (vi) comprises a top management team of about 10 members; and (vii) accounts for a 34% likelihood of belonging to the broader technology sector. Columns 1-6 report the pairwise correlations of variables which barely warrant any multicollinearity concerns. Furthermore, cases of an observed high magnitude are in line with economic intuition. For example, venture capital is positively associated with technology firms but negatively related to firm age and EPS which attests to the short-term investment horizon of this type of financiers. In passing, larger and longer-lived firms as proxied by proceeds and age, respectively, engage a more populous top management team.

Table 5.2 presents descriptive statistics on three distinct types of corporate political contributions (founders, top management team and corporate) at three benchmark years in corporate life cycle (inception, IPO and 5th quoted year). The upper part of the table analyzes founders' contributions, exclusively, for being the only feasible political footprint at this embryonic stage. The break-down reveals that the majority of firms derive direct political connectedness through the network of top management team. This is largely intuitive in the sense that this group of insiders outnumbers founders. However, it is also interesting that these politically involved individuals fail to stimulate commensurately large corporate political activity as in the form of lobbying and PAC campaigns. The fact that the median amounts of the latter contributions are multiples of individual contributions may partially explain the observed discrepancy. Lastly, all of the expenditure types increase in dollar intensity across the three benchmarks but this is barely surprising as the cash levels also ascend in the same direction.

5.5.2 The road towards an IPO: Venture capital and time

To assess the interplay of founders' political connections with the presence of VC financing in a firm's capital structure, we employ a Cox proportional hazard regression analysis whereby the time to angel or first-round of VC financing is the dependent variable. We obtain these dates from the SDC database and manually

estimate the distance from the firm's foundation as given on the Jay Ritter's website. Then, a set of covariates determines the hazard rates as follows:

$$\lambda(t) = \lambda_o(t).e^{(\beta_o+\beta_1 X_1+\beta_2 X_2+\beta_3 X_3+\cdots+\beta_k X_k)}$$

We apply the Cox proportional hazard (CPH) model to estimate the effect of plausible determinants on a firm's i) time to external financing (i.e. venture capital or angel financing) and ii) time to profitability. Because both variables measure time to an event (duration), they may not satisfy the normal distribution assumption which is a requirement for an ordinary least squares (OLS) model. Instead, CPH can provide statistical inferences without making any particular distribution assumptions (Cox, 1972). Once we have abandoned the OLS framework, the second important decision pertains to the selection between a CPH and an accelerated failure time (AFT) setting. The CPH model considers the effect of covariates constant whereas under the AFT that may either accelerate or decelerate the event. Although we cannot rule out the possibility that some regressors may indeed have a disproportional effect to time-to-failure, we prefer CPH as it does not make the assumption of a parametric distribution for the time-to-event. In this case, our methodological choice is also in line with prior literature; Jain et al. (2008) employ a CPH model to assess post-listing profitability and so do Hellman and Puri (2002) for investigating the likelihood of share option compensation in the presence of venture capital.

A common limitation that studies on firms' inception encounter is the dearth of firm-specific data (Shane and Stuart, 2002). In turn, they use information on founders' characteristics which, at this early stage, appear to exert a compelling influence on the evolving organization. Accordingly, we complement our study variable, founders' contributions, with the following covariates: i) number of founders and ii) a technology dummy which is used to account for the special relationship of VCs with companies in this sector (Ljungqvist and Wilhelm, 2003). Because of our argument in favor of recent contributions (and data availability constraints), we trace founders' activity since the year of 1988. This modification reduces the sample size by approximately 9% for a total of 1,615 IPOs.

The resulting coefficients vis-à-vis the corresponding hazard ratios are reported in Table 5.3. The variable in interest, founders' contributions, confirms Hypothesis 1 by means of a negative coefficient (and a hazard ratio less than unit). Therefore, the

existing resources are shown to suffice for politically connected founders who appear unwilling to relinquish any ownership until a considerably later time. A similar effect is documented for the number of founders. Plausibly, with more entrepreneurs on board, resource and expertise pooling results in greater self-sufficiency. Finally, the positive and sizable coefficient on the technology dummy highlights the fact that venture capital commonly comprises the lifeblood of companies standing at the high-end of technological innovation. Invariably, all coefficients are statistically significant, at the 1% level, and so is the likelihood ratio.

Table 5.4 traces the time to IPO for politically connected firms. However, as every firm in our sample experiences the event, no failures or censored observations are identified. Therefore, we apply a 4-step multiple hierarchical regression framework. The first step (Model 1) regresses the time to IPO solely upon the control variables. Subsequently, we add to this block the three variables in interest (one at a time) so that Models 2, 3 and 4 account for the effect of founders', TMT, and corporate political contributions, respectively.

The findings from Model 1 are largely intuitive. Firms exhibiting a higher capital adequacy or organic profitability attach less urgency to the IPO funds, thereby withholding listing until an advanced stage in corporate life cycle. This conclusion may be drawn from the positive and highly significant association with IPO proceeds and earnings per share. The presence of a venture capital in ownership structure also yields an unambiguously negative correlation at all levels of significance. This lends support to the grandstanding theory of VCs, as previously discussed, and is indicative of short-termism; the VC is looking forward to taking the firm public as an exit strategy and it requires that the IPO takes place at a sooner than later time. In contrast, TMT size is shown to significantly delay the event; possibly, because of a divergence of opinions as to the appropriate timing. Technology firms are known for shifting into the public domain soon after foundation as a consequence of their rapid growth, R&D requirements and VC-backing. This finding features in our analysis by means of a strong negative sign. In passing, the coefficient on leverage comes up negative and statistically insignificant.

Models 2-4 convey the gist of our analysis without altering the effects of covariates. Specifically, Model 2 attests to the incremental explanatory power of

founders' contributions accompanied with a steep increase in adjusted R^2 by about 35%. In particular, the coefficient is positive and statistically significant at the 5% level. In contrast, the inclusion of TMT and corporate contributions in Models 3 and 4, respectively, produces insignificant results. Furthermore, the overall model improvement is only marginal. Overall, the sharp distinction among the three contribution venues with reference to the effect on the time elapsing to IPO shows that founders' endowments determine organizational outcomes for at least as long as the firm remains in the private domain. In this respect, founders' endowments may not be easily replicated or externally acquired. Thus, the present study is in line with the evidence from Shane and Stuart (2002) attesting to the pervasive nature of founders' endowment effects.

5.5.3 Post-IPO operating performance

Because operating performance in the pre-IPO period frequently comes second to fuelling growth and market share increase (Trueman et al., 2000), we investigate its cross-sectional variation with political contributions subsequent to listing. To this end, we employ two sets of tests.

The first test uses data from the end financial statements of the IPO year. In this brief time window, we seek for any immediate effects on firm's ability to increase revenues, realize profits and generate cash. Table 5.5 reports the results of the multivariate regression analysis. Model 1 and 2 regress the natural logarithm of a firm's revenues and cash flow from operations, respectively, upon the contributions and the set of control variables. The main difference with the pre-IPO regime is discernible in the fact that founders' contributions cease to be an important determinant, failing all conventional levels of statistical significance. Instead, in Model 1 both TMT and corporate contributions, in the form of lobbying and PAC, appear important determinants in reinforcing turnover. Replacing revenues with the cash flow from operations as the dependent variable, in Model 2, results in the loss of significance for TMT contributions while leaving the influence of corporate contributions unaffected (the coefficient is positive and significant at the 1% level). Taken together, the evidence shows that founders' endowments and individual features such as proprietary political

networks evaporate in the public domain or fully assimilate into the broader corporate identity. Finally, we extend the analysis to net income which comprises the common numerator in the return on sales (Model 3) and return on assets (Model 4) ratios. Invariably, the variables in interest obtain statistically insignificant coefficients. Therefore, the positive association with turnover and the cash-generating ability fails to support accounting profits. Thus, we have drawn evidence from the IPO setting that is in congruence with Boubakri et al. (2008) attesting to the inability of politically connected firms to convert their increased market shares to abnormally positive profitability.

The second test traces each observation in the sample until profitability is attained. We resort for this purpose to time to event analysis. We specify a Cox proportional hazard regression model similar to time to VC but different in that the full set of control variables is employed. The dependent variable relates to the duration of losses or a net income of zero. In turn, this duration is regarded as completed upon the realization of positive profitability or the end of this study's time period for permanently loss-incurring firms.

Table 5.6 reports findings that tie in with the evidence from the time window of the IPO year. Specifically, founders' contributions once more fail to produce a statistically significant effect. In addition, the negative sign on the TMT contributions and, especially, corporate contributions variables at the 10% and 1% levels, respectively, show both behaviors to act in a manner which defers profitability for a later time. Evidently, absent other considerations such as market penetration and strategic positioning, managers predominantly relying on profitability-related measures to assess performance are incentivized to suppress a firm's political footprint at both the corporate and executive levels. In passing, the control variables confirm that larger firms, as evidenced by IPO proceeds, attain profitability within a shorter time. The earnings per share also obtain a strong (at the 1% level) positive coefficient, therefore decreasing the time to event in the post-IPO period. The opposite association holds for leverage as interest payments erode profit margins and restrictive debt covenants may prohibit firm from assuming risky projects (Houston et al., 2014). Venture capital similarly increases time to profitability. This marks a further testament to the fact that VCs lead firms to premature IPOs (as in Loughran and Ritter, 2004); the firm is likely to suffer multiple periods of losses before it develops the capability to sustain operations

organically. Finally, profitability tends to be a long-run objective for technology firms. Understandably, the product complexity requires a substantial time as well as monetary investment in R&D. If successful, this endeavor will confer a competitive advantage so that the firm claims market share and profitability within a more medium to long-term horizon. In this respect, our evidence complements that of Trueman et al. (2000) for Internet stocks.

5.5.4 IPO firm survival

The final organizational aspect examined in this study relates to a firm's ability to absorb the shock of a domain shift and defend its longevity in spite of the public entity's rigors (legal compliance, statutory reporting complexity, increased scrutiny etc.). With the mean (standard deviation) survival rate of the companies in our sample at 0.63 (0.49), it is clear that an important portion of IPOs are ultimately proven detrimental to the issuing firms. Our inquiry into the causes involves both univariate and multivariate regression analysis.

The distinction on a 'survivor versus non survivor' basis in Table 5.7 provides an initial overview. In particular, survivors are associated with almost double the size of non-survivors (i.e. $ 202.6 and 120.1 million, respectively). They also appear 5 years older in age with a mean of about 20 years. Unsurprisingly, firms advancing to an IPO with positive profitability have an approximately 36% greater representation within the survivors. The leverage ratio, while remaining above unit for both groups, is 45% bigger in magnitude for non-survivors. As previously discussed, venture capital financing is considerably less common among long-lived IPOs. Evidently, the short-termism of these investors exerts an adverse influence on numerous aspects in a new venture's life, triggering a chain of negative outcomes: a premature IPO, persistence of losses and, eventually, failure. In contrast, TMT size with a mean of 7.18 (7.56) members in successful (failed) IPOs barely warrants a disparity between the two samples, as also evidenced by an insignificant p value ($p > 0.1$). Lastly, a striking difference pertains to technology stocks which pose about 4 times more likely to experience failure underscoring the excessive riskiness prevailing in the sector.

The statistics on the 3 variables under study jointly give rise to a discernible pattern. That is, survivor IPOs surpass non-survivor ones across all contributions' avenues. At the individual level, founders' contributions from survivors exceed those made by non-survivors in terms of average values (i.e. $ 549.85 and 441.27, respectively). With respect to TMT contributions, the survivors' dominance accounts for more than a 2:1 relationship. This phenomenon reaches a peak at the corporate contributions level (i.e. lobbying and PAC), whereby the mean amounts for survivors and non-survivors are $ 100,688.6 and 37,958.1, respectively. Therefore, politically connected individuals appear to induce their corporations as a whole to centrally-planned political campaigns and this claims a direct effect on their likelihood of survival.

Given the above findings, a multivariate analysis is in order to capture the effect of contributions net of the confounding factors. In a methodological divergence from the previous analysis, IPO firm survival is explored via a logistic regression. This framework is preferable to the time to event analysis previously employed as the research interest now resides within the occurrence per se rather than the time to failure. Consistent with Fischer and Pollock (2004), we define as survivors those companies that remain listed 5 years after their IPO. However, unlike the aforementioned study, we assign M&As to the non-survivors' group. The reason lies in the poor corporate and market performance typically preceding an M&A which we regard as an alternative form of weakness.

Table 5.8 reports the results on a firm's survival likelihood for a sample of 1,184 IPOs. Focusing on the study variables, a differential effect on the odds for survival based on contributions' type becomes apparent. In particular, founders' and TMT contributions claim negligible explanatory power over the dependent variable. In contrast, corporate contributions obtain a positive and statistically significant coefficient at the 5% level. Therefore, the implications are clear in that contributions can be conducive to survival only if pooled and channeled towards the collective corporate means (i.e. lobbying and PAC). Fragmented action through individual contributions creates no positive externalities at this stage in corporate life cycle. Similarly, founders' interpersonal networks appear devoid of value-relevance.

As for the control variables, findings are largely in accord with those from the univariate analysis. Specifically, the survival likelihood is an increasing function of IPO proceeds, age and prior profitability as they all yield strong (at the 5% or better) associations. Inversely, technology firms and the presence of venture capital pose as threats to long-term viability; a finding that fulfils all conventional levels of significance. An interesting exception appears in leverage which produces a statistically insignificant effect. This can plausibly manifest some degree of resilience in firms' debt-bearing capacity. Finally, as it was evidenced in the univariate analysis, TMT size fails to warrant an important survival determinant. The overall specification results in a pseudo-R^2 of 12.56%.

5.6 Robustness

After excluding outlier observations, our baseline models in Tables 5.4, 5.5 and 5.8 produce qualitatively similar results. In addition, we create new specifications that engage only the explanatory variables that have attained some of the conventional levels of statistical significance (i.e. 10% or higher). Again, the effect of the remaining covariates remains unaffected.

The Cox regression models of Tables 5.3 and 5.6 require special methodological treatment. This is because a proportional hazard framework renders the common residuals-based diagnostic tests inappropriate. To this end, we follow an alternative course in order to identify observations excessively biasing the estimated parameters. Investigating the full sample estimate, $\hat{\beta}$, comparatively with the new parameter estimate, $\hat{\beta}^{(i)}$, which results from the deletion of observation (i), we can assess the overall influence of (i). Specifically, the deviation $\hat{\beta} - \hat{\beta}^{(i)}$ is referred to as the 'dfbeta' and comprises a vector with a dimension that is equal to the number of independent variables in the regression equation. In this regard, we standardize and summarize the absolute values of 'dfbetas' to construct an influence index with one-dimension. Based on their score value on this particular index, influential observations are singled out and excluded from the models. Accordingly, the proportional hazard model in Tables 5.3 and 5.6 are now run with sample sizes of 1,602 and 1,009 respectively. For the venture capital equation, the four explanatory variables remain significant at the highest level. In contrast, for the profitability equation, the age variable attains significance at the 1%

level, therefore slightly improving the model's overall explanatory power. Furthermore, the robustly positive coefficient is in accord with our initial conjecture that firms of greater operational experience can expect to transition to positive earnings per share faster.

Finally, we augment baseline specifications with a series of additional covariates. Namely, we use underwriter's reputation, ownership retention upon IPO completion, and listing exchange. Although, these factors are well-established covariates in the IPO-return equation, in our context, they invariably lead to insignificant results. Further, they impair the significance levels of some of the principal explanatory variables.

Omitted variables constitute a pervasive problem and our model cannot claim immunity to this bias. However, we exercise caution to approximate the underlying reality to a statistically and economically satisfactory degree. In this respect, we pay attention to the model's R-squared, the t-statistics and the Durbin-Watson value. In addition, we check that the coefficient signs are theoretically justified and in line with prior literature. The regressors in determining time to IPO (Table 5.4) feature in the study of Yang et al. (2011). Likewise, the regressors in the post-IPO profitability equation (Table 5.5) are commonly employed (e.g. Jain and Kini 2008, Chahine and Goergen 2013). Auxiliary to these variables, we can hypothesize about the effect of numerous confounding factors, though we choose to discard and apply the Occam's razor.

5.7 Conclusion

In this chapter, we investigate for a likely nurturing effect of political connections upon new ventures. Rather than setting up a typical event study, we sequentially visit key milestones and study the dynamics of the hypothesized associations across the corporate life cycle. Although not a one size-fits all solution, political connections of young firms claim significant explanatory power over a series of desirable organizational attributes such as financial independence, market share expansion and longevity. Taking monetary contributions as a proxy for political

connectedness, however, the effect varies considerably with contributors' identity and firm's ownership structure.

At inception, founders pass on to start-ups, among other resources, their proprietary political networks. This endowment leads to an increased time to VC and IPO financing. A finding which we interpret in positive terms as a firm's powerful alliances can underscore its operational and financial autonomy. Notably, founders' political contributions overshadow those made by top management team or at a centrally-planned level such as lobbying and PAC. This is observable until the IPO event which, along with the ownership change, brings about a peripheral role to founders' characteristics. Evidently, political involvement in order to influence the organizational outcomes of a public firm requires corporate-wide strategies and mass participation.

Consequently, corporate campaigns, much more than individual contributions, can pave the way for market penetration as evidenced by a positive relationship with turnover. Nevertheless, it is still upon the firm to convert the revenues to profitability. In this regard, the study provides mixed evidenced. Finally, it is corporate campaigns, exclusively, which can enhance a connected firm's survival likelihood by deterring M&As and any other form of failure.

Given the evidence on the multifaceted benefits stemming from proximity to politics, follow-up research could shed light on likely abuses. For example, it is possible that political connections invite management entrenchment. In this case, political contributions, rather than adding to the firm's relationship capital, comprise perquisite consumption and erode shareholders' wealth.

Table 5.1: Descriptive statistics

This table reports descriptive statistics for a sample of 1,769 U.S. IPOs announced from 1 January, 1998 to 31 June, 2014. All IPOs come from the Securities Data Company (SDC) database, while the accounting data is from Compustat. The statistics provided include the mean, standard deviation and the pairwise correlations for the independent variables used in the subsequent regressions. All variables are defined in Appendix A

	Mean	Std Dev.	(1)	(2)	(3)	(4)	(5)	(6)
1.Proceeds	123.1	223.8						
2.Age	16.3	22.9	0.17					
3.EPS	0.43	0.47	0.05	0.22				
4.Leverage	1.40	1.90	-0.09	-0.09	-0.19			
5.Venture	0.42	0.45	-0.11	-0.27	-0.30	0.09		
6.TMT Size	9.82	3.29	0.21	0.28	0.13	-0.08	-0.02	
7.Tech firm	0.34	0.43	-0.06	-0.21	-0.24	-0.01	0.34	-0.16

Table 5.2: Contributions breakdown across firms' life cycle

This table reports statistics of the political money contributions made by a sample of 1,769 U.S. IPOs announced from 1 January, 1998 to 30 June, 2014. The data for corporate contributions is from the OpenSecrets website; the data for founders' and TMT contributions is from the Federal Election Commission (FEC) archive. The statistics provided include the mean, standard deviation, median, minimum and maximum. These statistics are reported for the three benchmark years investigated in this study: i) Inception (founders-only) ii) IPO year and iii) 5th quoted year. *N* represents the number of firms identified with each type of activity at any given year.

			Inception			
	N	Mean	Std Dev.	Median	Min	Max
Contributions *($ 000s)*						
Founders	157	5.7	16.6	2.0	0.2	170.4
			IPO year			
	N	Mean	Std Dev.	Median	Min	Max
Contributions *($ 000s)*						
Founders	181	6.4	17.5	2.3	0.7	182.4
TMT	718	8.8	2.6	2.5	0.2	339.1
Corporate	397	297.9	864.5	72.7	2.5	8,854.2
			5th quoted year			
	N	Mean	Std Dev.	Median	Min	Max
Contributions *($ 000s)*						
Founders	134	7.6	12.3	3.0	0.25	70.9
TMT	942	12.6	3.8	4.7	1.1	400.1
Corporate	412	305.6	874.6	80.0	6.1	9,985.5

Table 5.3: VC capital funding for start-up firms

This table reports the Cox proportional hazard model estimates for a sample of 1,615 U.S. IPOs over the period 1 January 1998- 30 June 2014. The dependent variable is the time to angel or first-round of venture capital financing. All variables are defined in Appendix A. Industry and year fixed effects are included. The first column reports the resulting coefficient, the second the T-statistic and the third the corresponding hazard ratio. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 level, respectively.

	Coefficient	T-statistic	Hazard ratio
Number of founders	-0.096***	-3.44	0.909
Founders' contributions	-0.030***	-2.64	0.970
Tech firm	0.236***	4.44	1.267
Likelihood ratio			77.78***
N			1,769

Table 5.4: Time to IPO

This table reports the results of hierarchical multiple regressions for a sample of 1,769 U.S. IPOs over the period 1 January 1998- 30 June 2014. The dependent variable is the time to IPO measured since company's foundation. All variables are defined in Appendix A. Industry and year fixed effects are included. The lower part of the table reports model improvement as a result of adding the new explanatory variables. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 level, respectively.

	Model 1	Model 2	Model 3	Model 4
Proceeds	4.4445***	4.3476***	4.3964***	4.3927***
	(8.19)	(8.00)	(8.03)	(8.00)
Earnings per share	5.0524 ***	4.8856***	4.8927***	4.9025***
	(4.35)	(4.20)	(4.21)	(4.21)
Leverage	-0.1318	-0.1356	-0.1374	-0.1344
	(-0.77)	(-0.79)	(-0.80)	(-0.79)
VC	-7.0584***	-7.0854***	-7.081***	-7.0574***
	(-5.93)	(-5.96)	(-5.95)	(-5.93)
TMT Size	4.4946***	4.3442***	4.3461***	4.2484***
	(7.75)	(7.45)	(7.45)	(7.22)
Tech firm	-4.1159***	-4.0463***	-4.1122***	-4.0544***
	(-3.58)	(-3.52)	(-3.57)	(-3.52)
Founders' contributions		0.7851**	0.8845**	0.8442**
		(2.22)	(2.35)	(2.23)
TMT contributions			-0.1299	-0.1474
			(-0.76)	(-0.86)
Corporate contributions				0.1683
				(1.28)
N	1,769	1,769	1,769	1,769
Adjusted R^2	0.151	0.201	0.201	0.200
Δ Adjusted R^2		0.050	0.000	0.001
F	66.03***	57.44***	50.32***	44.93***

Table 5.5: The effect of contributions on post-IPO performance

This table reports the results of OLS regressions for a sample of 1,769 U.S. IPOs over the period 1 January 1998- 30 June 2014. The dependent variables in Columns 1, 2, 3 and 4 are revenues, cash flow, return on sales (ROS) and return on assets (ROA), respectively. All variables are defined in Appendix A. Industry and year fixed effects are included. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 level, respectively.

	Revenues (1)	Cash flow (2)	ROS (3)	ROA (4)
Proceeds	0.8352***	0.4743***	0.2439***	0.0612***
	(14.95)	(12.42)	(3.61)	(5.60)
Age	0.0169***	0.0057***	0.0029	0.0006
	(7.9)	(3.61)	(0.98)	(1.22)
Earnings per share	1.4685***	1.7857***	1.4859***	0.5218***
	(16.16)	(28.17)	(10.91)	(23.69)
Leverage	-0.0809***	0.0094***	-0.1139***	-0.0480***
	(-2.77)	(2.88)	(-5.72)	(-14.9)
VC	-0.5178***	0.0108	-0.4291***	-0.0774***
	(-5.49)	(0.19)	(-3.06)	(-3.42)
TMT Size	0.2294***	0.0595	0.0843	0.0052
	(5.65)	(1.33)	(1.21)	(0.46)
Tech firm	0.1650*	-0.0899*	0.3203**	0.0550**
	(1.87)	(-1.7)	(2.38)	(2.52)
Founders' contributions	-0.0119	0.0196	0.0029	-0.0031
	(-0.62)	(0.85)	(0.07)	(-0.43)
TMT contributions	0.0439***	0.0073	0.0025	0.0032
	(3.72)	(0.8)	(0.13)	(1.00)
Corporate contributions	0.0258***	0.0216***	-0.0193	0.0006
	(2.56)	(2.96)	(-1.26)	(0.22)
Adjusted R^2	0.5525	0.5652	0.1564	0.4532
N	1,769	1,769	1,769	1,769

Table 5.6: The effect of contributions on time to profitability

This table reports the Cox proportional hazard model estimates for a sample of 1,184 U.S. IPOs over the period 1 January 1998- 30 June 2010. The dependent variable is the time to profitability, evidenced by a positive net income. All variables are defined in Appendix A. Industry and year fixed effects are included. The first column reports the resulting coefficient, the second the T-statistic and the third the corresponding hazard ratio. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 level, respectively.

	Coefficient	T-statistic	Hazard ratio
Proceeds	0.065**	2.29	1.067
Age	0.037	0.62	1.038
Earnings per share	2.830***	17.33	1.040
Leverage	-0.025**	-2.37	0.975
VC	-0.003**	-2.27	0.997
TMT Size	-0.007	-0.25	0.993
Tech firm	-0.135**	-2.27	0.874
Founders' contributions	0.011	0.9	1.011
TMT contributions	-0.014*	-1.94	0.987
Corporate contributions (lobby+PAC)	-0.019***	-2.95	0.981
Likelihood ratio			392.37***
N			1,184

Table 5.7: A comparison between survivor and non-survivor IPOs

This table reports descriptive statistics on IPO and firm-specific characteristics for a sample of 1,184 U.S. IPOs announced from 1 January, 1998 to 30 June, 2010 which is further divided on the basis of survivors (non-survivors) 5 years after the IPO. All IPOs come from the Securities Data Company (SDC) database. The statistics provided include the mean and standard deviation for the main variables in interest and control variables used in the regressions. The presentation of each variable concludes with a test for difference in the sub-sample means. All variables are defined in Appendix A

	Survivors		Non-Survivors		P-value
	Mean	Std Dev	Mean	Std dev	diff in means
Proceeds	202.663	388.330	120.016	482.847	0.00
Age	20.237	28.919	15.313	21.212	0.01
EPS	0.649	0.477	0.419	0.493	0.00
Leverage	1.101	2.314	1.603	3.287	0.01
VC	0.225	0.4185	0.539	0.498	0.00
TMT Size	7.18	2.62	7.56	2.89	0.15
Tech firm	0.163	0.371	0.438	0.496	0.00
Founders	549.85	3,804	441.267	5,228.8	0.00
TMT	2,087.42	6,368.09	978.98	5,785.44	0.00
Corporate (lobby+PAC)	100,688.6	489,223.4	37,958.06	33,7328.9	0.00

Table 5.8: Probability of surviving in the public domain

This table reports the probit regression estimates for the probability of survival 5 years after the IPO for a sample of 1,184 U.S. IPOs over the period 1 January 1998- 30 June 2010. The dependent variable is the probability of an IPO surviving as an autonomously quoted firm 5 years following the offering. All variables are defined in Appendix A. Industry and year fixed effects are included. The first column reports the resulting coefficient, the second the standard error and the third the T-statistic. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 level, respectively.

	Coefficient	Standard error	T-statistic
Proceeds	0.340***	0.071	4.79
Age	0.006**	0.003	-2.21
Earnings per share	0.381***	0.147	2.6
Leverage	-0.043	0.040	-1.08
VC	-0.935***	0.161	-5.81
TMT Size	-0.023	0.066	-0.35
Tech firm	-1.020***	0.169	-6.03
Founders' contributions	0.046**	0.020	2.28
TMT contributions	-0.021	0.019	-1.1
Corporate contributions (lobby+PAC)	0.003	0.016	0.22
Pseudo-R^2			12.56
Model Chi-square			205.66***
N			1,184

Chapter 6 – Conclusion

6.1 Summary and concluding remarks

This thesis shows that political connections may be a valuable asset in a firm's effort to combat the market newness liability by conferring the necessary certification and legitimacy. We draw most of the empirical evidence from the process of going public. In Chapter 3, this is accomplished via a regression-based approach. In contrast, in Chapter 4, we introduce a nonparametric approach which is novel to the IPO setting and has general applicability when relationships of influence are suspected. In this respect, our analysis extends from outcome prediction to efficiency evaluation. Lastly, Chapter 5 broadens its scope to investigate the explanatory power of political outreach over additional milestone events besides an IPO.

Specifically, in Chapter 3 we consider two possible avenues through which proximity to politics, signified by lobbying and PAC contributions, is likely to mitigate an issuer's ex ante uncertainty. First, it is conducive to leveling the informational playing field among the principal IPO participants. In turn, this may be the outcome of the increased disclosure accompanying both of the aforementioned contribution types. Equally plausible is a networking argument. In particular, we acknowledge that issuer, institutional investors and underwrites may all come closer by virtue of their connections. As a result, a niche network arises which enables the exchange of firm-specific insight with predictions of demand and overall market sentiment. Second, we posit that the perceived capability to influence political elites elevates a connected issuer to a higher status which is discernible by the lead underwriter. Aspiring to prestige spill-over and a recurring business relationship, the latter party is less likely to low-ball the IPO offer price conceding a larger portion of the surplus value to the client firm. Invariably, all lines of argument converge on the prediction that IPO underpricing should abate with corporate political donations.

Given the multifaceted function that political connections can serve, identifying any of the above lines of arguments as a single, dominant culprit is unrealistic. Yet, we employ a series of tests. First, we visit the bookbuilding period to trace the magnitude of filing price revisions. If the networking channel is valid, the need for subsequent pricing interventions should be lower, ceteris paribus. The findings, however, fail to support a

superior information flow as the revisions, in absolute terms, barely differ from the rest offerings in the sample. Second, underwriters' own political network is taken into account. Presumably, underwriters that are connected themselves are less likely to concede a favorable valuation on the basis of the client's network. Yet, as the effect survives this robustness exercise, the bargaining power argument gains ground with an interesting note; rather than representing an underwriter's attempt to cajole the IPO firm's political acquaintances, a better negotiated outcome arises as a result of the brighter prospects that connected issuers are typically associated with. At the same time, we cannot relegate political connections as a means of instilling confidence in IPO investors. The significantly lower volatility the IPO shares realize in the aftermarket period is evident of the general market consensus on the liquidity and level that these equities will trade.

Issuers allowing for a political budget, albeit the cash-scarcity of the pre-IPO regime, benefit from the opportune setting. A modest 10% increase in political expenditure causes a 2.5% reduction in IPO underpricing. The substantial economic significance of the relationship is amplified once studied in conjunction with the median political contribution of $ 71.5 thousand. Breaking down the effect at the level of individual recipients, we develop political strategies for optimal results per dollar spent. In this regard, we show that supporting candidacies for the House of Representatives or those identifying with the Democratic party produces the maximum appeal. Furthermore, the application of the candidate indexes of Cooper et al (2010) divulges an incremental effect for incumbent politicians with long tenures and a competitive career track within Congress.

The interplay of political connections with IPO underpricing continues to be the main research question in Chapter 4, albeit from a different angle. Building upon the Chapter 3 evidence, we describe a framework which allows the relationships to manifest themselves in a data-driven manner. Specifically, we apply a frontier approach using a determinist-nonparametric methodology aiming to find the smallest convex cone enveloping the observed data. Then the efficiency is measured as the (output-based) distance from the estimated frontier. The objective is to create an envelope based on the "smallest," or "tightest fitting," convex cone, where the upper boundary of the "fit" will reveal the best practice. To this end, we apply the mathematical programming technique known as Data Envelopment Analysis (DEA). Using the ratios of offer prices to the first

aftermarket prices, we construct non-parametric piece-wise surfaces (i.e. frontiers) over the examined IPOs. Then the efficiency measures are calculated relative to these surfaces by the application of linear programming models. As a result we are able to obtain relative, comparable efficiency measures across the examined IPO sample.

This technique lends itself well to the vastly different philosophy of lobbying and PAC contributions, disentangling the effect of each type on IPO underpricing. In doing so, it reveals a robustly positive effect of PAC money on IPO efficiency levels whereas the effect of lobbying entails numerous sampling and methodological peculiarities. Indicatively, the inverse "U"-shape relationship of lobbying money with IPO performance alters into a "U"-shape pattern once we preclude issuers with a first aftermarket price below the IPO offer price. Our sector analysis also pinpoints circumstances under which contributions intensity can not only squander corporate cash but also impair efficiency levels. The implications for prospective issuers are clear in the sense that political donations do not constitute a one-size fit all solution. Nevertheless, once the distinct type of connectedness offered by each contribution type matches and reinforces the firm's position within its competitive environment, profound results can emerge as in the paradigm of the lobbying contributions of Energy and Power firms.

In the final chapter, we assess the role of political connections on a sequence of other important corporate events. Again, the value-adding element of proximity to politics emerges as the common theme. In particular, we associate connected ventures with the following: (1) financial autonomy as evidenced by a longer time to venture capital and, subsequently, IPO financing; (2) increased turnover without, however, this to result in increased profitability. Notably, setting time to profitability as the dependent variable in a Cox proportional hazard model, political contributions significantly defer the occurrence of the event; (3) greater survival likelihood in the public domain. Recognizing that connectedness may arise through multiple sources, we comparatively assess contributions made by 3 distinct avenues: founders, top management team and centrally planned campaigns directly financed by the corporate treasury (i.e. lobbying and PAC). At inception, founders' contributions account for a valuable endowment and suffice for a new venture to claim benefits at the early (and up to medium) stages in the corporate life cycle. Yet, as a distinct corporate identity emerges, founders progressively cease to be among the important determinants of organizational outcomes. In this

respect, the IPO time appears to be the turning point. Subsequently, means of involvement that rely on mass participation and demonstrate that the whole organization is on board, rather one or more prominent individuals, are preferable. Therefore, a firm's political strategy is a dynamic process necessitating rebalancing with timely interventions, otherwise it becomes obsolete.

6.2 Managerial implications

Given the multifaceted value that a new venture can claim as a consequence of its political capital, monetary contributions channeled towards this purpose obtain many of the characteristics of an investment; for example, the initial outlay is dwarfed by the value of the expected benefits. As an investment, therefore, political contributions barely constitute a one-size-fits-all solution but require strategy in both planning and implementation. To this end, the type, target recipients and timing of these cash flows can all be of critical importance.

Lobbying, as a message-oriented activity, lends itself to circumstances where the elements of communication and timely interactions with legislators are crucial. The Energy and Power sector, which is extensively regulated, illustrates this notion by a decisive advantage for lobbying IPOs. In contrast, the focused and personalized nature of PAC and individual contributions has an advantage when the quest is broadly for favoritism as in the cases of competing for government contracts or balancing labor union influence. More often than not, however, some combination is necessary whereby lobbying, by being uncapped, allows for dollar intensity and PAC for identification.

Drawing the profiles of value-adding targets, we offer evidence from the IPO paradigm in favor of politicians aligning with the Democratic party and the House of Representatives. Home state candidacies also claim special importance. Because a career record of accomplishment is associated with incremental explanatory power, incumbents have an advantage over new challengers. In all cases, the relationship grows stronger with a recurring and uninterrupted stream of campaign financing than a one-off lump sum payment.

The timing of cash flows is also important with regard to firm age. At early stages in the corporate life cycle, founders' proprietary networks appear to offer a valuable endowment. Yet, as a corporate identity emerges, centrally planned campaigns

that engage a greater number of stakeholders and organizational layers should be present in order to constitute a firm 'connected'. In this sense, a firm's breadth and depth of political involvement increases in proportion to operational experience and tangible asset base.

Consequently, the institutional and competitive environment together with the firm's idiosyncrasy dictates the successful political strategy. Random political expenditure or a pattern that fails to direct the political budget for a maximum effect per dollar spent nullifies the investment point of view and may represent managers' attempt to reinforce their personal network and sphere of influence at the shareholders' expense (perquisite consumption).

6.3 Research limitations

On the whole, our results attribute to corporate political donations a decisive advantage. In addition, the barrier to entry is low. Therefore, a question logically arising is why not even more firms have been drawn into this practice in order to claim benefits initiating as early as the firm's inception and extending up to the event of corporate failure. We propose four reasons that may be accountable for the underrepresentation of IPO firms among the donors.

First, an issuer may align with the agency cost view. Also consistent with a strand of literature (e.g. Ansolabehere et al., 2003) associating political donations to managerial consumption of perquisites, the value-relevance of this type of expenditure can involve important skepticism. However, as these studies remain silent with regard to the special setting of an IPO, the novelty of the present work comes to the forefront. Regardless of whether political contacts ultimately deliver the hypothesized benefits or not in the post-issuance period, we show how issuers can create value by myopically fixating on the IPO event. Arguably, in lieu of prior empirical evidence, such conclusion would entail a considerable leap of faith.

Second, proximity to politics is commonly associated with the side-effect of polarization. With IPO success being conditional on investor participation, this source of probable discomfort could alienate a fraction of market at a vital time. Therefore, preoccupied with attaining maximum appeal, an issuer is likely to suppress its political

footprint opting for the safety of an apolitical image. This argument also runs parallel to Masters and Keim (1985) conjecture that immensely profitable firms may shy away from contributions in fear of jeopardizing their status quo position.

Third, there is the threat of unwanted disclosure due to both lobbying and PAC campaigns. With IPO pricing impounding both the quantity and quality of information provided by issuer (refer also to Leone et al., 2007), the latter one is expected to exercise selectivity as to the dissemination of informational cues around listing time. This type of self-imposed censorship can plausibly extend to political donations; the filing of a lobbying report requires the explicit identification of the issue being lobbied for and, similarly, a PAC contribution is fully traceable to the recipient level. Thus, both political avenues are susceptible to revealing risk factors that management would otherwise prefer to conceal.

Fourth, cash scarcity is inherent in a typical pre-IPO regime. Given the mounting cash outflows in the preparation for going public (e.g. towards auditing, legal and marketing services), an issuer may opt out of an additional, highly discretionary, financial burden; at least for until the IPO cash enters the corporate coffer. Non-coincidentally, donor IPOs are more probable to exhibit positive profitability and firm's cash flow level has come up among the significant determinants of a firm's political involvement.

6.4 Recommendations for further work

This thesis paves the way for follow-up investigation on a number of related issues. Though, the pertinent list can practically be inexhaustible, we provide the following suggestions on the basis of thematic proximity.

An interesting investigation can pertain to the ownership changes transpiring at IPO. If politically connected insiders systematically retain larger equity stakes than other insiders, then the former ones plausibly factor in incremental benefits in the public domain. At the same time, this would also be indicative of asymmetric information within the sellers' side as any future economic rents due to connections are unlikely to be publicly disclosed or their very essence may be jeopardized. Another informative pattern could exist in institutional investors' preference or aversion to firms.

Accordingly, that would either divulge a vote of confidence in the firm's relationship capital or disdain for opaque forms of dependencies.

If political connections confer immunity in cases of malpractices and even fraudulent behavior, this privilege should manifest itself in the IPO setting by means of reduced litigation against connected issuers. Either as a reluctance to draw negative attention from the firm's political contacts or because of expectations of superior performance in the post-IPO regime, IPO investors are likely to withhold from exercising their legal rights. This status of insulation could result in a larger portion of proceeds to be channeled towards the intended uses rather than settling IPO-related lawsuits.

Given that the influence of political connections on corporate events grows stronger with the time length of the relationship, a certain degree of managerial entrenchment is likely to emerge. This study provides substantial evidence towards this possibility. In particular, it is observed that connected managers' contributions and, especially, lobbying and PAC campaigns, while relating to increased turnover and operating cash flow, significantly defer profitability. Future research could closely trace managerial decisions in light of a friendly government and pinpoint culprits for the striking discrepancy between the top and bottom line of the firm's income statement.

Yet another study could exclusively focus on business ventures established directly by politicians. If the latter ones systematically engage in areas related to their delegated duties in Congress, as evidenced by participating committees, subsequent abnormal performance may reflect more than accumulated knowledge and experience. Specifically, ongoing dependencies between former members of Congress and incumbent ones or other bureaucrats are likely to create for these businesses an undue competitive advantage. In turn, this entails a series of implications for politicians' investment activities and the extent to which the latter ones should be subject to regulation.

On a technical note, this thesis introduces a nonparametric framework to assess the impact of political connections. Because it is data-driven, this approach refrains from pre-assuming a functional form and is conducive to capturing likely nonlinearities. These features cater to the modeling challenges of intangible assets and even more so a firm's relationship capital. Overall, this is a technique of general applicability when relationships of influence are suspected and, thus, future literature can rely on this or

other nonparametric methods for providing less biased insight.

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Appendix A – Variables definitions

Variables	Definition
	Panel A: IPO pricing
First-day return	The difference between the first secondary market closing price available on CRSP and IPO offer price, divided by IPO offer price. This variable is transformed into the regression models by adding 1 and taking the natural logarithm.
Revisions	The difference between IPO offer price and midpoint of initial filing price range, divided by IPO offer price.
Absolute revisions	The absolute value of *Revisions* variable.
	Panel B: Contributions
PMC	Dummy variable set to 1 for IPOs with lobbying or PAC contributions, else 0.
Political money	The natural logarithm of all lobbying and PAC contributions made in the election cycle most closely preceding the IPO with an oldness cutoff set at 5 years.
Lobby money	The natural logarithm of total lobbying dollars in the year most closely preceding the IPO, with an oldness cutoff set at 5 years.
PAC money	The natural logarithm of total dollar contributions towards candidates in the election cycle most closely preceding the IPO, with an oldness cutoff set at 5 years.
House money	The natural logarithm of total dollar contributions towards House of Representatives candidates in the election cycle most closely preceding the IPO, with an oldness cutoff set at 5 years.
Senate money	The natural logarithm of total dollar contributions towards Senate candidates in the election cycle most closely preceding the IPO, with an oldness cutoff set at 5 years.
Democrat money	The natural logarithm of total dollar contributions towards Democratic candidates in the election cycle most closely preceding the IPO, with an oldness cutoff set at 5 years.
Republican money	The natural logarithm of total dollar contributions towards Republican candidates in the election cycle most closely preceding the IPO, with an oldness cutoff set at 5 years.
Both lobby - PAC	Dummy variable set to 1 for IPOs with both lobby and PAC contributions, else 0.
Just lobby	Dummy variable set to 1for IPOs with lobbying contributions only, else 0.
Just PAC	Dummy variable set to 1 for IPOs with PAC contributions only, else 0.
Founders' Contributions	The aggregate dollar contributions made by firm's founding members. Founding members are identified through the biographical information in S-1 documents. The contributions data is sourced from the archives of the Federal Election Committee (FEC).
TMT Contributions	The aggregate dollar contributions made by firm's top management team with data coming from FEC. TMT members are identified through the combined use of S-1 documents and the Boardex database.
Corporate Contributions	The sum of lobbying and PAC contributions with sources being the FEC and the Center for Responsive Politics (CRP), respectively.

Panel C: IPO characteristics	
Firm age	The number of years elapsed since firm's foundation to IPO date, using foundation dates from the Field-Ritter database. The variable is transformed into the regressions by adding 1 and taking the natural logarithm
Venture capital	Dummy variable set to 1 for venture capital-backed firms, else 0.
Proceeds	Gross proceeds raised by the IPO estimated as shares offered times the offer price.
Dotcom period	Dummy variable set to 1 for IPOs within the 1999-2000 period, else 0.
Internet firm	Dummy variable set to 1 for IPOs of Internet firms, else 0. As Internet firms are classified those with business description sections in Thomson Financial SDC containing any of the words "Internet", "Online", "eBusiness", "eCommerce", and "Website".
Technology firm	Dummy variable set to 1 for IPO firms with SIC codes 3571, 3572, 3575, 3577, 3578 (i.e. computer hardware); 3661, 3663, 3669 (i.e. communications equipment); 3671, 3672, 3674, 3675, 3677, 3678, 3679 (i.e. electronics); 3812 (i.e. navigation equipment); 3823, 3825, 3826, 3827, 3829 (i.e. measuring and controlling devices); 3841, 3845 (i.e. medical instruments); 4812, 4813 (i.e. telephone equipment); 4899 (i.e. communications services); and 7371, 7372, 7373, 7374, 7375, 7378,7379 (i.e. software), else 0.
Underwriter ranking	Dummy variable set to 1 for IPOs engaging underwriters of the highest prestige ranking (a value of 9) in the Loughran and Ritter (2004) database, else 0.
Share overhang	The ratio of shares retained by the pre-IPO shareholders over shares issued in the offering.
Credit crunch	Dummy variable set to 1 for IPOs within the financial ('credit crunch') crisis of 2007–2008, else 0.
NASDAQ	Dummy variable set to 1 for NASDAQ-listed IPOs, else 0.
Market return	The compounded daily return on the CRSP value-weighted index over the 20 trading days trailing the IPO.
Panel D: Firm fundamentals	
Assets	The trailing book-value of annual assets in millions of U.S. dollars.
Earnings per share	Dummy variable set to 1 for positive earnings per share in the last fiscal year prior to IPO, else 0.
Leverage	Defined as the ratio of total liabilities over total assets in the last fiscal year prior to IPO.
TMT Size	Number of top management team members based on S-1 documents and Boardex.
Panel E: PMC determinants	
Regulated industry	Dummy variable set to 1 for IPO firms with SIC codes of 4900–4939 (electric and gas), 1300 (oil and gas extraction), 4000– 4700 (transportation), 4800 (telecommunications), 4950–4959 (sanitary services) and all 6000s (financial companies), else 0.
Pre-IPO mgt ownership	Percentage of total shares held by executive officers & directors prior to IPO, with hand-collected data from the IPO prospectuses.
Bills introduced	The number of bills and joint resolutions introduced in each 2-year Congress.
Electoral College	The electoral college votes corresponding to IPO firm's headquarters state.

Cash flow	The natural logarithm of net income before extraordinary items plus depreciation and amortization minus dividends on common and preferred stock. The data comes from the last fiscal year prior to IPO with all amounts in millions of dollars.
Industry PMC	The number of firms in industry (at the 4-digit level of SIC code) with a traceable PMC record.
R&D	Dummy variable set to1 for IPO firms reporting an R&D figure, else 0.
HHI	The Herfindahl -Hirschman index (HHI) of industry concentration constructed with net revenues from Compustat.
Business segments	The number of firm's business segments as given by the Compustat segment file.
Geographic segments	The number of firm's geographic segments as given by the Compustat.
Media coverage	Dummy variable: 1 for IPOs within the top 25^{th} percentile of results returned by the LexisNexis database n the year prior to PMC, else 0.
Government purchases	Dummy variable set to1 for the five sectors topping the Economic Census list of U.S. public spending i.e. the sectors of defense, heath, energy, transportation and education, else 0.
Unionized employees	Percentage of industry-wide (at the 4-digit level of SIC code) participation of employees in labour unions as reported in Hirsch and Macpherson (2003).

Appendix B – PAC & lobby

Political Action Committee (PAC) is a committee that is established with the explicit purpose of accumulating funds for supporting a political candidate's campaign. A PAC may also act pre-emptively in order to sabotage and fight against the election of disliked candidates. PACs dare back to 1944 and the conception of the Congress of Industrial Organizations (CIO) to form one in order to secure financing for the second electoral race of President Franklin D. Roosevelt. Importantly, the funds were sourced from individual members of the union rather than the union's treasury thereby Smith Connally Act of 1943. Ever since, PACs have grown in popularity (the Center for Responsive Politics estimates aggregate PAC contributions for the election cycle 2014-2016 at almost $ 0.5 billion) and are commonly used by corporations, labour unions and a plethora of ideological groups to ensure representation by like-minded candidates. PACs are eligible to donate: i) $ 5 thousand to a candidate per election cycle, ii) $ 15 thousand to any political party annually and iii) $ 5 thousand to other PACs. Given the diversity of PAC money sources and targets our focus on this study is PAC established by corporations to influence the campaign of incumbent or new candidates for a seat in the U.S. Senate or Houser of Representatives. Notably, the corporation is eligible to provide for the PAC's operating costs only. Any amount in excess of PAC's break-even point needs to come from different donors. A corporation typically circumvents this constraint soliciting financing from various stakeholders such as management team, employees, business partners and their families.

Lobbying (or lobby) refers to the attempt of exerting influence on legislators or other policy makers so that they act in ways that are aligned with the purposes of a corporation or other interest group. The origin of the term, though is subject to debate, is often attributed to the gatherings of the members of the UK parliament at the lobbies of the building to meet representatives of the public before or after the planned parliamentary proceedings. Nowadays, lobbying constitutes the prevalent way for US firms to reach out to the Congress Chambers; in 2014 the aggregate lobbying expenditure reached the amount of $ 3.21 billion. Lobbying can be conducted by in-house lobbyists or outsourced to lobbyist specialists (which may be the only feasible option for smaller and more resource-constrained organizations). In either case, the lobbyist is in charge with communicating and promoting the perspective of a client organization: for example a medical company would exercise pressure for stricter anti-smoking legislation whereas a tobacco company would strive for more leniency on the grounds of the freedom of choice. The amounts a firm can disburse for lobbying are uncapped which has resulted in the skyrocketing of contributions in order to provide incumbent politicians with a wide variety of accommodations (e.g. trips, social event organizations). The opacity that generally characterizes lobbying donations has also

been conducive to the rapid development of the lobbying practice: the disclosure requirement is limited to the filing of a lobbying report as the Lobbying Disclosure Act of 1995 (LDA) reporting the donor, total lobbying contribution and the lobbying issue (in very broad terms). In our study, we rely on the dollar amount stated in these lobbying reports as a proxy for a firm's lobbying intensity.

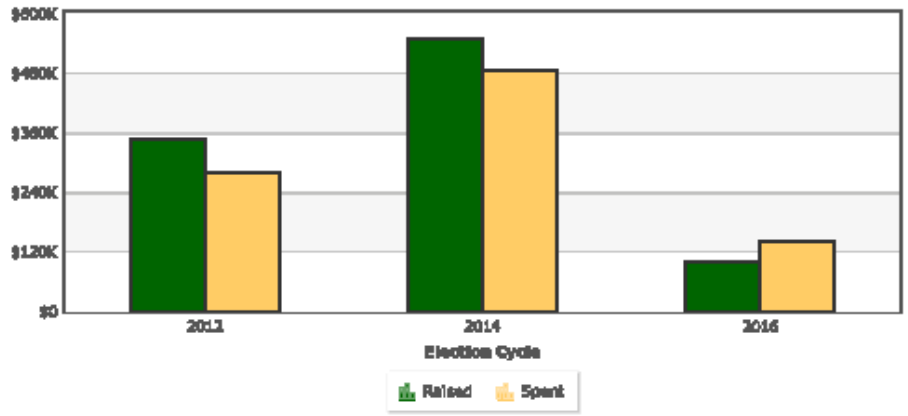
Appendix C – PMC search

Illustration of a PAC search (Facebook Inc - 2012)

Facebook Inc

- Summary
- Recipients
- Donors
- Expenditures
- PAC to PAC/Party

SPENDING BY CYCLE Party Split by Cycle



2012 PAC Summary Data

Select a Cycle: 2012

Total Receipts	$345,421
Total Spent	$277,675
Begin Cash on Hand	$0
End Cash on Hand	$67,746
Debts	$0
Date of last report	December 31, 2012

2012 PAC Contribution Data

Contributions from this PAC to federal candidates (list recipients) (46% to Democrats, 53% to Republicans)	$270,000
Contributions to this PAC from individual donors of $200 or more (list donors)	$330,800

Official PAC Name:
FACEBOOK INC PAC (FBPAC)
Location: WASHINGTON, DC 20004
Industry: Internet; Social Media
Treasurer: KAPLAN, JOEL
FEC Committee ID: C00502906
(Look up actual documents filed at the FEC)

Appendix D – 1st stage results

1st stage regressions	*IV method*		*Heckman*		*MLE*		*IV method (with revision)*	
	Coef.	*z-Stat.*	*Coef.*	*z-Stat.*	*Coef.*	*z-Stat.*	*Coef.*	*z-Stat.*
Proceeds	0.044***	3.61	0.197***	2.86	0.168**	2.51	0.051***	3.31
Earnings per Share	-0.057***	-2.56	-0.305**	-2.1	-0.349**	-2.41	-0.046*	-1.67
Leverage	-0.001	-0.77	-0.026	-0.68	-0.008	-0.29	0.000	-0.19
Firm age	-0.000	-0.04	-0.014	-0.29	-0.024	-0.52	-0.003	-0.28
Venture Capital	-0.020	-0.98	0.026	0.22	-0.003	-0.03	-0.006	-0.25
Dotcom period	-0.092***	-4.72	-0.620***	-4.9	-0.651***	-5.08	-0.080***	-3.4
Financial crisis	0.090***	2.57	0.413***	3.25	0.391***	3.1	0.079**	2.07
Internet firm	0.072***	2.99	0.277*	1.76	0.259*	1.66	0.060**	2.1
Tech firm	-0.016	-0.79	-0.111	-1.05	-0.082	-0.78	-0.015	-0.6
Underwriter rank	0.024	1.28	0.125	1.1	0.099	0.88	0.032	1.41
Share Overhang	0.005*	1.74	0.025**	2.08	0.026	2.01	0.003	1.01
NASDAQ	-0.038*	-1.75	-0.037	-0.33	-0.045	-0.41	-0.035	-1.34
Market Return	0.113***	2.91	0.609***	2.51	0.627***	2.62	0.152***	3.17
Assets	0.023***	3.13	0.129***	3.08	0.154***	3.77	0.020**	2.34
Cash flow	0.019**	2.12	0.094**	2.06	0.098**	2.17	0.025**	2.32
Pre-IPO mgt ownership	0.063***	2.53	0.355***	2.96	0.346***	2.97	0.057**	2.16
Bills introduced	0.182***	7.56	0.889***	6.75	0.819***	6.30	0.200***	7.02
Electoral College	-0.000	-0.12	-0.001	-0.28	-0.001	-0.54	0.000	0.53
Industry PMC	0.000	1.14	0.000	1.41	0.000**	2.24	0.000	0.6
Regulated industry	0.093***	3.49	0.434***	3.94	0.408***	3.79	0.118***	3.59
R&D	0.175***	7.79	0.914***	7.64	0.850***	7.18	0.180***	6.87
HHI	-0.136	-0.97	-0.680	-1.05	-0.818	-1.29	-0.295*	-1.73
Business segments	0.030***	2.8	0.090**	1.96	0.091**	2.02	0.025**	2.04
Geographic segments	0.000	-0.04	-0.008	-0.33	-0.007	-0.27	-0.005	-0.98
Media coverage	0.053***	3.08	0.252***	2.71	0.241***	2.68	0.054***	2.63
Government purchases	0.060**	2.06	0.292***	2.29	0.336	2.68	0.027	0.79
Unionized employees	0.095	0.82	0.127	0.22	0.160	0.28	0.198	1.27
Revisions							0.518***	4.3
N	1,578		1,578		1,578		1,173	
Pseudo-R^2	0.2361		0.2850		0.2850		0.2347	

Appendix E –DEA principles and other methodologies

Conventional economic theory presumes that producers are capable of working at maximum capacity or attain an optimum. Yet, this premise is regularly falsified in practice as only a fraction of them succeed in converting available inputs to outputs with frugality; most companies will misallocate resources IPO issuers by giving away a portion of their equity at a discount price comprise one more corporate finance setting that raises efficiency concerns. As a production problem, the study of best-performing practices (i.e. least-underpriced IPOs) for the purpose of emulation appears pivotal to leaving less money on the table.

Comparative efficiency assessment is attainable by means of two distinct methodological avenues. The first one relies on econometric techniques, namely regression analysis and stochastic frontier analysis (an extension intended to derive the frontier for an assortment of functions with varying corresponding efficiency values). The second approach involves a non-parametric framework and conducts frontier analysis through the use of a mathematical programming technique known as data envelopment analysis (DEA), which can also be viewed as an addition to the plain-vanilla method of index numbers. Schematically, efficiency assessment may be represented by the following roadmaps:

Figure 1: Efficiency assessment

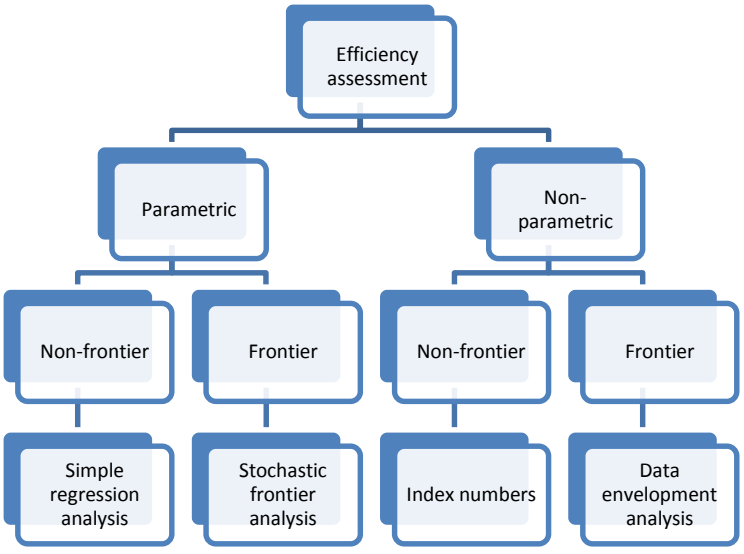
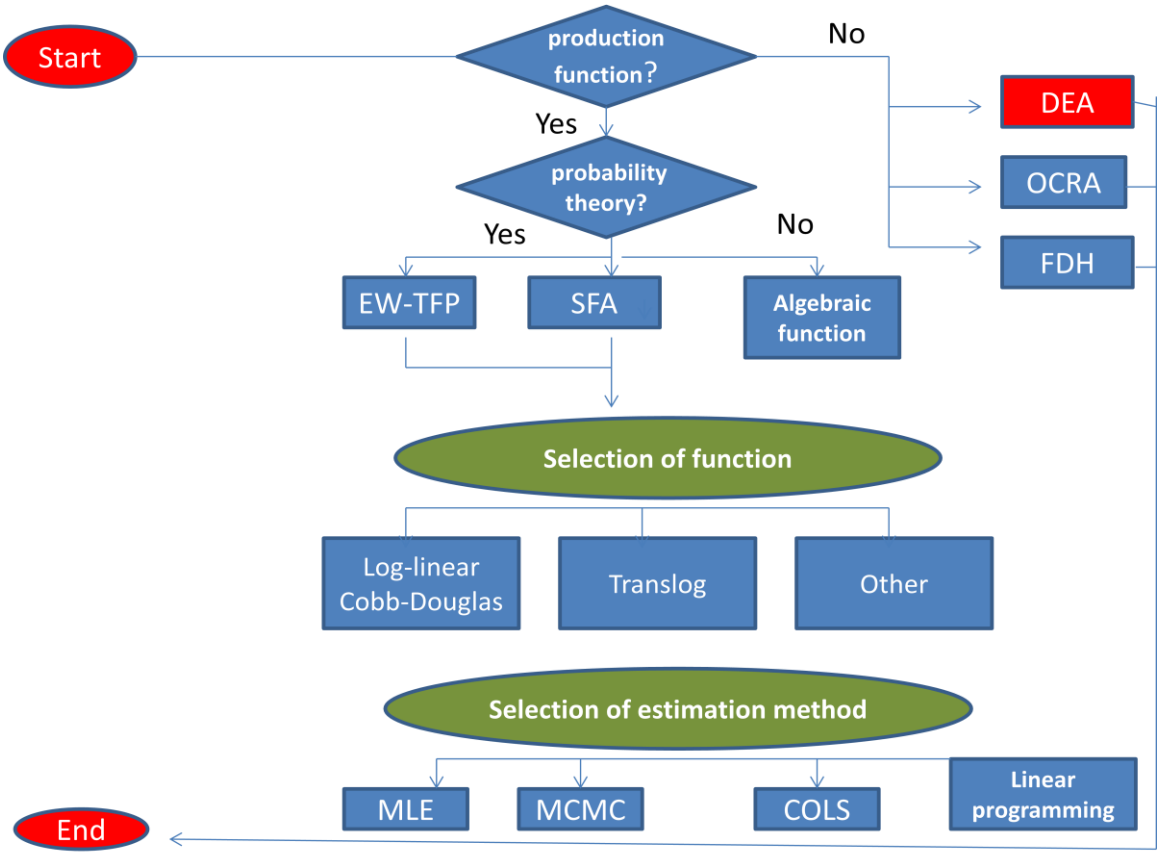


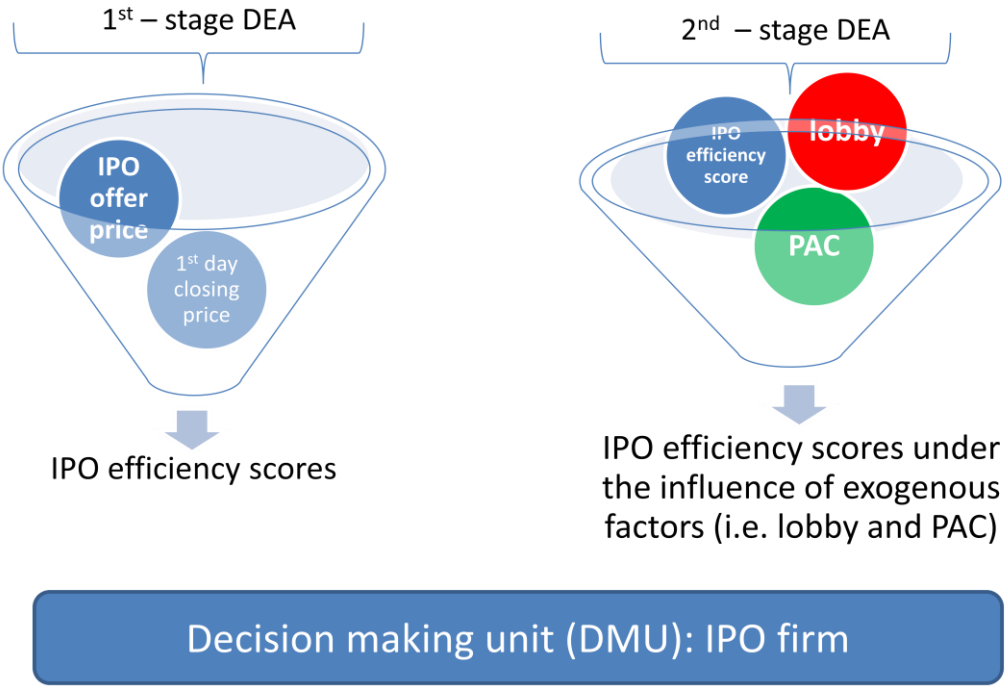
Figure 2: Roadmap to mainstream estimation procedures



Resorting to linear programming, DEA targets at determining weights (set of) that will maximize the efficiency of each IPO firm (decision making unit) in the sample with the constraint that none of the firms can assume an efficiency score in excess of 1 (100%) at the respective weights. DEA not only permits heterogeneity of these weights across issuers but is also capable of capturing nonlinear associations between inputs and outputs. A unit is deemed inefficient if its efficiency score is dwarfed by another one at the same set of weights. The efficient firms collectively comprise the peer group and the benchmark from which the inefficient unit derive their efficiency score. Accordingly, at the first-stage of the DEA model, we obtain the ratio of offer price to first aftermarket close in order to develop non-parametric piece-wise surfaces over the sample. With reference to this efficient frontier, the DEA estimation assigns efficiency scores to each

firm in the sample. In turn, the estimated efficiencies are used as the second-stage inputs in order to examine their variation based on the influence of the exogenous factors under study (i.e. lobbying and PAC contributions). The process can be graphically represented by the following chart:

Figure 3: DEA estimation



DEA estimation, though is discarded by IPO research mainly in favor of parametric non-frontier analysis, can offer numerous advantages in the study of IPO underpricing. First, overcoming the need of assigning a functional form, DEA estimation exhibits the least bias with regard to the alternative frontier methods (even though the data-driven approach implies an inability to define a goodness of fit that would allow for comparability across different specifications and models). To the best of our knowledge, IPO underpricing literature (Ritter, 1991; Loughran and Ritter, 1995 and Jain and Kini, 1994) pre-assumes a linear association with the postulated determinants (for example, underwriter reputation, industry, firm size, venture capital, share overhang, exchange of listing). Second, such variables raise important endogenous concerns stemming from either the possibility that they are simultaneously determined with IPO returns (Carter et al., 1998, Loughran and Ritter, 2002, 2004) or are affected by omitted terms. For

example Ljungqvist and Wilhelm, 2003 speculate that external financing, as in the form of venture capital, was a greater necessity during the overheated period of 1999-2000 compared to earlier years. Moreover, the same study shows a high correlation between high-technology firms, NASDAQ (as the preferred exchange), a small size and the presence of venture capital.IPO underpricing and underwriter reputation as shown in or Third, DEA compared to regression analysis and, to a degree, over SFA considers only the efficient decision making units in deriving the frontier. This is an advantage as the best practices are revealed and the rest units derive a efficiency score that is indicative of their distance from the optimal performance. To illustrate the use of DEA in offering appropriate benchmarks for issuers, let us consider two IPOs: IPO A with an offer price of $2 and a first aftermarket close of $4; IPO B with an offer price of $10 and an aftermarket close of $20. Because both cases yield an initial return of 100%, the focus on underpricing conceals the disparity in absolute price appreciation (i.e. $2 and $10 for IPOs A and B, respectively) providing no information on whether the issue is ‘cheap’ or ‘expensive’. Consequently, in terms of relative performance assessment, each IPO misleadingly appears to be an appropriate benchmark for the other. Fourth, DEA is mathematically less demanding than SFA (especially true for baseline DEA forms) and, because of its simplicity, the method is more frequently observed, especially in operations research.

Looking to the future, natural computing (NC) and the use of algorithms, though still at an infant stage, can facilitate common financial modeling and optimization problems (refer to figure 4 for a schematical overview of the algorithmic process). Drawing motivation from the natural phenomena, such methods seek to establish the parallels to processes featuring in asset allocation, portfolio selection, risk management, derivatives valuations and more (refer to Bradazon et al., 2012 for an overview of seminal studies). Quintana et al., 2005 and Chou et al., 2010 extend the use of NC to the IPO setting letting the IPO returns to be predicted by common covariates from the underpricing literature (e.g. share overhang, listing exchange, amount of proceeds) according to pre-assigned algorithmic patterns. In both cases, the findings demonstrate that the performance of the algorithmic constructs greatly depends on the fitness function and the maximum of computational reiterations permitted. Additionally, the studies converge on the vitality of the calibration procedure; it is shown that the optimal parameters depend on the problem specification, the fitness function and the algorithmic

variants. The implication is that slight alterations of the algorithmic forms can give remarkably different results. Given these shortcomings, DEA estimation remains for the time-being least as a more robust and significantly less-computationally intensive approach.

Figure 4: Key Step on Estimation based on Evolutionary algorithms