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**The Effect of ‘Underwriter–Issuer’
Personal Connections on IPO Underpricing**

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Abstract

Using a large sample of U.S. IPOs between 1999 and 2020, we show that personal connections between directors and top executives of issuers and those of underwriting banks result in significantly lower levels of IPO underpricing. We estimate the average effect to be about 13 percentage points. The results hold with several alternative robustness tests including non-random choice of underwriter, endogenous presence of venture capitalists, additional controls for managerial traits, matching exercises and doubly robust estimations. Our results indicate that the effect of connections is significantly stronger for companies that are more likely to suffer from asymmetric information problems. This corroborates the idea that the lower level of underpricing for connected companies reflects better flow of information with the underwriter.

Keywords: IPO, underpricing, executive and director networks, asymmetric information

1. Introduction

Personal connections are the focus of a growing body of literature that shows how educational and professional ties among individuals (managers in particular) play a role in corporate financial decisions. These include private equity transactions (Hochberg et al, 2007; Stuart and Yim 2010), mutual fund voting patterns and CEO compensation (Butler and Gurun 2012), internal corporate governance (Fracassi and Tate 2012), mergers and acquisitions (Cai and Sevilir 2012), banking relationships (Engelberg et al, 2012), credit ratings (Khatami et al, 2016) and seasoned security issuances (Fang et al, 2020). The common denominator is that the existence of personal connections of directors and executives facilitates the sharing and transfer of soft information (Stein, 2003) which, in turn, leads to higher efficiency in decision making at corporate level and lower cost of capital.

We study the effect of network connections between directors and top executives of IPO companies and those of their lead underwriting bank on the underpricing for a large sample of 2,351 IPOs in the U.S. from 1999 to 2020. We find a statistically significant and economically relevant reduction in underpricing for issues by connected firms of about 13 percentage points which is about third of the average level of underpricing. These results are corroborated when we isolate connections terminated prior to the IPO (past), connections of different nature (i.e., educational or professional) as well as connections that run through the CEO of either the issuing firm or the underwriter, or when we use continuous measures of the number of connections.

The literature in this field is quite limited. To the best of our knowledge, the only study close in spirit to ours is Cooney et al. (2015). Although IPO underpricing is not the focal point of the paper, they report no association between the coefficient on social ties between directors of IPO firms and those of underwriting banks for a sample of U.S. IPOs between 2000 and 2009.

Cai et al (2012) and Feng et al (2019) study the effect of broad measures of network connections of the directors of the IPO firms on underpricing for the periods 2001-2008 and 1999-2011, respectively,

and reach opposite conclusions. Their focus is, however, quite different from ours as their proxy measures the general connectivity of the boards of IPO firms with all other firms in the economy; our focus, on the other hand, is on the connections between the issuer and its underwriter. Also, we include a proxy similar to theirs as a control variable in all our tests.

Chahine and Goergen (2013) study the role of family and social ties that top management has with board members for a sample of US IPOs between 1997 and 2008. Their focus is also different from ours, as they study the connections between managers and directors inside the IPO firm while our focus is on the links between managers and directors of the IPO firm and its underwriter.

Our analysis contributes to the literature on several grounds. First, our study covers a significantly longer (and recent) time series than previous studies. This is important for IPOs, given their widely documented cyclical nature. For instance, according to Lowry et al, (2010) the “volatility of IPO initial returns is substantial, fluctuates dramatically over time and is considerably larger during hot IPO markets.” Our results are therefore less likely to be driven by a specific period, as confirmed by our preliminary analysis on the representativity of our sample, reported in Figure 1.

Our second main contribution is methodological in nature. Differently from previous studies, we explicitly allow for various potential sources of endogeneity that are likely to affect the IPO process and the level of underpricing, including the possible endogeneity of the choice of underwriter. We do this in several ways. First, we saturate all our tests with underwriter fixed effects. This has the benefit of controlling for possible underwriter-specific omitted variables that may affect the level of underpricing and also be associated to the presence of a connection. Second, we perform an explicit Heckman correction treatment effect model in an attempt to explicitly model the selection of the underwriter in presence of a connection. Third, in our tests we also allow for the endogenous presence of Venture Capitalists backing the IPO. Among others, Lee and Wahal (2004) document that venture capital backed IPOs experience larger first-day returns than comparable non-venture backed IPOs. Therefore, given the

strong role they play, not only we include a dummy variable to control for the presence of venture capital in all our tests, but we also perform a further Heckman correction test to control for the endogenous nature of the presence of venture capitalists.

Further, we perform a stringent matching exercise and run regression tests on the matched sample of statistically indistinguishable connected and unconnected firms (doubly robust estimation), in the attempt to minimise further possible concerns of endogeneity.

Our results of a negative effect of personal connections on underpricing seems to be consistent with an asymmetric information interpretation. Indeed, we show that this effect is significantly stronger for companies that are potentially more *opaque*, such as small, young, and technology firms, firms with less connected board and without lock-up agreements and pre-IPO banking relations. As such, we also contribute to the growing body of corporate governance literature that investigates the role of personal connections and social ties both in financial markets and in the decision making at corporate level (e.g., Cohen et al, 2008; Engelberg et al, 2012; Khatami et al, 2016; Fracassi, 2017).

Our results are of potential interest to practitioners besides academics, as they highlight another relevant factor to consider when developing portfolio allocation strategies involving IPO firms. Further, regulators may consider requiring the disclosure of connections between top management of issuers and underwriters prior to IPOs to assure the availability of the relevant information to all market participants and the efficiency of IPO market.

The rest of this paper is structured as follows. Section 2 describes the theoretical background. Section 3 illustrates the sample and the variables included in the analysis. Section 4 presents the empirical analysis. Section 5 includes the discussion of our findings. Section 6 concludes.

2. Theoretical background and hypothesis development

Personal (social) connections are particularly relevant in an environment such as a corporation where employees, directors and managers in particular, face severe asymmetric information. Building (over time) personal connections can lead to preferred information access that, ultimately, can be rewarding at both personal and corporate levels. In particular, a growing literature shows that sharing information through personal connections affects corporate decisions and performance. For instance, Cohen et al (2008) present strong evidence on how personal connections between corporate directors and mutual fund managers affect flow of information and mutual fund investments and performance. Engelberg et al (2012) show how personal connections at managerial level between banks and borrowers act as information channels between the two, resulting in lower interest rates and more relaxed covenants on the borrowing agreements. Khatami et al (2016) find that personal connections between directors of issuing companies and Moody's reduce asymmetric information, resulting in higher ratings for connected firms. Fracassi (2017) reports that personal networks among directors result in similar investment decisions and behavior in connected companies. Fang et al (2020) report that more socially connected firms enjoy an increased level of trust by investors which positively affects the firm's ability to issue securities.¹

We borrow from previous studies and investigate whether personal connections affect also a crucial phase in the corporation's life, the IPO underpricing.

A large body of studies attempts to explain the anomaly of the IPO underpricing (i.e. the stock price increase at the end of the first trading day as compared to the initial offer price) using different theoretical frameworks (Ljungqvist 2007, for a comprehensive review of IPO literature). For the purpose of our analysis, we build on those studies that focus on the role of asymmetric information.

More in detail, Rock (1986) argues that information asymmetry between investors is the reason for IPOs to be underpriced. In his work, there are only two groups of investors, informed (they have better

information about the value of the firm) and uninformed ones (whose lack of information exposes them to adverse selection). Underpricing is necessary to keep uninformed investors in the market. Benveniste and Spindt (1989) and Benveniste and Wilhelm (1990) propose a similar model where a group of institutional investors are informed about the firm's true value and interact repeatedly with the underwriting bank. Underpricing is their compensation for revealing their private information. Similarly, the findings of Aggarwal et al (2002) and Cornelli and Goldreich (2001, 2003) suggest that underwriting banks compensate institutional investors for revealing their private information on the true value of the issuer through higher allocations in IPOs. Muscarella and Vetsuypens (1989) show that those IPOs that face less asymmetric information problems, such as self-marketed IPOs and IPOs of reverse leveraged buyouts, face also lower levels of underpricing. In contrast to the previous models, Allen and Faulhaber (1989), Grinblatt and Hwang (1989), and Welch (1989, 1992) argue that only the issuer has accurate information on its own true value, and underpricing is a costly signal chosen by higher-quality firms to distinguish themselves from lower-quality ones. A common element among all these explanations is that the underwriter is the less informed party (either compared to some of the investors in the market or the IPO company itself) and underpricing is a mechanism for the underwriter to be (at least partly) compensated for the risks it takes during the IPO process.²

While *in a vacuum*, leaving less money on the table is a desirable outcome for IPO firms, a lower offer price may be also desirable. Everything else being equal, a lower offer price is more likely to lead to a larger share price run-up. This, in turn, positively affects the post IPO market value of the firm. This is essentially the basis for the "Prospect Theory" introduced and documented in Loughran and Ritter (2002). They argue that most issuers don't get upset about leaving money on the table because they are mostly concerned with the "net effect" of the underpricing. The money left on the table due to underpricing is offset by the money gained on

the value of the retained shares from the price increase. This, in their study, most often leads to an overall net increase in wealth for shareholders. This suggests that underpricing per se may not be a primary concern for IPO firms.

For instance, Krigman Wayne Shaw and Womack (2001) study the phenomenon of IPO firms switching underwriters for their SEOs. Quoting their abstract: “A surprising result is that switchers' IPOs were significantly less underpriced than non-switchers' IPOs”. This result suggests that lower underpricing is not necessarily perceived as totally positive from IPO firms, or that at least it is not a main driver of their decisions. In their study, IPO firms appear to be more interested in the reputation of the underwriter and the relative analyst coverage that a more reputable underwriter could bring.

In our study, we do not focus on whether the (lower) underpricing is desirable or not. We argue that the existence of personal connections between the IPO company and the underwriting bank is likely to reduce the ex-ante risks faced by the underwriter at IPO by facilitating the transfer of soft information between the two parties. As such, we expect that everything else being equal, a reduced level of information asymmetry would lead to a reduced level of IPO underpricing.

To be able to address such question empirically, it is crucial to have detailed information at personal level on the connections that directors and managers have created over time. At the same time, proper econometric techniques need to be employed to attenuate endogeneity concerns. To this end, the following sections explain in detail the data we use and the empirical analyses we undertake.

3. Sample and variable description

3.1. Personal Connections

Data on personal connections among directors come from BoardEx. The database includes detailed data on the individuals' biographical, educational, professional and social backgrounds, enabling us to track potential connections among them. For instance, we can establish a connection between the CFO of the issuing firm and a director of the underwriting bank if they have studied together for their MBA several years before the IPO. Further, we can establish a connection between the CEOs of the underwriter and the issuer if they sit together on the board of a third company at the time of IPO. This detailed information further helps us distinguish between connections with different origins and nature. Boardex is probably the industry standard when it comes to personal connection data. An increasing number of studies use this database as a primary source of information on corporate social connections (e.g. Engelberg et al, 2012, Khatami et al, 2016, Fracassi, 2017 and Fang et al, 2020). A common concern about this data is whether the connections are legitimate. It is entirely possible that (two) directors studied at the same institution or worked for the same firm but without actually meeting. Then, the connection information would be spurious and reflect instead personal homophily and/or commonality of backgrounds. Although BoardEx does not allow clients to speak directly to their analysts for company policy, we did engage in several telephone conversations with their relationship managers. According to them, data on educational and professional connections are extremely reliable and precise as their analysts use a variety of different sources to double and triple check the data, including CVs, bios on websites, LinkedIn profiles, articles. We were assured that with regards to educational connections, the two individuals studied in the same college/department (and most often the same programme) and had an overlap during their studies. Moreover, with regards to professional connections, connected individuals worked in the same company and same geographical locations and had an overlap in the period they worked there. Especially in the case of multinational and large companies, it is not enough for two people to be employees of the same company at the same time to be classified

as connected, but they should be in the same office and potentially the same department to be classified as connected. For instance, we understand that the analyst(s) would look for traces of interaction on the job (e.g. serving on the same board, being involved in common projects, etc.) when looking at professional connections.

To build our main variable, *Connections Dummy*, we focus on information relating to the personal connections between directors and top executives of the IPO firm and those of the underwriters. We require all connections to have originated before the issue date. This allows us to make more robust inference about the effect of connections on underpricing and should ensure that our tests are not affected by cross causality. We also include a proxy for *Past Connections*, which is a connection that not only originated but also terminated prior to the IPO.

We consider two different types of connections in this study: *Professional Connections* (when two individuals have previously worked or work together in an organization), and *Educational Connections* (when two individuals share a common educational background). We further isolate those cases where connections go via the issuer's CEO (*Issuer CEO Connections*) or those which go via the underwriting bank's CEO (*UW CEO Connections*). We also build a parallel set of proxies where we use the natural log of (1+ the number of connections) for each of the definitions described above.³

In addition, we create an overall connectivity variable for each company which counts the total number of individuals (covered by BoardEx) who are connected to the issuer through personal relationships with its managers and directors at the time of issue. The variable represents how well connected a firm is to its outside environment, and it is controlled for in our tests to address the concerns regarding the confounding effect of the firm's general connectivity on underpricing.

Furthermore, to sharpen our identification strategy with respect to the continuous variables, we collect information on the total number of directors and top executives in the IPO firms and in their lead

underwriters at the time of IPO and include both proxies in our tests. Firms with larger boards may mechanically be more likely to have connections to their underwriters. As such, in our regressions we use the log-linear form of the total number of connections and we also control for firm size.

3.2. Initial Public Offering

We use the SDC Platinum New Issues Database to gather information on IPOs for companies that went public in the U.S. market in the period from January 1, 1999 to December 31, 2020.⁴ In line with the empirical IPO literature, we exclude ADRs, closed-end funds, REITs, right issues, limited partnerships, reverse LBOs, equity-carve outs and IPOs with offer prices less than \$5 from our sample. Issues related to financial institutions (SIC 6000-6999) and regulated utility companies (SIC 4909-4939) are also excluded from the sample. Information on IPO characteristics, such as the number of primary and secondary shares issued, IPO proceeds, the market where the shares are issued for the first time, presence of venture capitals among stakeholders and the number of lockup days are collected from SDC New Issues as well.⁵

We use the underwriter ranking (on the scale of 1 to 9) provided by Loughran and Ritter (2004) to control for the effect of underwriter reputation on IPO underpricing in our tests (e.g., Beatty and Ritter 1986; Carter and Manaster 1990; Fernando et al, 2015; Liu and Ritter 2011). In those cases with more than one lead underwriter and several co-managers as part of the sponsoring syndicate, the underwriter ranking is computed as the average of the rankings for the lead underwriters. Finally, the companies' founding date is extracted from Jay Ritter's Website.⁶

We use Compustat and CRSP databases for financial and accounting variables. We require companies to have accounting data for the financial year before the IPO available on Compustat, and

the share price information from the first day of trading on CRSP. In line with the literature, we define underpricing for firm i as:

$$Underpricing_i = \frac{First\ Day\ Closing\ Price_i - Offer\ Price_i}{Offer\ Price_i} * 100 \quad (1)$$

The data requirements described above leaves us with a sample of 2,351 IPOs from January 1, 1999 to December 31, 2020, with available data for variables used in the baseline models.⁷

4. Empirical results

4.1. Descriptive Statistics

We first check the representativeness of our IPO sample by comparing the total number of IPOs per year in our sample as opposed to the entire universe of IPOs as reported in Ritter's website. In Figure 1 (Panels A and B) we report some preliminary statistics on the sample to ensure that it is representative of the IPO population. Figure 1 Panel A compares the total number of IPOs per year in our sample as opposed to the entire universe of IPOs as reported in Ritter's website. Clearly, part of the discrepancy is due to the filter we impose in the data as described in section 3.2. Nonetheless, in each year we have the majority of the entire population of IPOs (although coverage is more limited in 1999). Further, Figure 1 Panel B reports comparative statistics on average underpricing. Again, our sample closely mirrors the population. Our overall equally weighted average (median) underpricing is 22.43% (16.92%) which is very close to the population sample of 19.74% (14.00%). The individual values in each year also confirm that our sample is a very good representation of the overall population.

Table 1 shows the descriptive statistics of the connection variables. The first set of variables are the connection dummies which take the value of 1 if there are any instances of a connection between the

issuer and the underwriting bank, and zero otherwise. The second set of variables represents the total number of personal connections of each type. Around 44% of the issuers in our sample are connected to their underwriters at the time of the IPO. Almost all these connections (41%) terminated before the IPO date (*Past Connections*). Professional connections are more common (40%) than Educational ones (21%). The table further shows that in 8% of cases an issuer's CEO has a personal connection with the underwriting bank's directors and executives, and in 9% of the cases the connection goes through the underwriting bank's CEO. Interestingly, the average issuer in our sample has about 4.5 connections with its underwriter, 4.4 of which based on professional relations.

[Please insert Table 1 here]

Table 2 presents descriptive statistics of all other control variables included in our baseline models for connected and non-connected issuers, separately. Connected issuers tend to have a higher number of connected individuals through their directors and managers. This may be due to the fact that they are, on average, larger than non-connected firms. We find a minor (albeit still statistically significant) difference in the number of directors and managers in connected firms (approximately 8 vs 7) while the difference is much larger in the number of directors and managers of the lead underwriters employed by connected firms (33 vs 22).⁸

Connected firms tend to have lower average price revisions although both connected and unconnected firms are quite close to an average of zero; they are also about five years older when they go public; they have higher debt ratios and lower cash holding. Connected companies on average issue higher numbers of shares during IPOs, although the ratio of their IPO proceeds to their total assets is somewhat lower than that of non-connected issuers. Possibly this is influenced by the differential average underpricing we document below. The percentage of secondary shares to the total number of

shares issued is also significantly higher across the connected IPOs. There is a lower fraction of high-tech connected issuers either if we use the Loughran and Ritter (2004)'s definition of technology stocks or the listing status, i.e. NASDAQ. The proportion of IPO firms backed by venture capital companies is slightly larger among the non-connected group, and there is no significant difference between the two groups in terms of the lock-up period. Further, connected companies seem more likely to employ highly ranked (lead) underwriters and co-managers.

[Please insert Table 2 here]

4.2. Univariate Results

Table 3 provides the univariate test results (t-tests of difference in means) for the effect of issuer-underwriter personal connections on IPO underpricing. IPOs of issuers with no connections are underpriced by 37.70% on average, while those of connected issuers are underpriced by only 18.38%. In other words, the IPO shares of connected issuers have been priced around 19.32% more than those of non-connected issuers by the underwriters. The table also indicates a similar underpricing (18.53%) for IPOs where the connections terminated prior to the IPO. Similarly, Professional and Educational connections both appear to have a significant negative effect on the underpricing level. The difference in underpricing is substantially larger when personal connections go through either the issuer's CEO (20.58%) or the underwriting bank's CEO (21.43%).

[Please insert Table 3 here]

For completeness, we report correlation tables to get an initial sense of the way in which our connection variables move together with the controls. In Table 4 Panel A we report the correlations with regards to our dummy variables while in Panel B we report the continuous variables. By and large it appears that, at

least on a univariate level, the correlation matrix confirms the previous descriptive tests as there is a strong and negative correlation between the level of IPO underpricing and the connection variables.

[Please insert Table 4 here]

4.3. Regression Results

To control for the effect of both firm and issue characteristics on underpricing, we employ the following OLS regression model:

$$UP_i = \alpha_0 + \beta_0 Connection_i + \sum_{k=1}^K \beta_k X_{k,i} + U.F.E. + I.F.E. + Y.F.E. + \epsilon_i \quad (2)$$

where UP_i denotes the IPO underpricing experienced by company i ; $Connection_i$ is the set of alternative variables indicating the connection status between company i and its underwriter;

$\sum_{k=1}^K \beta_k X_{k,i}$ represents a vector of k company characteristics which are expected to affect underpricing; U.F.E., I.F.E., and Y.F.E. are the lead underwriter, industry, and year fixed effects, respectively, that should mitigate possible concerns stemming from omitted variable bias; ϵ_i is a mean-zero normal random error representing the unobservable factors affecting the underpricing.

Table 5 Panel A (Panel B) presents the results where connection dummies (number of connections) are used as proxy for issuer-underwriter personal connections.

[Please insert Table 5 here]

Results in Model I, our baseline regression with binary variable for connections, indicate that the presence of personal connections between directors or senior executives of the issuing company and directors or senior executives of the underwriting bank results in significantly lower levels of underpricing. The *Connections* dummy coefficient suggests that connected issuers face as large as 13.6

percentage point lower underpricing compared to non-connected ones, which is also highly economically significant when compared to the average sample underpricing of 29.26%.

Model II includes only the connections terminated before the IPO and shows that results do not differ significantly from the baseline regression.

Both professional and educational connections appear to have a significant impact on reducing underpricing, as presented in Model III. In Model IV, we specifically examine the effect of existence of connections through the issuer's CEO or the underwriting bank's CEO, separately. The results suggest that underpricing is also lower in presence of personal connections at CEO level, although the effect is economically stronger when the connection goes through the issuer's CEO rather than the underwriter's CEO. A possible explanation for such difference is that the CEO of the issuing company is more likely to be directly involved in the IPO process compared to the underwriting bank's CEO.

Table 5 Panel B reports the results with the (log of 1+) number of connections instead. We still observe that issuer-underwriter personal connections result in significantly lower underpricing. To calculate the economic impact, we estimate the shift in fitted value from a company with no connection to a company with average connection (4.556, as reported in Table 1). For instance, this implies a reduction in underpricing of about 7.814% in Model V, our baseline regression with continuous variable for connections. The implied economic impact increases up to 8.49% when we consider connections that run through the CEO of the issuing companies (Model VIII).

The control variables show qualitatively similar coefficients and significance levels across all models. The proxy intended to capture better overall connected firms ($\ln(1+No. \text{ of Connected Individuals})$) is never statistically significant. One possible explanation is that its effect is absorbed by the main connection variables in the regressions.

We err on the side of caution by including several proxies for size: the natural log of total assets, the natural log of sales, the total number of shares issued, and total proceeds. This may create

collinearity problems among these proxies. Nonetheless, this is not a reason for concern here as we are mostly interested in the behaviour of the connection variables. *Ceteris paribus*, being listed in the NASDAQ stock exchange does not seem to have a significant bearing in underpricing compared to being listed in the NYSE market.

4.4. Endogeneity Concerns

The results from the OLS regressions suggest that the presence of personal connections between directors and managers of the IPO company and their underwriters results in significantly lower underpricing. A caveat in the interpretation of our results, as in any empirical study, is the issue of endogeneity. Our findings are unlikely to be affected by cross-causality as the personal connections identified in our sample are all formed prior to IPO announcements. Furthermore, our results are robust when we isolate *past* connections only, i.e. those which were terminated prior to the IPO. This should rule out possible reverse causality concerns by construction since the personal connection was both formed and terminated before the IPO. Below we discuss all the other ways endogeneity could affect our results, as well as the steps we take to alleviate such concerns.

4.4.a Omitted Variable Bias – The role of Pre-IPO Banking Relationships

A number of studies show that pre-IPO banking relationships might have a significant effect on IPO underpricing through the asymmetric information channel. On one hand, Schenone (2004) shows that pre-IPO lending relationships between the underwriting bank and the issuer reduce asymmetric information between the two. Her results show that firms with a pre-IPO banking relationship with a prospective underwriter face about 17% lower underpricing than firms without such banking relationships. Similarly, Benzoni and Schenone (2010) show descriptive statistics of a significantly smaller underpricing among IPO

companies underwritten by relationship banks. On the other hand, Bennouri et al. (2015) report that when (at least) one of the multiple lending banks is also the underwriter, the impact on underpricing is not significant.

To reduce concerns of a possible confounding effect with our results of personal connections between the issuer and the underwriter, we collect the information on the presence of a pre-IPO banking relation with the underwriters. This information comes from Dealscan. Loans data are matched with SDC using the linking table provided by Chava and Roberts (2008), and the underwriting banks' names were manually matched with BoardEx data. This entails that the availability of this information is limited to the year 2017 (<https://finance.wharton.upenn.edu/~mrrobert/styled-9/styled-12/index.html>). For this reason, we cannot include this variable across all tests without losing the most recent three years of data.⁹

In Table 6 we replicate our main results while also including a proxy for the presence of a lending relationship between the IPO firm and its lead underwriter or co-manager(s). Results are similar to those reported above. Even after controlling for the presence of a pre-IPO lending relation, the connection variables still display a strong and negative sign. For instance, the coefficient on the baseline connection dummy in model I is -16.217% which is still very close to the analogous coefficient reported in Table 5 (-13.601%). The dummies indicating the pre-IPO lending relation are not statistically significant. This may be explained by the results documented by Bennouri et al. (2015) of lack of statistical significance when the underwriter is also one of the IPO firm's relationship bank among many others.

4.4.b Omitted Variable Bias – The Impact of Managerial Traits

A potential concern is that our results might be driven by managerial ability. Better quality managers, i.e. those with more experience and better educational qualifications, might end up working

for the most attractive employers, including the better-quality IPO companies and the best investment banks, hence creating a mechanical link between the two. Furthermore, better quality managers in IPO companies signal potential superior performance in the future and therefore might reduce an underwriter's reputational risk and hence the necessity for excessive underpricing. For instance, directors with high(er) levels of education or directors who attended more prestigious institutions may influence investor perception of board prestige. This, in turn, may affect IPO underpricing (e.g., Certo 2003; Cohen and Dean 2005). To control whether management quality drives our results, we collect information on education of directors and the degrees they possess from BoardEx. In particular, we augment the baseline regression models with variables which represent the fraction of directors and senior managers in the IPO company who have an MBA, an MSc or a PhD degree or any other special certificates or degrees, such as Certified Accountant, Certified Bank Auditor, Certified Management Consultant. We further collect an indicator on the total number of qualifications reported by BoardEx which is defined as "The average number of qualifications at undergraduate level and above for all the Directors".

To further control for the quality of managers, we manually match the University names reported in BoardEx with those available in the "(QS) Quacquarelli Symonds" World University Rank. In some cases, we find no information on any of the University for any of the directors that is the reason why the number of observations does not match those of Tables 5 and 6 above. When QS assigns a range rather than a point number to indicate the ranking, we use the median of the range as a proxy.

We further attempt to control for the quality of the managers by taking into account their involvement in other companies as well as their age as a proxy for their experience. In particular, we create a variable showing the average number of board seats that directors of the IPO company have in other firms (*Total Boards*) and the average number of quoted firms where the directors have a seat (*Quoted Boards*). *Avg. Manager Age* corresponds to the average age of directors and senior executives

in the IPO company. As the results indicate (Table 7), the inclusion of these proxies for managerial traits does not alter the effect of the personal connections variables. Across all models the effect remains negative and highly significant.

[Please insert Table 7 here]

4.4.c Non-Random matching with Underwriters

One crucial issue in this literature is whether the choice of underwriter is related to the outcome of the IPO – the level of underpricing in our case. Several studies analyze the determinants and consequences of the non-random matching between the firm and its underwriter. For instance, an early influential study by Dunbar (1995) analyses how self-selection is related to the choice of using warrants as a form of compensation. Closer to our paper, Cooney et al. (2015) show that social ties to the firm are a strong determinant of underwriters being part of the sponsoring syndicate. Thus, in this section we replicate our previous analysis by endogenizing the connection status of the firm to the sponsoring underwriter by estimating a two-stage Heckman (1979) selection model. In the first stage, we run a probit regression where we model the connection status of the firm with a binary variable indicating connection to the lead underwriter, and lack of otherwise. This should simulate the choice of the firm to be sponsored with a connected vs a non-connected underwriter. In the second stage, we re-estimate our baseline model augmented by the Inverse Mills Ratio from the first stage regression in order to correct for potential self-selection. A crucial problem in this type of setting is the inclusion (or not) of valid instrumental variables in the first stage regressions which are linked to the choice of underwriting banks but not to the outcome variable. Li and Prabhala (2007) argue that the inclusion of exogenous instruments is not strictly necessary in a treatment effects model as identification is achieved by non-linearity. Accordingly, we first perform the selection model with no exclusion restrictions. In the second selection model, we use the geographical distance between the firm's headquarter and that of the

underwriter as an instrumental variable, arguing that it is more likely that an IPO firm and an investment bank share some personal connections if they are headquartered close to each other, without having no direct bearing on the actual level of underpricing. For each IPO firm, we collect information on the full postal address of the company's headquarter from COMPUSTAT and compute its latitude and longitude. We then manually search for the full postal address of the lead underwriter for each company and compute its latitude and longitude. Finally, we calculate the spherical distance between each firm i and each underwriter j , using the following formula:

$$d_{i,j} = \arccos(\cos(lat_i) \times \cos(lon_i) \times \cos(lat_j) \times \cos(lon_j) + \cos(lat_i) \times \sin(lon_i) \times \cos(lat_j) \times \sin(lon_j) + \sin(lat_i) \times \sin(lat_j)) \times r \quad (3)$$

where lat and lon refer to the latitude and longitude in radians and r is the radius of Earth in miles.

These tests are performed using either the *Connections Dummy* or the *Past Connections Dummy* as “treatment” effects in the first stage.

Table 8 reports both the first and the second stage results of the Heckman selection regressions. Models I and II (Models III and IV) show results from the tests without (with) exclusion restriction in the first stage. Across all tests results are consistent with our previous findings: connection dummies remain statistically significant. Importantly, the inclusion of the Inverse Mills Ratio to control for self-selection does not alter the sign of the coefficients of the connection indicators maintain as in the OLS specifications. The coefficients for the dummies are in line with the OLS results reported in Table 5 whether we include any instrument in the first stage (Models III and IV) or not (Models I and II). The Pseudo R-Square is about 20% in all tests which is typically considered relatively high; however, the geographical distance does not exhibit strong association with the connection variables.

[Please insert Table 8 here]

4.4.d Non-Random matching with Venture Capitalists

It is well documented in the literature that Venture Capitalists play a crucial role in shaping all aspects of an IPO. Among others, Lee and Wahal (2004) document that venture capital backed IPOs experience larger first-day returns than comparable non-venture backed IPOs. While all our tests include a control for the presence of VC backing, here we go a step further and perform a further Heckman correction test to control for the endogenous nature of the presence of venture capitalists. We follow Lee and Wahal (2004) and Morsfield and Tan (2006) and perform our test in two steps. In the first stage we model the likelihood of being Venture Capital backed. We use four digit SIC code dummy variables, year dummies, book value of equity per share, and sales per share as independent variables in the first-stage. We then include the Inverse Mills Ratio in the second stage. As Table 9A reports, allowing for the endogenous presence of VC backing largely confirms our OLS tests. Our baseline results are largely confirmed and, in particular, the estimated coefficients of the connection variables are very similar in magnitude to our OLS main tests.

As for the first stage in Table 9B, book value per share and sales per share are both strongly associated with the presence of VC backing and the Pseudo R-Square is around 18% which is quite similar to the 22% of Lee and Wahal (2004) and the 18% of Morsfield and Tan (2006).

[Please insert Table 9A&B here]

4.4.e Propensity Score Matching Results

Our tests of differences in means reported in Tables 2 and 3 clearly show that there are important structural differences between connected and unconnected firms. This may raise concerns that standard OLS analysis may not perform well and that its results may be tainted by endogeneity issues. To further

control for the possible effect of confounding variables and the issue of endogeneity, we employ the propensity score matching procedure (Rosenbaum and Rubin, 1983). This procedure enables us to identify matched samples of connected (treated) and non-connected (control) IPOs which are similar across every observable characteristic apart from existence of personal connections. Table 10A presents the propensity score matching results, where the companies are categorized into treatment and control groups based on the existence of any form of connection (Panel A), the existence of connections which terminated before the IPO (Panel B), and the existence of Professional and Educational connections (Panels C and D, respectively).

[Please insert Table 10A here]

To ensure the quality of the matching, we require that the maximum difference in propensity score (*caliper*) between the treated and control IPOs not to exceed 0.1% in absolute value. This ensures sufficient similarity between the two groups. The p-value of the difference between the propensity of being connected (P-Score) ranges between 0.68 to 0.91, indicating that the two sets of companies are indeed virtually indistinguishable. As a further test of the quality of the matching, in Panel B we report the test of difference in means of all the controls that enter the first stage of the matching. In line with the average p-values of p-scores, all right-hand side controls for connected and unconnected firms appear statistically identical.

Most importantly, personal connections (present or past) result in lower IPO underpricing with a decrease ranging between 12 to 14 percentage points. The other more specific forms of connection (professional and educational) are also significant in determining a lower underpricing between 10 to 11 percentage points for the treated firms.

Table 10B reports t-tests of differences in means across all control variables to further appease readers that the treated and control samples are well matched.

[Please insert Table 10B here]

4.4.f Regression Analysis on Matched Sample

The advantage of the matching exercise is to ensure balance in the samples of treated and untreated. Once only companies with similar propensity scores are kept, treated and untreated firms are virtually indistinguishable at least from a statistical point.

However, the size of the average treatment effect reported in Panel A of Table 10A is only a simple univariate test. A “doubly robust” approach, more and more frequently adopted in the literature, consists in performing a regression test on the matched samples. Clearly, the risk in our sample is loss of statistical power due to the reduced number of observations. The advantage, however, is that the average treatment effect (essentially the estimated coefficient of the dummy) is now calculated in a multivariate setting where the impact of possible confounding variables is explicitly accounted for in the regression. At the same time, common support in the sample is ensured by the matching exercise as now treated and untreated are very similar in terms of observables.

Results from this further test are reported in Table 11. The coefficients of the connection variables are highly comparable to those in Table 5. For instance, the average underpricing of connected firms in Model I is 14.018% less than that of (comparable) unconnected firms almost identical to the 13.60% reported in Table 5 Model I. Table 11 Panel B reports the results with the (log of 1+) number of connections. The implied economic impact of the presence of connections (calculated in the same way we described above), is about 11.3% in Table 11 Model V as opposed to 7.8% in Table 5 Model V.

[Please insert Table 11 here]

5. Discussion

We consistently observe a negative and significant relationship between the existence of personal connections and the level of underpricing irrespective of the methodology employed in the analysis. The lower underpricing for connected firms seems to be consistent with the hypothesis of a better flow of information from the issuer to the underwriter through their personal connections and better access to soft information in line with several papers arguing that personal connections act as an information channel between firms and investors (e.g., Cohen et al, 2008; Engelberg et al, 2012; Khatami et al, 2016).

To test this asymmetric information interpretation, we reason that the effect of personal connections should be stronger among firms that are potentially more subject to asymmetric information problems. To this end, we split the sample between companies that are more or less likely to suffer from asymmetric information using several different criteria. First, an extensive number of studies use size and age as proxies for asymmetric information, where small (young) firms are assumed to be more opaque. We measure firm size as the natural log of the total assets. Models I and II of Table 12 report results of our baseline model with *Connections* dummy for the small and large (below/above the median) companies, respectively. Similarly, we use firm age and Models III and IV report results for young and mature (below/above the median) firms. Second, for underwriters it is harder valuing technology firms because of the innate nature of their growth options. We therefore expect technology firms to be more exposed to asymmetric information problems. In Models V and VI, Tech Firm equals one if the firm is categorized as a technology firm as in Loughran and Ritter (2004), and zero otherwise. In Models VII and VIII we also split firms that listed in NASDAQ and NYSE since NASDAQ is more likely to host smaller technology firms as opposed to the NYSE which usually hosts more established firms (e.g., Lowry et al, 2010). Third, we use the total amount of connections. Cai et al (2012) report that firms run by better connected executives are in general less exposed to asymmetric information problems. Also, Chuluun et al (2014) show that better-connected boards are associated with greater media coverage, which facilitates firm's visibility and investor recognition. Therefore, we split firms

between those that have below/ above median overall connected executives (Models IX and X). Fourth, we take into account a particular characteristic of the IPO, the lock up agreements since companies use such agreements to reduce asymmetric information and to signal their quality to investors in the market (Brav and Gompers 2003). Therefore, we split the sample between firms with and without lock-up in place (Models XI and XII, respectively). Fifth, Schenone (2004) shows that pre-IPO lending relationships between the underwriting bank and the issuer reduce asymmetric information between the two. Accordingly, we split the sample between firms with no and with pre-IPO banking relations (Models XIII and XIV, respectively). This limits the sample to the period 1999-2017 due to the data limitations discussed above.

Results from these tests all point in the same direction: companies that are more exposed to asymmetric information problems experience far greater reductions in IPO underpricing when a connection to the underwriter is present than their counterparts. For instance, the coefficient of the *Connections* dummy for small firms is almost three times larger (in absolute value) than that for large firms (21.45 versus 8.34 in Models I and II, respectively). Similarly, the coefficient for young firms is almost three times larger than that of mature firms (19.58 versus 7.71 in Models III and IV, respectively). We observe a large difference in coefficients also between technology and not technology firms (Models V and VI) and firms listed in NASDAQ and NYSE (Models VII and VIII).

Further, we report that firms with lower number of connections generally experience an underpricing almost three times as large as that of firms with higher overall connectivity (19.60 versus 7.06 in Models IX and X, respectively). In addition, the effect for companies with no lock up is almost twice that of firms with lock up agreement in place (21.85 versus 11.32 in Models XI and XII, respectively).

Finally, the presence of a banking (lending) relation with the underwriter also significantly reduces the effect of the connection on underpricing. The estimated coefficient for companies that use an

underwriter with no lending relation pre-IPO is almost six times the coefficient of firms with a previous lending relation (18.66 versus 3.48 in Models XIII and XIV, respectively).

Across all models, we perform tests of stability of coefficients. All these tests confirm that, statistically, we can reject the null hypothesis that the coefficient is the same across the subgroups. In other words, the coefficient estimates in the subgroups included in these tests are statistically different from each other. P-values of the stability of coefficients tests are reported at the bottom of Table 12.

Overall, all these results appear to provide strong support to the notion that personal connections are a channel to reduce asymmetric information. Irrespective of the sample-splitting criterion we choose companies that are more exposed to asymmetric information (i.e. smaller, younger, high tech, listed in NASDAQ, generally less connected, with no lockup in place, with no lending relation to their underwriting bank) appear to experience a proportionally larger reduction in underpricing due to the presence of connections. Companies that are less exposed to such issue have less to benefit from a mechanism that reduces asymmetric information such as personal connections. Therefore, they experience a proportionally smaller reduction in underpricing.

[Please insert Table 12 here]

Finally, two more remaining concerns could be that our results are explained via different mechanisms: *quid-pro-quo* and homophily. We discuss these alternative explanations in the next sections.

5.1 Quid-pro-quo

A known issue in the IPO literature is that underwriters have a very complex utility function, and they may use underpricing to maximize it. For instance, several papers argue that underwriters use underpricing to allow spinning to executives of prospective investment bank clients (Maynard, 2002 and Griffith, 2004) or flipping to their institutional investor clients (Aggarwal, 2003, Fische, 2002, and

Krigman et al., 1999) or friends and family members (Ljungqvist and Wilhelm, 2003), effectively expropriating the IPO firm with a larger underpricing (“leaving money on the table”).

Along these lines, in a recent paper Jenkinson et al. (2018) find strong evidence of a quid-pro-quo between underwriters and institutional investors motivated by broking revenues when it comes to shares allocation.

The results of our baseline tests could be consistent with this different interpretation: in presence of personal relations, lower underpricing may be the result of favouritism towards the issuing company as a compensation for making an IPO allocation against the interest of the issuer (for example to high-revenue clients).

While it is very hard to explicitly test for this alternative explanation, we discuss two arguments that may reduce such concern. One is related to the tests reported above in Section 5. Broadly speaking it is not clear why this favourable treatment of connected firms should be different for firms of different characteristics. For example, we observe a large difference in coefficients between technology and not technology firms (Models V and VI) and firms listed in NASDAQ and NYSE (Models VII and VIII). Results on the technology firms are particularly interesting here. These firms are those that, everything else being equal, generally tend to compensate less the underwriters (e.g. Cooney et al., 2015). Therefore, it becomes difficult to interpret our results in Models V to VIII according to the favourable treatment story, i.e. a connected underwriter limits more IPO underpricing in exchange for higher compensation. Our results, on the contrary, suggest that IPO underpricing is more limited for connected technology firms that do not compensate as much as the others.

Moreover, as Jenkinson et al. (2018) argue, their evidence of a “quid-pro-quo” story (at least when it comes to IPO shares allocation) might be more relevant in a market where fees and underpricing are comparatively low, such as the U.K. In a market such as US with greater underpricing as well as higher, less variable, and nondiscretionary fees, the resulting equilibrium might be different.

Overall, the two interpretations are not necessarily mutually exclusive. The presence of a connection may at the same time reduce asymmetric information and also provide incentives to the underwriter to limit the underpricing for the reasons discussed above.

5.2 Homophily

Another alternative explanation of our results might be that, our connection proxies could simply be latent variables for similarity of backgrounds and skills between the directors and managers of IPO firms and those of their lead underwriters. This could happen for instance if both the CEO of the IPO firm and that of the lead underwriter were – for the sake of example- Harvard Graduates. Even without ever crossing path in campus, they may approach the problem of private equity valuation in a very similar fashion and reach similar conclusions without necessarily exchanging information. Alternatively, one may be more likely to follow the advice of the other. For instance, in a recent paper Stolper and Walter (2019) report a strong and positive association between client/advisor homophily and the propensity of clients to follow advice. *Mutatis mutandis*, this evidence may translate to our IPO setting.

Disentangling the effect of personal connections from that of homophily is quite complicated since commonality of backgrounds may actually “facilitate interactions and thereby foster personal connections.” (Hwang and Kim, 2009). Nonetheless, we try to separate these two interpretations using a matching exercise. In the first stage, the likelihood of being connected or not depends on all the managerial characteristics that we could collect from BoardEx. Similarly to the analysis in Table 7, we use the fraction of MBA, MSC, and PhD graduates, the fraction of other qualifications that their directors and managers have, the total number of qualifications, the quality of the institutions that granted these degrees, the fraction of other (quoted) boards where they sit and their average age. We also add all the other dummies we use in all our regression tests i.e. underwriter and year fixed effects. For further

robustness, we perform the matching *within* each SIC4 cluster, to try and condition also for the industry that the IPO firm belongs to. In other words, each treated firm is matched to a statistically equivalent company which belongs to the same SIC4. This reduces the number of matches dramatically but ensures the maximum quality of the matches. Far from a perfect test, this attempts to condition the sample based on backgrounds and skills, so that treated and untreated firms are made by highly similar directors and managers.

As reported in Table 13, results from this test are strongly in line with our baseline results. After conditioning on background and skills of the directors (the best way we can), we still find that connections result in a lower level of underpricing. The figures are also in line with the matching tests in Table 10. Evidently, given the more stringent matching, the sample now drops to 218/218 treated/untreated from the 569/569 observations in Table 10. Nonetheless, connected firms face a lower level of underpricing of about 14% which is almost identical to the equivalent figure in Table 10. Results for “past” connections are also similar to those in Table 10.

[Please insert Table 13 here]

We acknowledge that this test may not be perfect, but even after matching directors and managers for their background and matching them as precisely as possible within the same industry, we still find that the effect of personal connection is in line with our tests.

6. Conclusions

Following a growing body of literature focusing on the role of personal relationships in decision making at corporate level, we study whether personal connections between issuers and underwriting banks act as information channels, conveying (soft) information to the underwriter and enabling it to rely on this information without facing higher reputational risk or fearing undersubscribed IPOs. Using

OLS regressions, we show that after controlling for a wide range of firm, issue, and underwriter characteristics, personal connections between issuers and their underwriting banks result in significantly lower underpricing. We further show that connections that terminated prior to the IPO (to further reduce potential concerns on reverse causality) as well as those of different nature (professional and educational connections) all have significant negative effects on the IPO underpricing. Results are also robust when we further control for managers' quality and experience in our robustness tests.

Ruling out the cross-causality due to the nature of the data and several robustness tests, we also address potential endogeneity concerns by employing a treatment effect model to endogenize underwriter selection, venture capital backing, a propensity score matching technique and a doubly robust analysis which entails running the OLS regressions on the matched sample only. Results indicate that after correcting for potential endogeneity biases, current connections play the most significant role in lowering the IPO underpricing, while other types of connection still show very significant effects on the decrease in underpricing.

We further investigate whether the reduced underpricing of connected firms is the result of reduced asymmetric information between the issuer and the underwriter (i.e., the personal connections become an information channel through which the underwriter has access to more soft information and becomes therefore able to reduce the underpricing level without facing higher risk). Tests on a very wide array of sample splits suggest that connected firms that are expected to suffer more from asymmetric information experience a significantly stronger reduction in underpricing than connected ones facing less severe asymmetric information issues.

Using some discussion on the existing tests, we attempt to reduce the concern that our results are driven by a quid-pro-quo between the underwriter and the issuing firm. We also try to disentangle the effect of network connections from that of homophily. Even after matching the directors and managers for all their observable characteristics in terms of background, quality and experience, we still find that

connected firms face a lower level of underpricing of a magnitude that is highly in line with our baseline tests.

We contribute to both empirical studies on IPO and those with a focus on the role of personal connections in financial decision making and practice. We show that existence of personal connections between directors or executives of the issuer and the underwriting bank is among the most important determinants of IPO underpricing. We further show that the existence of personal connections decreases the underpricing level by reducing the asymmetric information problem between the issuers and investment banks acting as underwriters.

The documented effect is not only statistically significant but also economically sizeable. Using the matched sample as reference where everything else (observable) is equal, average underpricing is about 13% smaller for connected firms. This is about one third of the total underpricing of unconnected firms. Back of the envelope calculations suggest that in presence of connected managers, if the offer price of the average (median) IPO firm were 13% higher than the actual one, the company would raise about 21 (12) million more at IPO.

Our results show that the presence of connections between underwriters and issuers is an important predictor of the IPO underpricing. Therefore, such information should be available to market participants for a more efficient working of the financial markets. This would lead to conclude that IPO regulations may push for more transparency in the IPO process by, for instance, requiring the disclosure of connections between underwriters and issuers. Although, arguably, this kind of information would be potentially hard to document and verify, nonetheless regulators have already launched a number of initiatives aimed at addressing potential conflicts of interest between the parties involved in the allocation of IPO shares, as highlighted by Jenkinson et al (2018).¹⁰

Notes

¹ In a related study, Hwang and Kim (2009) challenge the conventional notion of independent boards in presence of social and family connections among board members.

² Risk of post IPO litigation is also a concern for underwriters and underpricing is a mechanism through which underwriters hedge against this risk too (e.g., Tinic 1988; Hughes and Thakor 1992).

³ We also collect data on Social connections. Results with the inclusion of this variable are largely consistent with the ones reported in the paper.

⁴ All results reported in the paper remain consistent when we exclude 1999 and 2000, the internet bubble years.

⁵ While this data source is widely used in the IPO literature (e.g., Schenone 2004; Cai et al, 2012), we perform a thorough check of the reliability of the data by manually collecting information from EDGAR Company Filings (<https://www.sec.gov/edgar/searchedgar/companysearch.html>) for 400 of our companies. By benchmarking the IPO share price and the name of the lead Underwriters as reported in SDC, we conclude that the source of data we use is extremely reliable.

⁶ <https://site.warrington.ufl.edu/ritter/ipo-data/>

⁷ As a robustness test, we also compute the underpricing after one week of trading as opposed to one day. Untabulated results are qualitatively similar to those presented here.

⁸ Underwriters have much larger numbers of executives and directors as they are significantly larger and more established companies. For instance, inspecting Goldman Sachs' 2020 annual report and proxy statement the number of directors and executive officers comes to a total of 29 which is highly in line with our descriptive statistics.

⁹ In unreported tables we replicate all other tests included in the paper and all results are in line with those reported in the text.

¹⁰ *Mutatis mutandis*, this same line of argument could also be applied to some of the increasingly more stringent criteria set out by the stock exchanges to define the “independency” of directors in the board.

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Figure 1

This figure reports a comparison between the total number of IPOs (Panel A) and average underpricing (Panel B) per year in our sample and the population data reported in Ritter (2021) [<https://site.warrington.ufl.edu/ritter/files/IPO-Statistics.pdf>].

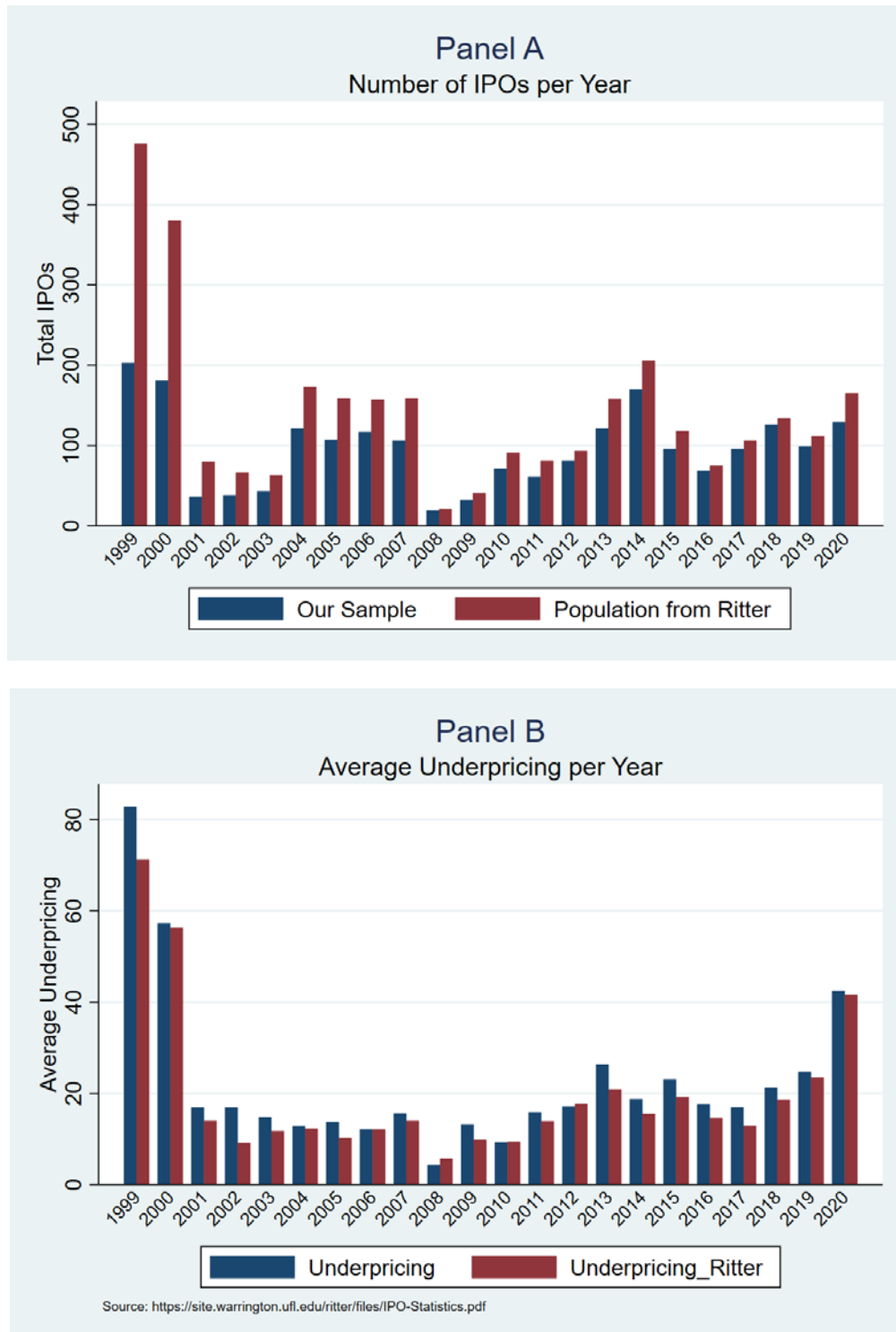


Table 1: Summary Statistics of Personal Connection Variables

	Mean	S.D.	Min	Max
<i>Connections Dummy</i>	0.437	0.496	0	1
<i>Past Connections Dummy</i>	0.406	0.491	0	1
<i>Professional Connections Dummy</i>	0.403	0.491	0	1
<i>Educational Connections Dummy</i>	0.209	0.407	0	1
<i>Issuer CEO Connections Dummy</i>	0.080	0.272	0	1
<i>UW CEO Connections Dummy</i>	0.090	0.286	0	1
<i>Connections</i>	4.556	19.865	0	257
<i>Past Connections</i>	3.814	15.985	0	198
<i>Professional Connections</i>	4.394	19.769	0	257
<i>Educational Connections</i>	0.750	2.124	0	27
<i>Issuer CEO Connections</i>	0.268	1.075	0	33
<i>UW CEO Connections</i>	0.341	2.048	0	67
Number of Issues	2,351			

This table presents descriptive characteristics for the personal connection variables. The sample contains all U.S. IPO industrial companies between 1999 and 2020 which meet the data requirements explained in Section 3. The first set of variables contains binary variables equal to 1 if there exists at least one instance of a specific type of connection between the underwriter and the issuer, zero otherwise. *Connections Dummy* is equal to 1 if at least one instance is reported where directors or executives from underwriter have personal relationship with directors or executives from the issuing firm, zero otherwise. These connections are always initiated before the issue. *Past connections Dummy* is equal to 1 if there are connections and these connections were terminated prior to the IPO, zero otherwise. *Professional Connections Dummy* is equal to 1 if these connections take place because directors or executives from the underwriter and directors or executives from the issuing firm worked at the same place, zero otherwise. *Educational Connections Dummy* is equal to 1 if these connections take place because directors or executives from the underwriter and directors or executives from the issuing firm went to the same school, zero otherwise. *Issuer CEO Connections Dummy* and *UW CEO Connections Dummy* are equal to 1 if these connections go through the issuer's CEO and the underwriting bank's CEO, respectively, zero otherwise. *Connections* is the sum of all the instances where directors or executives from the underwriter are reported to have some personal relationship with directors or executives from the issuing firm. These connections are always initiated before the issue. *Past Connections* is the sum of all connections which were terminated between the issuer and the underwriter prior to the IPO. These connections take place because directors or executives from the underwriter and directors or executives from the issuing firm either worked at the same place (*Professional Connections*) or went to the same school (*Educational Connections*). *Issuer CEO Connections* and *UW CEO Connections* are those connections which go through the issuer's CEO or the underwriting bank's CEO, respectively.

Table 2: Comparative Summary Statistics of Firm and Issue Characteristics

	Connected		Non-Connected		Diff. in Means (p-value)
	N	Mean	N	Mean	
<i>No. of Connected Individuals</i>	1,027	7,043.293	1,324	4,810.684	0.000
<i>Directors IPO Firm</i>	1,027	8.195	1,324	7.383	0.000
<i>Directors Lead UW</i>	1,027	33.415	1,324	21.666	0.000
<i>Tot Assets (\$m)</i>	1,027	1,679.374	1,324	1,068.041	0.000
<i>Tot Sales (\$m)</i>	1,027	766.803	1,324	376.753	0.000
<i>Price Revision</i>	1,027	-0.006	1,324	-0.020	0.009
<i>Age (Years)</i>	1,027	19.110	1,324	14.304	0.000
<i>Total Debt to Total Assets</i>	1,027	0.314	1,324	0.209	0.000
<i>Cash to Total Assets</i>	1,027	0.319	1,324	0.456	0.000
<i>Number of Shares Issued (m)</i>	1,027	12.836	1,324	9.398	0.000
<i>% Secondary Shares</i>	1,027	12.004	1,324	7.851	0.000
<i>IPO Proceeds to Total Assets</i>	1,027	1.323	1,324	2.076	0.048
<i>Technology Stock</i>	1,027	0.332	1,324	0.393	0.002
<i>NYSE</i>	1,027	0.327	1,324	0.190	0.000
<i>NASDAQ</i>	1,027	0.673	1,324	0.810	0.000
<i>Venture Backed</i>	1,027	0.562	1,324	0.599	0.070
<i>Lock-up Period (days)</i>	1,027	167.887	1,324	166.090	0.433
<i>Lead Underwriter Rank</i>	1,027	8.210	1,324	7.562	0.000
<i>Co-Managers Rank</i>	1,027	7.888	1,324	7.264	0.000

This table presents the descriptive statistics for connected and non-connected firms separately over a set of company and issue characteristics that are likely to affect IPO underpricing. The sample contains all U.S. IPO industrial companies between 1999 and 2020 that meet the data requirements explained in Section 3. Tests of difference in the means are also reported. *No. of Connected Individuals* is the number of individuals from any other company included in BoardEx who are connected to directors or senior executives of the company at the time of IPO. *Directors IPO Firm* is the number of directors and executives working for the IPO firm at the time of IPO included in BoardEx. *Directors Lead UW* is the number of directors and executives working for the lead underwriter at the time of the IPO. *Tot Assets* is the company's total assets from the latest financial statements prior to the IPO. *Tot Sales* is the company's total sales from the latest financial statements prior to the IPO. *Price Revision* is calculated as the offer price less the midpoint of the original filing range divided by the midpoint of original filing range (multiplied by 100). *Age* is the company's age (from founding date) at the time of IPO. *Total Debt to Total Assets* is the ratio of total debt to total assets from the latest financial statements prior to the IPO. *Cash to Total Assets* is the ratio of cash and cash equivalents to total assets from the latest financial statements prior to the IPO. *Number of Shares Issued* is the number of shares offered to the market in the IPO process. *%Secondary Shares* is the percentage of secondary shares (owned by the shareholders) offered in the market out of the total number of shares issued. *IPO Proceeds to Total Assets* is the ratio of the IPO proceeds to the company's total assets based on the latest financial statements prior to the IPO. *Technology Stock* is a dummy equal to 1 if the issuer is categorized as a technology firm by Loughran and Ritter (2004), and zero otherwise. *NYSE* and *Nasdaq* are dummies equal to 1 if the shares are initially listed on NYSE or Nasdaq respectively, and zero otherwise. *Venture Backed* is a dummy equal to 1 if the company is identified as venture-backed on SDC New Issues database, and zero otherwise. *Lock-up Period* is the length of IPO lock-up period in days as reported by SDC New Issues. *Lead Underwriter Rank* and *Co-Managers Rank* are the lead underwriter(s) and co-manager(s)' Rank respectively, as provided by Loughran and Ritter (2004).

Table 3: Underpricing Univariate Tests

Connection Status (Type)	Number of Observations	Underpricing Mean	Diff. Connection – No Connection	P-Value of Diff. Connection – No Connection
<i>No Connections</i>	1,324	37.707		
<i>Connections</i>	1,027	18.383	-19.324	0.000
<i>Past Connections</i>	955	18.527	-18.084	0.000
<i>Professional Connections</i>	947	17.838	-19.134	0.000
<i>Educational Connections</i>	491	18.480	-13.632	0.000
<i>Issuer CEO Connections</i>	189	10.342	-20.578	0.000
<i>UW CEO Connections</i>	212	9.769	-21.429	0.000

This table presents the univariate test results for the effect of personal connections between underwriting banks and issuing firms on IPO underpricing. The sample contains all U.S. IPO industrial companies between 1999 and 2020 which meet the data requirements explained in detail in Section 3. *Underpricing* is the percentage difference between the initial offer price and the first-day closing price for the IPO. Companies with *Connection* are those in which directors or executives from the underwriter are reported to have some personal relationship with directors or executives from the issuing firm. These connections are always initiated before the issue. Companies with *Past connection* are those which have connections with their underwriter which were terminated prior to the IPO. These connections take place because directors or executives from the underwriter and directors or executives from the issuing firm either: worked at the same place (*Professional Connections*) or went to the same school (*Educational Connections*). *Issuer CEO Connections* and *UW CEO Connections* are those connections which go through the issuer's CEO or the underwriting bank's CEO, respectively.

Table 4 Panel A: Correlation Matrix (dummy variables)

Variables	<i>Underpricing</i>	<i>Connections</i>	<i>Past Connections</i>	<i>Employment Connections</i>	<i>Educational Connections</i>	<i>Issuer CEO Connections</i>	<i>UW CEO Connections</i>
<i>Underpricing</i>	1.000						
<i>Connections</i>	-0.176***	1.000					
<i>Past Connections</i>	-0.163***	0.932***	1.000				
<i>Employment Connections</i>	-0.172***	0.933***	0.864***	1.000			
<i>Educational Connections</i>	-0.102***	0.583***	0.619***	0.470***	1.000		
<i>Issuer CEO Connections</i>	-0.103***	0.333***	0.335***	0.290***	0.229***	1.000	
<i>UW CEO Connections</i>	-0.113***	0.357***	0.359***	0.323***	0.258***	0.191***	1.000
<i>Ln(1+No. of Conn.)</i>	-0.049**	0.262***	0.224***	0.303***	0.139***	0.022	0.001
<i>Directors IPO Firm</i>	-0.103***	0.150***	0.128***	0.155***	0.068***	0.050**	0.035*
<i>Directors Lead UW</i>	-0.053**	0.202***	0.205***	0.181***	0.142***	0.079***	0.071***
<i>Ln Tot Assets</i>	-0.083***	0.229***	0.199***	0.255***	0.082***	0.034*	0.025
<i>Ln Tot Sales</i>	-0.087***	0.116***	0.120***	0.090***	0.031	0.057***	0.078***
<i>Price Revision</i>	0.293***	0.054***	0.049**	0.057***	0.041**	-0.004	-0.011
<i>Age</i>	-0.089***	0.109***	0.090***	0.113***	0.008	0.028	0.049**
<i>Debt to Total Assets</i>	-0.133***	0.158***	0.152***	0.145***	0.070***	0.036*	0.056***
<i>Cash to Total Assets</i>	0.130***	-0.210***	-0.202***	-0.191***	-0.115***	-0.098***	-0.106***
<i>Ln. No. Shares Issued</i>	-0.126***	0.257***	0.239***	0.248***	0.128***	0.098***	0.085***
<i>% Secondary Shares</i>	-0.071***	0.095***	0.093***	0.071***	0.065***	0.049**	0.091***
<i>IPO Proceeds to TA</i>	0.027	-0.041**	-0.034*	-0.046**	0.004	-0.015	-0.012
<i>Technology Stock</i>	0.216***	-0.063***	-0.050**	-0.079***	-0.015	-0.004	-0.027
<i>NASDAQ</i>	0.104***	-0.158***	-0.137***	-0.163***	-0.076***	-0.068***	-0.079***
<i>Venture Backed</i>	0.125***	-0.037*	-0.027	-0.038*	0.038*	-0.007	-0.041**
<i>Lock-up Period (days)</i>	-0.111***	0.016	0.003	0.053***	0.000	-0.033*	-0.005
<i>Lead Underwriter Rank</i>	0.050**	0.208***	0.203***	0.172***	0.137***	0.085***	0.078***
<i>Co-Managers Rank</i>	0.029	0.215***	0.209***	0.211***	0.152***	0.069***	0.043**

Table 4 Panel B: Correlation Matrix (continuous variables)

Variables	<i>Underpricing</i>	<i>Connections</i>	<i>Past Connections</i>	<i>Employment Connections</i>	<i>Educational Connections</i>	<i>Issuer CEO Connections</i>	<i>UW CEO Connections</i>
<i>Underpricing</i>	1.000						
<i>Connections</i>	-0.142***	1.000					
<i>Past Connections</i>	-0.134***	0.966***	1.000				
<i>Employment Connections</i>	-0.137***	0.986***	0.951***	1.000			
<i>Educational Connections</i>	-0.096***	0.683***	0.695***	0.644***	1.000		
<i>Issuer CEO Connections</i>	-0.059***	0.332***	0.303***	0.315***	0.112***	1.000	
<i>UW CEO Connections</i>	-0.063***	0.430***	0.378***	0.423***	0.188***	0.338***	1.000
<i>Ln(1+No. of Conn.)</i>	-0.049**	0.247***	0.239***	0.265***	0.259***	0.001	0.003
<i>Directors IPO Firm</i>	-0.103***	0.177***	0.180***	0.173***	0.110***	0.082***	0.060***
<i>Directors Lead UW</i>	-0.053**	0.238***	0.246***	0.221***	0.205***	0.058***	0.079***
<i>Ln Tot Assets</i>	-0.083***	0.284***	0.274***	0.292***	0.189***	0.083***	0.087***
<i>Ln Tot Sales</i>	-0.087***	0.150***	0.148***	0.134***	0.060***	0.087***	0.093***
<i>Price Revision</i>	0.293***	0.037*	0.042**	0.038*	0.065***	-0.033	-0.016
<i>Age</i>	-0.089***	0.171***	0.157***	0.170***	0.052**	0.092***	0.100***
<i>Debt to Total Assets</i>	-0.133***	0.146***	0.146***	0.136***	0.079***	0.042**	0.046**
<i>Cash to Total Assets</i>	0.130***	-0.235***	-0.229***	-0.223***	-0.161***	-0.096***	-0.090***
<i>Ln. No. Shares Issued</i>	-0.126***	0.287***	0.278***	0.273***	0.172***	0.158***	0.133***
<i>% Secondary Shares</i>	-0.071***	0.098***	0.094***	0.082***	0.077***	0.087***	0.111***
<i>IPO Proceeds to TA</i>	0.027	-0.039*	-0.036*	-0.040*	-0.003	-0.012	-0.020
<i>Technology Stock</i>	0.216***	-0.067***	-0.056***	-0.074***	0.002	-0.007	-0.029
<i>NASDAQ</i>	0.104***	-0.212***	-0.198***	-0.209***	-0.116***	-0.091***	-0.092***
<i>Venture Backed</i>	0.125***	-0.096***	-0.085***	-0.093***	0.008	-0.062***	-0.078***
<i>Lock-up Period (days)</i>	-0.111***	0.022	0.018	0.041**	0.044**	-0.023	-0.010
<i>Lead Underwriter Rank</i>	0.050**	0.199***	0.203***	0.176***	0.164***	0.081***	0.092***
<i>Co-Managers Rank</i>	0.029	0.220***	0.219***	0.216***	0.208***	0.047**	0.053**

This table presents the correlation matrix between the personal connection variables and the control variables. The sample contains all U.S. IPO industrial companies between 1999 and 2020 that meet the data requirements explained in Section 3. In Panel A the underwriter–issuer personal connections are proxied by binary variables. In Panel B the underwriter-issuer personal connections are measured by the natural log of one plus the total number of connections, according to the type of connection. Please see description of Table 1 for all definitions of connection-related variables and description of Table 2 for all other control variables. P-values are reported in brackets. *, **, and *** report the statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 5: OLS Regressions

	<i>Panel A: Connections (Dummy Variables)</i>				<i>Panel B: Connections (Continuous Variables)</i>			
	I	II	III	IV	V	VI	VII	VIII
<i>Connections</i>	-13.601*** [0.000]				-4.557*** [0.000]			
<i>Past Connections</i>		-12.215*** [0.000]				-4.651*** [0.000]		
<i>Professional Connections</i>			-10.192*** [0.000]				-2.170* [0.058]	
<i>Educational Connections</i>			-6.468*** [0.005]				-6.459*** [0.002]	
<i>Issuer CEO Connections</i>				-11.651*** [0.000]				-5.403** [0.040]
<i>UW CEO Connections</i>				-8.767*** [0.000]				-4.877** [0.049]
<i>Ln(1+No. of Conn.)</i>	1.588 [0.222]	1.293 [0.318]	1.635 [0.211]	0.296 [0.814]	1.204 [0.365]	1.136 [0.396]	1.578 [0.241]	0.104 [0.935]
<i>Directors IPO Firm</i>	-0.461 [0.154]	-0.503 [0.121]	-0.47 [0.146]	-0.529 [0.105]	-0.439 [0.176]	-0.425 [0.191]	-0.452 [0.164]	-0.5 [0.127]
<i>Directors Lead UW</i>	-0.023 [0.590]	-0.021 [0.629]	-0.02 [0.645]	-0.039 [0.360]	-0.026 [0.536]	-0.024 [0.565]	-0.02 [0.637]	-0.043 [0.322]
<i>Ln. Tot Assets</i>	1.857 [0.131]	1.81 [0.142]	1.891 [0.124]	1.687 [0.175]	2.116* [0.090]	2.109* [0.091]	2.150* [0.085]	1.864 [0.135]
<i>Ln. Tot Sales</i>	-0.511 [0.415]	-0.519 [0.409]	-0.628 [0.316]	-0.715 [0.256]	-0.628 [0.319]	-0.63 [0.318]	-0.701 [0.264]	-0.757 [0.231]
<i>Price Revision</i>	0.790*** [0.000]	0.788*** [0.000]	0.787*** [0.000]	0.769*** [0.000]	0.771*** [0.000]	0.771*** [0.000]	0.768*** [0.000]	0.767*** [0.000]
<i>Age</i>	0.053 [0.267]	0.052 [0.280]	0.051 [0.282]	0.056 [0.240]	0.064 [0.184]	0.062 [0.198]	0.057 [0.234]	0.064 [0.183]
<i>Debt to Total Assets</i>	-1.543 [0.615]	-1.871 [0.544]	-1.827 [0.553]	-3.768 [0.220]	-2.511 [0.419]	-2.465 [0.430]	-2.435 [0.431]	-3.677 [0.236]
<i>Cash to Total Assets</i>	11.281**	12.086**	11.370**	14.461***	13.182***	13.285***	12.518**	15.577***

	[0.024]	[0.016]	[0.023]	[0.005]	[0.009]	[0.009]	[0.013]	[0.002]
<i>Ln. No. Shares Issued</i>	-4.246**	-4.127**	-4.287**	-3.955*	-4.387**	-4.427**	-4.645**	-4.205**
	[0.040]	[0.046]	[0.038]	[0.058]	[0.035]	[0.034]	[0.026]	[0.044]
<i>% Secondary Shares</i>	0.028	0.027	0.026	0.033	0.027	0.027	0.034	0.037
	[0.367]	[0.372]	[0.397]	[0.285]	[0.390]	[0.391]	[0.280]	[0.231]
<i>IPO Proceeds to TA</i>	0.284	0.279	0.294	0.264	0.291	0.289	0.313	0.274
	[0.325]	[0.334]	[0.306]	[0.383]	[0.333]	[0.336]	[0.293]	[0.372]
<i>Technology Stock</i>	10.157***	10.096***	10.072***	9.830***	10.082***	10.192***	10.221***	10.018***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
<i>NASDAQ</i>	-3.273	-3.016	-3.506	-4.295	-3.964	-3.775	-3.592	-4.093
	[0.187]	[0.224]	[0.160]	[0.286]	[0.114]	[0.130]	[0.152]	[0.104]
<i>Venture Backed</i>	1.072	1.117	1.251	0.9	0.867	0.893	1.209	0.777
	[0.673]	[0.661]	[0.623]	[0.726]	[0.734]	[0.727]	[0.635]	[0.762]
<i>Lock-up Period (days)</i>	-0.046	-0.045	-0.044	-0.046	-0.043	-0.042	-0.04	-0.043
	[0.196]	[0.206]	[0.223]	[0.197]	[0.234]	[0.241]	[0.269]	[0.233]
<i>Lead Underwriter Rank</i>	2.002	1.931	2.004	1.523	1.755	1.775	1.779	1.432
	[0.199]	[0.219]	[0.198]	[0.326]	[0.261]	[0.259]	[0.255]	[0.363]
<i>Co-Managers Rank</i>	-0.54	-0.56	-0.418	-0.724	-0.488	-0.523	-0.4	-0.7
	[0.529]	[0.515]	[0.626]	[0.401]	[0.571]	[0.544]	[0.642]	[0.418]
<i>Constant</i>	72.244**	69.252*	69.299*	78.520**	72.612**	73.059**	72.647**	82.826**
	[0.049]	[0.053]	[0.057]	[0.029]	[0.045]	[0.043]	[0.043]	[0.022]
Underwriter Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.379	0.377	0.379	0.374	0.374	0.374	0.375	0.37
Observations	2,351	2,351	2,351	2,351	2,351	2,351	2,351	2,351

This table presents the OLS regression results for identification of the determinants of IPO underpricing. The sample contains all US IPOs by industrial companies between 1999 and 2020 which meet the data requirements explained in detail in Section 3. Underpricing is the percentage difference between the initial offer price and the first-day closing price for the IPO. In Panel A the underwriter–issuer personal connections are proxied by binary variables. In Panel B the underwriter-issuer personal connections are measured by the natural log of one plus the total number of connections, according to the type of connection. Please see description of Table 1 for all definitions of connection-related variables and description of Table 2 for all other control variables. P-values are reported in brackets. *, **, and *** report the statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 6: Robustness Tests for the role of pre-IPO Lending Relation

	<i>Panel A: Connections (Dummy Variables)</i>				<i>Panel B: Connections (Continuous Variables)</i>			
	I	II	III	IV	V	VI	VII	VIII
<i>Connections</i>	-16.217*** [0.000]				-6.182*** [0.000]			
<i>Past Connections</i>		-14.236*** [0.000]				-6.356*** [0.000]		
<i>Professional Connections</i>			-12.848*** [0.000]				-3.463*** [0.001]	
<i>Educational Connections</i>			-6.297** [0.011]				-7.488*** [0.001]	
<i>Issuer CEO Connections</i>				-11.545*** [0.000]				-4.668** [0.021]
<i>UW CEO Connections</i>				-8.978*** [0.000]				-5.585* [0.066]
<i>Ln(1+No. of Conn.)</i>	1.864 [0.199]	1.523 [0.292]	1.928 [0.187]	0.28 [0.842]	1.671 [0.260]	1.601 [0.284]	2.171 [0.151]	0.042 [0.976]
<i>Directors IPO Firm</i>	-0.466 [0.187]	-0.514 [0.147]	-0.463 [0.190]	-0.577 [0.103]	-0.437 [0.219]	-0.414 [0.245]	-0.441 [0.215]	-0.542 [0.129]
<i>Directors Lead UW</i>	-0.065 [0.186]	-0.062 [0.205]	-0.065 [0.190]	-0.083* [0.094]	-0.064 [0.191]	-0.061 [0.213]	-0.057 [0.240]	-0.086* [0.083]
<i>Ln. Tot Assets</i>	1.248 [0.359]	1.23 [0.368]	1.322 [0.332]	1.101 [0.425]	1.638 [0.235]	1.645 [0.233]	1.712 [0.216]	1.304 [0.346]
<i>Ln. Tot Sales</i>	-0.481 [0.481]	-0.492 [0.473]	-0.622 [0.361]	-0.762 [0.267]	-0.632 [0.357]	-0.632 [0.357]	-0.707 [0.301]	-0.787 [0.253]
<i>Price Revision</i>	0.749*** [0.000]	0.741*** [0.000]	0.745*** [0.000]	0.731*** [0.000]	0.726*** [0.000]	0.723*** [0.000]	0.721*** [0.000]	0.727*** [0.000]
<i>Age</i>	0.067 [0.194]	0.066 [0.203]	0.066 [0.200]	0.07 [0.180]	0.08 [0.131]	0.077 [0.146]	0.072 [0.170]	0.078 [0.140]
<i>Debt to Total Assets</i>	-3.408 [0.295]	-3.48 [0.287]	-3.579 [0.273]	-4.846 [0.140]	-3.763 [0.254]	-3.618 [0.275]	-3.607 [0.273]	-4.804 [0.147]
<i>Cash to Total Assets</i>	9.557* [0.077]	10.707** [0.049]	9.690* [0.073]	14.088** [0.010]	11.768** [0.031]	11.899** [0.030]	10.778** [0.047]	15.292*** [0.006]
<i>Ln. No. Shares Issued</i>	-4.364* [0.077]	-4.340* [0.049]	-4.430* [0.073]	-4.596** [0.010]	-4.776** [0.031]	-4.860** [0.030]	-5.039** [0.047]	-4.869** [0.006]

	[0.060]	[0.061]	[0.055]	[0.049]	[0.040]	[0.037]	[0.030]	[0.037]
<i>% Secondary Shares</i>	0.024	0.023	0.019	0.033	0.023	0.022	0.03	0.037
	[0.467]	[0.488]	[0.556]	[0.313]	[0.493]	[0.499]	[0.371]	[0.260]
<i>IPO Proceeds to TA</i>	0.263	0.257	0.274	0.234	0.272	0.269	0.299	0.245
	[0.353]	[0.366]	[0.331]	[0.432]	[0.357]	[0.361]	[0.306]	[0.417]
<i>Technology Stock</i>	8.966***	8.913***	8.910***	8.796***	9.062***	9.253***	9.160***	9.025***
	[0.004]	[0.005]	[0.004]	[0.006]	[0.004]	[0.003]	[0.004]	[0.005]
<i>NASDAQ</i>	-3.133	-2.961	-3.48	-4.610*	-4.17	-3.915	-3.637	-4.402
	[0.253]	[0.280]	[0.208]	[0.097]	[0.134]	[0.158]	[0.190]	[0.115]
<i>Venture Backed</i>	0.124	0.285	0.308	-0.233	-0.095	-0.037	0.359	-0.353
	[0.965]	[0.921]	[0.914]	[0.935]	[0.974]	[0.990]	[0.899]	[0.902]
<i>Lock-up Period (days)</i>	-0.042	-0.04	-0.039	-0.04	-0.037	-0.036	-0.033	-0.037
	[0.254]	[0.274]	[0.289]	[0.273]	[0.317]	[0.331]	[0.369]	[0.320]
<i>Lead Underwriter Rank</i>	2.17	2.166	2.168	1.88	2.142	2.207	2.154	1.803
	[0.168]	[0.172]	[0.167]	[0.228]	[0.170]	[0.161]	[0.167]	[0.255]
<i>Co-Managers Rank</i>	-0.362	-0.481	-0.243	-0.563	-0.269	-0.36	-0.169	-0.524
	[0.697]	[0.606]	[0.794]	[0.547]	[0.773]	[0.700]	[0.856]	[0.577]
<i>Pre-IPO Bank Relationship with Lead Underwriter</i>	0.656	0.775	0.618	0.894	1.043	0.941	0.777	0.829
	[0.742]	[0.698]	[0.760]	[0.669]	[0.614]	[0.648]	[0.702]	[0.688]
<i>Pre-IPO Bank Relationship with Co-Managers</i>	0.983	0.912	0.969	1.178	1.357	1.388	1.117	1.17
	[0.686]	[0.708]	[0.695]	[0.634]	[0.593]	[0.586]	[0.658]	[0.641]
<i>Constant</i>	58.603	60.61	56.186	73.951*	59.201	60.531	58.714	78.733**
	[0.154]	[0.140]	[0.167]	[0.061]	[0.144]	[0.135]	[0.143]	[0.049]
Underwriter Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.385	0.382	0.384	0.377	0.379	0.379	0.381	0.372
Observations	1,997	1,997	1,997	1,997	1,997	1,997	1,997	1,997

This table presents the OLS regression results for identification of the determinants of IPO underpricing. The sample contains all U.S. IPOs by industrial companies between 1999 and 2017 as this is the latest year available for the Dealscan-Compustat linking file (<https://finance.wharton.upenn.edu/~mrrobert/styled-9/styled-12/index.html>). *Underpricing* is the percentage difference between the initial offer price and the first-day closing price for the IPO. In Panel A the underwriter-issuer personal connections are proxied by binary variables. In Panel B the underwriter-issuer personal connections are measured by the natural log of one plus the total number of connections, according to the type of connection. *Pre-IPO Bank Relationship with Lead Underwriter* is a dummy equal to 1 if the issuer has banking

relationship with the lead underwriter which predates the IPO, and zero otherwise. *Pre-IPO Bank Relationship with Co-Managers* is a dummy equal to 1 if the issuer has banking relationship(s) with the co-manager(s) of the banking syndicate which predates the IPO, and zero otherwise. Please see description of Table 1 for all definitions of connection-related variables and description of Table 2 for all other control variables. *P*-values are reported in brackets. *, **, and *** report the statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 7: Robustness Tests for Omitted Variable Bias-the role of Managerial Traits

	<i>Panel A: Connections (Dummy Variables)</i>				<i>Panel B: Connections (Continuous Variables)</i>			
	I	II	III	IV	V	VI	VII	VIII
<i>Connections</i>	-14.414*** [0.000]				-4.491*** [0.001]			
<i>Past Connections</i>		-12.856*** [0.000]				-4.232*** [0.002]		
<i>Professional Connections</i>			-9.516*** [0.000]				-1.412* [0.090]	
<i>Educational Connections</i>			-8.064*** [0.001]				-7.675*** [0.001]	
<i>Issuer CEO Connections</i>				-12.071*** [0.000]				-8.043* [0.069]
<i>UW CEO Connections</i>				-8.172*** [0.001]				-4.65** [0.020]
<i>MBA</i>	-25.048 [0.197]	-24.564 [0.204]	-24.382 [0.213]	-27.861 [0.150]	-26.159 [0.177]	-25.471 [0.189]	-25.667 [0.188]	-27.888 [0.150]
<i>MSc</i>	-14.717 [0.569]	-15.78 [0.542]	-13.553 [0.599]	-20.84 [0.421]	-20.091 [0.436]	-20.274 [0.432]	-17.933 [0.486]	-22.532 [0.383]
<i>PhD</i>	-8.189 [0.835]	-11.362 [0.775]	-6.842 [0.863]	-11.492 [0.770]	-15.77 [0.690]	-16.218 [0.682]	-14.137 [0.721]	-12.83 [0.744]
<i>Other</i>	-5.919 [0.251]	-5.831 [0.259]	-6.227 [0.230]	-6.404 [0.215]	-7.076 [0.172]	-6.954 [0.180]	-6.662 [0.198]	-7.279 [0.161]
<i>Total Qualifications</i>	3.611 [0.136]	3.632 [0.136]	3.666 [0.133]	3.473 [0.158]	3.529 [0.149]	3.535 [0.149]	3.684 [0.131]	3.419 [0.166]
<i>University Rank</i>	-0.00003 [0.891]	-0.00002 [0.882]	-0.00003 [0.901]	0.00004 [0.832]	-0.00002 [0.896]	-0.00002 [0.889]	-0.00004 [0.905]	0.00001 [0.866]
<i>Quoted Boards</i>	-0.139 [0.906]	-0.099 [0.933]	-0.097 [0.934]	-0.165 [0.889]	-0.22 [0.854]	-0.221 [0.853]	-0.23 [0.847]	-0.103 [0.931]
<i>Total Boards</i>	-0.047 [0.909]	-0.049 [0.905]	-0.066 [0.873]	-0.022 [0.957]	-0.025 [0.951]	-0.025 [0.952]	-0.034 [0.935]	-0.075 [0.857]
<i>Avg. Manager Age</i>	-0.32 [0.239]	-0.333 [0.222]	-0.332 [0.222]	-0.241 [0.379]	-0.318 [0.244]	-0.313 [0.253]	-0.369 [0.179]	-0.289 [0.292]
<i>Ln(1+No. of Conn.)</i>	0.472	0.171	0.504	-0.85	0.121	0.002	0.557	-0.983

	[0.721]	[0.896]	[0.704]	[0.513]	[0.929]	[0.999]	[0.684]	[0.452]
<i>Directors IPO Firms</i>	-0.421	-0.468	-0.446	-0.507	-0.413	-0.408	-0.433	-0.477
	[0.215]	[0.170]	[0.188]	[0.139]	[0.227]	[0.234]	[0.205]	[0.168]
<i>Directors Lead UW</i>	-0.028	-0.026	-0.025	-0.044	-0.034	-0.033	-0.027	-0.05
	[0.525]	[0.557]	[0.567]	[0.321]	[0.444]	[0.454]	[0.534]	[0.262]
<i>Ln. Tot Assets</i>	1.784	1.711	1.797	1.595	2.031	1.991	2.058	1.771
	[0.163]	[0.182]	[0.162]	[0.219]	[0.119]	[0.127]	[0.115]	[0.173]
<i>Ln. Tot Sales</i>	-0.294	-0.253	-0.336	-0.284	-0.249	-0.25	-0.296	-0.273
	[0.660]	[0.706]	[0.614]	[0.673]	[0.712]	[0.711]	[0.659]	[0.686]
<i>Price Revision</i>	0.830***	0.830***	0.828***	0.810***	0.810***	0.810***	0.806***	0.806***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
<i>Age</i>	0.062	0.063	0.062	0.062	0.076	0.074	0.071	0.073
	[0.217]	[0.211]	[0.223]	[0.218]	[0.139]	[0.150]	[0.168]	[0.154]
<i>Debt to Total Assets</i>	0.367	-0.153	-0.052	-2.293	-1.015	-1.132	-0.965	-2.205
	[0.915]	[0.965]	[0.988]	[0.504]	[0.771]	[0.746]	[0.781]	[0.524]
<i>Cash to Total Assets</i>	14.359**	15.350***	14.666***	18.443***	17.054***	17.310***	16.269***	19.579***
	[0.010]	[0.006]	[0.008]	[0.001]	[0.002]	[0.002]	[0.004]	[0.001]
<i>Ln. No. Shares Issued</i>	-5.199**	-5.083**	-5.212**	-4.489**	-5.122**	-5.148**	-5.519**	-4.699**
	[0.018]	[0.021]	[0.017]	[0.042]	[0.020]	[0.020]	[0.012]	[0.034]
<i>% Secondary Shares</i>	0.031	0.031	0.029	0.031	0.029	0.029	0.037	0.035
	[0.376]	[0.362]	[0.399]	[0.371]	[0.400]	[0.394]	[0.287]	[0.305]
<i>IPO Proceeds to TA</i>	0.232	0.226	0.242	0.212	0.238	0.235	0.263	0.22
	[0.401]	[0.415]	[0.380]	[0.473]	[0.413]	[0.421]	[0.360]	[0.461]
<i>Technology Stock</i>	6.918**	6.901**	6.804**	6.916**	6.957**	7.063**	7.072**	7.154**
	[0.043]	[0.043]	[0.046]	[0.044]	[0.042]	[0.039]	[0.038]	[0.037]
<i>NASDAQ</i>	3.378	3.013	3.495	4.123	3.781	3.565	3.234	3.995
	[0.181]	[0.232]	[0.168]	[0.104]	[0.137]	[0.159]	[0.204]	[0.118]
<i>Venture Backed</i>	0.002	0.015	0.318	0.042	-0.126	-0.11	0.238	0.022
	[1.000]	[0.996]	[0.907]	[0.988]	[0.963]	[0.968]	[0.930]	[0.994]
<i>Lock-up Period (days)</i>	-0.064	-0.063	-0.061	-0.067	-0.061	-0.06	-0.057	-0.064
	[0.178]	[0.185]	[0.201]	[0.165]	[0.200]	[0.209]	[0.238]	[0.185]
<i>Lead Underwriter Rank</i>	-2.138	-2.291	-1.923	-2.188	-1.971	-2.07	-1.92	-2.344
	[0.374]	[0.344]	[0.425]	[0.359]	[0.414]	[0.392]	[0.427]	[0.332]
<i>Co-Managers Rank</i>	-0.718	-0.694	-0.567	-0.957	-0.672	-0.696	-0.576	-0.908

	[0.425]	[0.442]	[0.528]	[0.290]	[0.458]	[0.443]	[0.524]	[0.318]
<i>Constant</i>	123.833**	118.921**	119.730**	119.451**	119.148**	120.073**	122.313**	126.053**
	[0.016]	[0.016]	[0.018]	[0.017]	[0.018]	[0.016]	[0.014]	[0.012]
Underwriter Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.416	0.414	0.416	0.410	0.409	0.408	0.411	0.405
Observations	2,039	2,039	2,039	2,039	2,039	2,039	2,039	2,039

This table presents the OLS regression results for identification of the determinants of IPO underpricing. The sample contains all U.S. IPOs by industrial companies between 1999 and 2020 which meet the data requirements explained in detail in Section 3. *Underpricing* is the percentage difference between the initial offer price and the first-day closing price for the IPO. In Panel A the underwriter–issuer personal connections are proxied by binary variables. In Panel B the underwriter-issuer personal connections are measured by the natural log of one plus the total number of connections, according to the type of connection. Please see description of Table 1 for all definitions of connection-related variables and description of Table 2 for all other control variables. *MBA (MSc, PhD)* measures the fraction of board members that have an MBA (MSc, PhD) qualification. *Other* measures the fraction of board members that have professional qualifications. *Total Qualifications* is the average number of qualifications at undergraduate level and above for all the Directors. *University Rank* measures the average quality of the university where directors earned their most recent degree using the “(QS) Quacquarelli Symonds” World University Rank. *Quoted Boards* measures average number of board seats on public (quoted) companies held by directors of the issuing firm. *Total Boards* measures the total number of board seats held by the directors of the IPO company. *Avg. Manager Age* measures the average age of directors of issuing firms. *P-values* are reported in brackets. *, **, and *** report the statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 8: Robustness Tests – Endogenous Selection of Underwriters

	Panel A: Second Stage Regressions			
	I	II	III	IV
<i>Connections</i>	-13.474*** [0.000]		-13.473*** [0.000]	
<i>Past Connections</i>		-12.089*** [0.000]		-12.090*** [0.000]
<i>Inverse Mills Ratio</i>	-4.249 [0.611]	-2.802 [0.734]	-4.635 [0.579]	-2.453 [0.766]
<i>Ln(1+No. of Conn.)</i>	0.097 [0.966]	0.404 [0.844]	-0.014 [0.995]	0.494 [0.810]
<i>Directors Ipo Firms</i>	-0.481 [0.154]	-0.519 [0.114]	-0.484 [0.151]	-0.519 [0.115]
<i>Directors Lead UW</i>	-0.036 [0.449]	-0.029 [0.556]	-0.037 [0.436]	-0.028 [0.573]
<i>Ln. Tot Assets</i>	2.163* [0.082]	2.015 [0.107]	2.163* [0.082]	2.013 [0.108]
<i>Ln. Tot Sales</i>	-0.52 [0.529]	-0.448 [0.585]	-0.54 [0.515]	-0.429 [0.599]
<i>Price Revision</i>	0.735*** [0.000]	0.736*** [0.000]	0.734*** [0.000]	0.737*** [0.000]
<i>Age</i>	0.045 [0.361]	0.044 [0.371]	0.045 [0.354]	0.043 [0.379]
<i>Debt to Total Assets</i>	-2.598 [0.536]	-2.341 [0.572]	-2.729 [0.516]	-2.23 [0.589]
<i>Cash to Total Assets</i>	15.419** [0.015]	15.504*** [0.009]	15.646** [0.013]	15.318*** [0.010]
<i>Ln. No. Shares Issued</i>	-4.116* [0.053]	-4.046* [0.060]	-4.132* [0.052]	-4.025* [0.061]
<i>% Secondary Shares</i>	0.04 [0.203]	0.038 [0.228]	0.04 [0.200]	0.038 [0.232]
<i>IPO Proceeds to TA</i>	0.278 [0.335]	0.27 [0.350]	0.278 [0.335]	0.27 [0.349]
<i>Technology Stock</i>	9.322*** [0.002]	9.413*** [0.001]	9.314*** [0.002]	9.417*** [0.001]
<i>NASDAQ</i>	-3.008 [0.248]	-2.811 [0.301]	-3.047 [0.241]	-2.758 [0.311]
<i>Venture Backed</i>	9.759 [0.490]	6.897 [0.618]	10.409 [0.462]	6.316 [0.647]
<i>Lock-up Period (days)</i>	-0.054 [0.143]	-0.055 [0.130]	-0.054 [0.146]	-0.055 [0.128]
<i>Lead Underwriter Rank</i>	1.24 [0.469]	1.314 [0.461]	1.203 [0.483]	1.354 [0.447]
<i>Co-Manager Rank</i>	-0.395 [0.645]	-0.317 [0.710]	-0.402 [0.638]	-0.311 [0.716]
<i>Constant</i>	113.221*** [0.003]	90.521** [0.026]	114.246*** [0.003]	89.360** [0.028]
Underwriter Fixed Effects	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Observations	2,351	2,351	2,351	2,351

Dependent Variable	Panel B: First Stage Regressions			
	<i>Connections</i>	<i>Past Connections</i>	<i>Connections</i>	<i>Past Connections</i>
<i>Geographical Distance</i>			-0.000005 [0.811]	0.000004 [0.820]
<i>Ln(1+No. of Conn.)</i>	0.467*** [0.000]	0.418*** [0.000]	0.467*** [0.000]	0.418*** [0.000]
<i>Directors Ipo Firms</i>	0.011 [0.393]	0.001 [0.930]	0.011 [0.387]	0.001 [0.938]
<i>Directors Lead UW</i>	0.004*** [0.007]	0.005*** [0.001]	0.004*** [0.007]	0.005*** [0.001]
<i>Ln. Tot Assets</i>	-0.007 [0.802]	-0.016 [0.550]	-0.007 [0.792]	-0.016 [0.558]
<i>Ln. Tot Sales</i>	0.082*** [0.000]	0.085*** [0.000]	0.082*** [0.000]	0.085*** [0.000]
<i>Price Revision</i>	0.005* [0.065]	0.005* [0.056]	0.005* [0.064]	0.005* [0.057]
<i>Age</i>	-0.003 [0.126]	-0.003* [0.061]	-0.003 [0.125]	-0.003* [0.062]
<i>Debt to Total Assets</i>	0.536*** [0.000]	0.504*** [0.000]	0.535*** [0.000]	0.505*** [0.000]
<i>Cash to Total Assets</i>	-1.009*** [0.000]	-0.901*** [0.000]	-1.009*** [0.000]	-0.901*** [0.000]
<i>Ln. No. Shares Issued</i>	0.069 [0.280]	0.113* [0.077]	0.07 [0.277]	0.113* [0.078]
<i>% Secondary Shares</i>	-0.001 [0.418]	-0.001 [0.327]	-0.001 [0.419]	-0.001 [0.326]
<i>IPO Proceeds to TA</i>	0.002 [0.703]	0.001 [0.868]	0.002 [0.708]	0.001 [0.864]
<i>Technology Stock</i>	0.016 [0.852]	0.001 [0.990]	0.016 [0.852]	0.001 [0.989]
<i>NASDAQ</i>	0.163* [0.079]	0.245*** [0.008]	0.164* [0.078]	0.244*** [0.008]
<i>Venture Backed</i>	0.091 [0.292]	0.123 [0.161]	0.092 [0.287]	0.122 [0.164]
<i>Lock-up Period (days)</i>	-0.002* [0.086]	-0.001 [0.168]	-0.002* [0.085]	-0.001 [0.171]
<i>Lead Underwriter Rank</i>	0.165** [0.036]	0.190*** [0.009]	0.164** [0.037]	0.191*** [0.009]
<i>Co-Manager Rank</i>	0.029 [0.388]	0.028 [0.406]	0.029 [0.388]	0.028 [0.405]
<i>Constant</i>	-7.291*** [0.000]	-7.916*** [0.000]	-7.287*** [0.000]	-7.924*** [0.000]
Underwriter Fixed Effects	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Pseudo R-Square	0.208	0.188	0.208	0.188
Observations	2,351	2,351	2,351	2,351

This table presents results for identification of the determinants of IPO underpricing using a two-stage treatment effect model. Panel A reports the results for the second stage while Panel B reports the results for the first stage. Models I and II have no exclusion restriction in the first stage, while in models III and IV the geographical distance between the firms' and the underwriters' headquarters is used as an exclusion restriction. The sample contains all U.S. IPOs by industrial companies between 1999 and

2020 which meet the data requirements explained in detail in Section 3. *Underpricing* is the percentage difference between the initial offer price and the first-day closing price for the IPO. Please see description of Table 1 for all definitions of connection-related variables and description of Table 2 for all other control variables. The *Inverse Mills Ratio* reported in the second stage is calculated from the predicted values of the first stage probit regressions *P*-values are reported in brackets. *, **, and *** report the statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 9A: Robustness Tests – Endogenous Selection of Venture Capital Backing (Second Stage)

	Panel A: Connections (Dummy Variables)				Panel B: Connections (Continuous Variables)			
	I	II	III	IV	V	VI	VII	VIII
<i>Connections</i>	-16.039*** [0.000]				-6.724*** [0.000]			
<i>Past Connections</i>		-14.877*** [0.000]				-6.908*** [0.000]		
<i>Professional Connections</i>			-11.774*** [0.000]				-3.663*** [0.006]	
<i>Educational Connections</i>			-8.318*** [0.002]				-7.842*** [0.001]	
<i>Issuer CEO Connections</i>				-13.237*** [0.000]				-9.167* [0.092]
<i>UW CEO Connections</i>				-10.817*** [0.000]				-5.513* [0.084]
<i>Inverse Mills Ratio</i>	-0.027 [0.996]	0.129 [0.979]	0.815 [0.871]	0.896 [0.857]	0.499 [0.920]	0.3 [0.951]	0.667 [0.892]	1.116 [0.823]
<i>Ln(1+No. of Conn.)</i>	1.963 [0.213]	1.699 [0.279]	2.089 [0.188]	0.435 [0.777]	1.715 [0.283]	1.622 [0.310]	2.123 [0.188]	0.265 [0.864]
<i>Directors IPO Firm</i>	-0.469 [0.229]	-0.533 [0.174]	-0.5 [0.200]	-0.551 [0.167]	-0.401 [0.308]	-0.376 [0.340]	-0.418 [0.287]	-0.516 [0.198]
<i>Directors Lead UW</i>	-0.033 [0.521]	-0.029 [0.582]	-0.029 [0.574]	-0.051 [0.326]	-0.034 [0.514]	-0.031 [0.551]	-0.025 [0.632]	-0.062 [0.237]
<i>Ln. Tot Assets</i>	1.984 [0.161]	1.945 [0.171]	1.996 [0.160]	1.745 [0.225]	2.303 [0.109]	2.314 [0.107]	2.367 [0.100]	1.978 [0.169]
<i>Ln. Tot Sales</i>	0.008 [0.993]	-0.006 [0.994]	-0.207 [0.805]	-0.312 [0.712]	-0.188 [0.823]	-0.199 [0.813]	-0.327 [0.697]	-0.386 [0.650]
<i>Price Revision</i>	0.797*** [0.000]	0.800*** [0.000]	0.796*** [0.000]	0.767*** [0.000]	0.772*** [0.000]	0.773*** [0.000]	0.766*** [0.000]	0.760*** [0.000]
<i>Age</i>	0.091 [0.335]	0.083 [0.377]	0.084 [0.372]	0.082 [0.389]	0.112 [0.241]	0.108 [0.256]	0.096 [0.315]	0.102 [0.284]
<i>Debt to Total Assets</i>	-1.029 [0.767]	-1.268 [0.716]	-1.264 [0.716]	-3.678 [0.294]	-1.681 [0.632]	-1.593 [0.651]	-1.571 [0.653]	-3.357 [0.343]
<i>Cash to Total Assets</i>	14.943***	15.544***	14.737***	18.818***	16.791***	16.887***	15.769***	20.064***

	[0.007]	[0.005]	[0.007]	[0.001]	[0.002]	[0.002]	[0.004]	[0.000]
<i>Ln. No. Shares Issued</i>	-5.336**	-5.236**	-5.386**	-4.964**	-5.583**	-5.642**	-5.936**	-5.385**
	[0.028]	[0.032]	[0.027]	[0.044]	[0.023]	[0.022]	[0.016]	[0.029]
<i>% Secondary Shares</i>	0.015	0.011	0.012	0.019	0.015	0.015	0.024	0.028
	[0.732]	[0.803]	[0.788]	[0.649]	[0.719]	[0.728]	[0.581]	[0.509]
<i>IPO Proceeds to TA</i>	0.299	0.294	0.312	0.263	0.303	0.301	0.334	0.274
	[0.372]	[0.381]	[0.350]	[0.451]	[0.378]	[0.382]	[0.329]	[0.437]
<i>Technology Stock</i>	12.276***	12.219***	12.266***	12.125***	12.526***	12.556***	12.661***	12.505***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
<i>NASDAQ</i>	-4.786	-4.57	-4.882	-5.738	-5.391	-5.22	-4.999	-5.522*
	[0.140]	[0.159]	[0.134]	[0.280]	[0.100]	[0.111]	[0.128]	[0.094]
<i>Venture Backed</i>	0.123	-0.192	-1.125	-1.635	-0.641	-0.361	-0.621	-1.985
	[0.988]	[0.982]	[0.895]	[0.847]	[0.939]	[0.966]	[0.941]	[0.815]
<i>Lock-up Period (days)</i>	-0.04	-0.039	-0.037	-0.038	-0.034	-0.034	-0.031	-0.034
	[0.324]	[0.331]	[0.359]	[0.350]	[0.398]	[0.397]	[0.446]	[0.399]
<i>Lead Underwriter Rank</i>	2.164	2.106	2.152	1.564	1.934	1.973	1.929	1.428
	[0.188]	[0.204]	[0.190]	[0.340]	[0.240]	[0.235]	[0.241]	[0.390]
<i>Co-Managers Rank</i>	-0.288	-0.311	-0.135	-0.434	-0.159	-0.214	-0.031	-0.409
	[0.767]	[0.749]	[0.889]	[0.656]	[0.870]	[0.826]	[0.974]	[0.675]
<i>Constant</i>	146.567***	147.896***	142.392***	156.873***	141.500***	142.330***	139.815***	151.742***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Underwriter Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	2,351	2,351	2,351	2,351	2,351	2,351	2,351	2,351

Table 9B: Robustness Tests – Endogenous Selection of Venture Capital Backing (First Stage)

Dependent Variable	Panel A: Connections (Dummy Variables)				Panel B: Connections (Continuous Variables)			
	<i>Venture Backed</i>	<i>Venture Backed</i>	<i>Venture Backed</i>	<i>Venture Backed</i>	<i>Venture Backed</i>	<i>Venture Backed</i>	<i>Venture Backed</i>	<i>Venture Backed</i>
<i>Book value of equity per share</i>	-0.003*** [0.003]	-0.003*** [0.003]	-0.003*** [0.003]	-0.003*** [0.003]	-0.003*** [0.003]	-0.003*** [0.003]	-0.003*** [0.003]	-0.003*** [0.003]
<i>Sales per share</i>	-5.778*** [0.000]	-5.778*** [0.000]	-5.778*** [0.000]	-5.778*** [0.000]	-5.778*** [0.000]	-5.778*** [0.000]	-5.778*** [0.000]	-5.778*** [0.000]
<i>Constant</i>	-0.895 [0.157]	-0.895 [0.157]	-0.895 [0.157]	-0.895 [0.157]	-0.895 [0.157]	-0.895 [0.157]	-0.895 [0.157]	-0.895 [0.157]
Industry Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Pseudo R-Square	0.183	0.183	0.183	0.183	0.183	0.183	0.183	0.183
Observations	2,351	2,351	2,351	2,351	2,351	2,351	2,351	2,351

This table presents results for identification of the determinants of IPO underpricing using a two-stage treatment effect model to allow for endogenous presence of Venture Capital backing. Table 9A reports Second Stage results while Table 9B reports First Stage results. Here, we largely follow Morsfield and Tan (2006) and use four digit SIC code dummy variables, year dummies, book value of equity per share, and sales per share as exclusion restrictions in the first stage. The sample contains all U.S. IPOs by industrial companies between 1999 and 2020 which meet the data requirements explained in detail in Section 3. *Underpricing* is the percentage difference between the initial offer price and the first-day closing price for the IPO. Please see description of Table 1 for all definitions of connection-related variables and description of Table 2 for all other control variables. The *Inverse Mills Ratio* in the first stage is calculated from the predicted values of the first stage probit regressions *P*-values are reported in brackets. *, **, and *** report the statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 10A: Propensity Score Matching Results

	Matched Firms	Underpricing Mean	Diff. in Means (Connected-Non- Connected)	Diff. (p-value)	P-Score (p-value)
<i>Panel A: All Connections</i>					
<i>Connected</i>	569	19.302	-14.055	0.000	0.677
<i>Non-Connected</i>	569	33.357			
<i>Panel B: Past Connections</i>					
<i>Connected</i>	560	18.917	-12.089	0.000	0.680
<i>Non-Connected</i>	560	31.007			
<i>Panel C: Professional Connections</i>					
<i>Connected</i>	557	17.483	-11.371	0.000	0.677
<i>Non-Connected</i>	557	28.854			
<i>Panel D: Educational Connections</i>					
<i>Connected</i>	444	18.540	-9.827	0.001	0.910
<i>Non-Connected</i>	444	28.367			

In this table, for each set of companies whose directors are connected to directors from their IPO underwriters (*Connected*), we identify a control sample of firms that are run by directors that are not connected to those of their IPO underwriters (*Non-Connected*). The sample contains all U.S. IPOs by industrial companies between 1999 and 2020 which meet the data requirements explained in detail in Section 3. We use the propensity score matching procedure estimated with all firm and issue characteristics included in our regression analyses, as well as year, industry and underwriter dummies. We require that the difference between the propensity score of the firm which is connected to its underwriter and its matching peer does not exceed 0.1% in absolute value. We then compare the average underpricing between connected and non-connected companies. *Underpricing* is the percentage difference between the initial offer price and the first-day closing price for the IPO. We also report the difference in underpricing means across the two groups, as well as the *p*-value of the significance of the difference and the *p*-value of the Propensity Score. Panel A presents the results where the observations are grouped based on the existence of connections between the issuer and underwriter (*All Connections*); while Panel B shows tests for past connections (*Past Connections*) and Panels C and D present the results for professional (*Professional Connections*) and educational (*Educational Connections*) connections respectively. Panel E reports tests of differences in means for all control variables. Please see description of Tables 1 and 2 for all definitions of variables.

Table 10 B: Propensity Score Matching Results: Test of quality of matching

	Matched Firms	Mean Connected	Mean Non- Connected	P- Value
<i>Ln(1+No. of Conn.)</i>	569	8.267	8.345	0.422
<i>Directors Ipo Firms</i>	569	7.557	7.702	0.525
<i>Directors Lead UW</i>	569	30.504	30.326	0.899
<i>Ln. Tot Assets</i>	569	5.385	5.425	0.705
<i>Ln. Tot Sales</i>	569	-1.535	-1.576	0.759
<i>Price Revision</i>	569	-0.010	-0.014	0.657
<i>Age</i>	569	15.554	15.826	0.829
<i>Debt to Total Assets</i>	569	0.260	0.253	0.715
<i>Cash to Total Assets</i>	569	0.406	0.414	0.672
<i>Ln. No. Shares Issued</i>	569	15.907	15.900	0.869
<i>% Secondary Shares</i>	569	10.812	10.169	0.636
<i>IPO Proceeds to TA</i>	569	1.702	1.575	0.825
<i>Technology Stock</i>	569	0.360	0.344	0.577
<i>NASDAQ</i>	569	0.710	0.724	0.599
<i>Venture Backed</i>	569	0.615	0.627	0.669
<i>Lock-up Period (days)</i>	569	165.330	165.346	0.996
<i>Lead Underwriter Rank</i>	569	8.156	8.109	0.524
<i>Co-Managers Rank</i>	569	7.731	7.742	0.880

Table 11: OLS Regressions on matched sample

	<i>Panel A: Connections [Dummy Variables]</i>				<i>Panel B: Connections [Continuous Variables]</i>			
	I	II	III	IV	V	VI	VII	VIII
<i>Connections</i>	-14.018*** [0.000]				-7.427*** [0.000]			
<i>Past Connections</i>		-13.412*** [0.000]				-6.947*** [0.000]		
<i>Professional Connections</i>			-9.770*** [0.000]				-4.085*** [0.008]	
<i>Educational Connections</i>			-8.242** [0.013]				-9.074*** [0.005]	
<i>Issuer CEO Connections</i>				-16.142*** [0.000]				-15.207** [0.048]
<i>UW CEO Connections</i>				-10.973*** [0.001]				-9.137* [0.091]
<i>Ln(1+No. of Conn.)</i>	1.788 [0.409]	1.963 [0.367]	2.192 [0.313]	1.926 [0.388]	2.72 [0.211]	2.795 [0.201]	3.112 [0.152]	2.27 [0.309]
<i>Board Size Ipo Firms</i>	0.177 [0.754]	0.13 [0.819]	0.151 [0.788]	0.215 [0.710]	0.161 [0.777]	0.204 [0.723]	0.206 [0.719]	0.279 [0.631]
<i>Board Size Lead UW</i>	-0.089 [0.124]	-0.084 [0.146]	-0.091 [0.119]	-0.088 [0.125]	-0.096* [0.097]	-0.094 [0.105]	-0.096* [0.099]	-0.097* [0.096]
<i>Ln. Tot Assets</i>	0.474 [0.715]	0.505 [0.700]	0.642 [0.621]	0.258 [0.845]	0.803 [0.534]	0.788 [0.545]	0.839 [0.515]	0.545 [0.682]
<i>Ln. Tot Sales</i>	-1.193 [0.193]	-1.176 [0.201]	-1.319 [0.150]	-1.308 [0.155]	-1.163 [0.206]	-1.201 [0.194]	-1.253 [0.171]	-1.223 [0.190]
<i>Price Revision</i>	0.680*** [0.000]	0.683*** [0.000]	0.680*** [0.000]	0.681*** [0.000]	0.657*** [0.000]	0.662*** [0.000]	0.654*** [0.000]	0.667*** [0.000]
<i>Age</i>	0.093 [0.262]	0.089 [0.286]	0.095 [0.254]	0.108 [0.199]	0.113 [0.184]	0.11 [0.194]	0.099 [0.238]	0.111 [0.200]
<i>Debt to Total Assets</i>	-1.883 [0.664]	-1.763 [0.685]	-1.896 [0.662]	-2.57 [0.558]	-1.514 [0.729]	-1.248 [0.776]	-1.304 [0.764]	-2.172 [0.625]
<i>Cash to Total Assets</i>	12.212 [0.112]	12.188 [0.113]	12.005 [0.117]	12.788* [0.099]	11.942 [0.119]	11.979 [0.119]	11.166 [0.140]	12.55 [0.110]
<i>Ln. No. Shares Issued</i>	-5.579* [0.000]	-5.320* [0.000]	-5.812** [0.000]	-4.997* [0.000]	-5.475* [0.000]	-5.497* [0.000]	-5.808** [0.000]	-5.134* [0.000]

<i>% Secondary Shares</i>	[0.051] 0.05	[0.062] 0.049	[0.041] 0.053	[0.078] 0.059	[0.057] 0.034	[0.056] 0.038	[0.044] 0.045	[0.074] 0.057
<i>IPO Proceeds to TA</i>	[0.247] 0.107	[0.263] 0.106	[0.214] 0.126	[0.167] 0.087	[0.441] 0.12	[0.382] 0.114	[0.306] 0.156	[0.186] 0.104
<i>Technology Stock</i>	[0.565] 11.397**	[0.573] 11.379**	[0.496] 11.374**	[0.656] 10.474**	[0.531] 10.833**	[0.556] 10.830**	[0.405] 11.184**	[0.605] 10.873**
<i>NASDAQ</i>	[0.014] -3.572	[0.014] -3.065	[0.014] -3.565	[0.023] -3.752	[0.017] -4.764	[0.018] -4.361	[0.014] -4.418	[0.018] -3.884
<i>Venture Backed</i>	[0.315] -4.101	[0.386] -4.231	[0.318] -3.952	[0.291] -3.653	[0.194] -4.106	[0.232] -4.094	[0.226] -3.903	[0.285] -3.641
<i>Lock-up Period [days]</i>	[0.279] 0.014	[0.266] 0.015	[0.298] 0.016	[0.344] 0.017	[0.279] 0.018	[0.282] 0.02	[0.302] 0.021	[0.343] 0.014
<i>Lead Underwriter Rank</i>	[0.829] 1.865	[0.816] 1.992	[0.809] 2.167	[0.796] 1.488	[0.789] 2.091	[0.762] 2.302	[0.747] 2.319	[0.839] 1.737
<i>Co-Managers Rank</i>	[0.527] -0.374	[0.508] -0.399	[0.468] -0.221	[0.593] -0.343	[0.471] -0.183	[0.438] -0.262	[0.437] -0.217	[0.540] -0.37
<i>Constant</i>	[0.758] 132.778**	[0.743] 125.482**	[0.856] 126.768**	[0.779] 116.611**	[0.882] 117.173**	[0.832] 114.465**	[0.860] 117.887**	[0.763] 114.842**
	[0.013]	[0.019]	[0.017]	[0.025]	[0.026]	[0.031]	[0.026]	[0.030]
Underwriter Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.32	0.318	0.32	0.316	0.319	0.316	0.322	0.307
Observations	1,138	1,138	1,138	1,138	1,138	1,138	1,138	1,138

This table presents the OLS regression results for identification of the determinants of IPO underpricing. The sample contains only companies that are matched according to the characteristics of the directors as described in Table 7. Please see description of Table 1 for all definitions of connection-related variables and description of Table 2 for all other control variables. *P*-values are reported in brackets. *, **, and *** report the statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 12: OLS Regressions on the Role of Asymmetric Information

	I	II	III	IV	V	VI	VII	VIII
	Small	Large	Young	Mature	Tech	No-Tech	NASDAQ	NYSE
<i>Connections</i>	-21.451***	-8.344***	-19.577***	-7.713***	-21.156***	-8.603***	-16.949***	-1.704**
	[0.000]	[0.001]	[0.000]	[0.004]	[0.000]	[0.000]	[0.000]	[0.029]
<i>Ln(1+No. of Conn.)</i>	2.498	0.069	2.057	0.967	2.603	2.081*	1.803	0.683
	[0.263]	[0.955]	[0.433]	[0.468]	[0.400]	[0.057]	[0.286]	[0.677]
<i>Directors IPO Firm</i>	-0.788	0.016	-0.947	-0.371	-0.676	-0.531	-0.644	-0.286
	[0.159]	[0.967]	[0.111]	[0.361]	[0.349]	[0.123]	[0.135]	[0.675]
<i>Directors Lead UW</i>	-0.145	-0.031	-0.008	0.037	-0.049	0.029	-0.002	-0.02
	[0.159]	[0.536]	[0.922]	[0.395]	[0.639]	[0.516]	[0.979]	[0.652]
<i>Ln. Tot Assets</i>	3.498	6.474**	5.791**	1.446	10.021***	1.551*	3.904**	-0.326
	[0.206]	[0.028]	[0.013]	[0.160]	[0.004]	[0.076]	[0.027]	[0.801]
<i>Ln. Tot Sales</i>	-0.37	0.038	0.202	-1.184*	-0.209	-1.181**	-0.128	-1.364
	[0.769]	[0.950]	[0.864]	[0.086]	[0.914]	[0.047]	[0.886]	[0.112]
<i>Price Revision</i>	0.774***	0.697***	0.672***	0.793***	0.783***	0.728***	0.840***	0.634***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
<i>Age</i>	-0.195	0.038	0.485	0.014	-0.046	0.01	0.009	0.021
	[0.242]	[0.459]	[0.616]	[0.782]	[0.752]	[0.832]	[0.880]	[0.714]
<i>Debt to Total Assets</i>	-3.006	2.523	-3.088	-4.147	8.603	-3.672	-8.887**	3.686
	[0.483]	[0.584]	[0.602]	[0.188]	[0.298]	[0.109]	[0.028]	[0.338]
<i>Cash to Total Assets</i>	6.864	15.113**	15.473**	8.365	37.725***	-0.692	12.386**	2.571
	[0.335]	[0.024]	[0.039]	[0.181]	[0.000]	[0.873]	[0.029]	[0.776]
<i>Ln. No. Shares Issued</i>	0.092	-12.032***	-3.571	-5.563**	-14.543***	-3.282	-5.418*	-7.442**
	[0.985]	[0.001]	[0.395]	[0.024]	[0.004]	[0.118]	[0.078]	[0.030]
<i>% Secondary Shares</i>	0.044	0.016	0.008	0.002	0.052	0.034	0.058	0.043
	[0.589]	[0.661]	[0.926]	[0.948]	[0.575]	[0.290]	[0.241]	[0.243]
<i>IPO Proceeds to TA</i>	0.341	17.329***	2.396**	0.108	6.127***	0.052	1.529**	-0.045
	[0.236]	[0.002]	[0.042]	[0.449]	[0.001]	[0.566]	[0.033]	[0.319]
<i>Technology Stock</i>	15.655***	3.972	20.899***	2.941			13.404***	-1.964
	[0.001]	[0.272]	[0.000]	[0.387]			[0.000]	[0.673]
<i>NASDAQ</i>	0.89	-2.083	4.369	-5.728**	-2.449	-1.185		
	[0.849]	[0.494]	[0.368]	[0.048]	[0.617]	[0.688]		
<i>Venture Backed</i>	-2.503	3.794	2.205	0.939	-0.315	2.2	1.599	1.266

	[0.549]	[0.200]	[0.634]	[0.761]	[0.954]	[0.411]	[0.617]	[0.723]
<i>Lock-up Period (days)</i>	-0.066	-0.052	-0.077	-0.017	-0.096	-0.021	-0.039	-0.152**
	[0.159]	[0.258]	[0.176]	[0.677]	[0.129]	[0.606]	[0.310]	[0.036]
<i>Lead Underwriter Rank</i>	1.424	1.072	1.542	-0.21	0.765	0.883	1.321	7.563**
	[0.439]	[0.793]	[0.511]	[0.928]	[0.833]	[0.550]	[0.444]	[0.031]
<i>Co-Managers Rank</i>	-0.372	-1.261	-0.203	-0.354	-2.244	-0.211	-0.485	0.854
	[0.756]	[0.351]	[0.891]	[0.732]	[0.317]	[0.811]	[0.641]	[0.557]
<i>Constant</i>	-23.911	186.097***	49.951	104.384**	171.781***	54.39	63.207	168.085***
	[0.728]	[0.000]	[0.390]	[0.024]	[0.003]	[0.177]	[0.183]	[0.007]
Underwriter Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Stability of Coeff. (P-Value)	[0.002]		[0.000]		[0.009]		[0.000]	
R-squared	0.434	0.403	0.438	0.430	0.454	0.431	0.401	0.486
Observations	1,175	1,176	1,121	1,230	861	1,490	1,764	587

	IX	X	XI	XII	XIII	XIV
	Low Connections	High Connections	No Lock-up	Long Lock-up	No Bank	Bank
<i>Connections</i>	-19.605***	-7.061**	-21.851**	-11.316***	-18.661***	-3.48*
	[0.000]	[0.010]	[0.043]	[0.000]	[0.000]	[0.053]
<i>Ln(1+No. of Conn.)</i>	3.908*	2.656	10.825	0.63	1.769	-2.026
	[0.053]	[0.337]	[0.189]	[0.599]	[0.277]	[0.341]
<i>Directors IPO Firm</i>	-0.658	-0.491	-1.994	-0.132	-0.464	-0.516
	[0.272]	[0.167]	[0.286]	[0.678]	[0.223]	[0.500]
<i>Directors Lead UW</i>	-0.122	0.046	0.539	-0.054	-0.08	-0.083
	[0.116]	[0.378]	[0.459]	[0.200]	[0.173]	[0.265]
<i>Ln. Tot Assets</i>	1.024	4.026***	29.169*	2.198*	1.265	5.623**
	[0.672]	[0.007]	[0.058]	[0.072]	[0.376]	[0.028]
<i>Ln. Tot Sales</i>	-0.180	-0.349	-5.999	-0.463	-0.509	-0.566
	[0.865]	[0.683]	[0.219]	[0.431]	[0.505]	[0.565]
<i>Price Revision</i>	0.973***	0.692***	2.456***	0.701***	0.799***	0.735***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
<i>Age</i>	0.056	0.015	-0.564	0.042	0.103	-0.091
	[0.297]	[0.858]	[0.237]	[0.366]	[0.162]	[0.146]
<i>Debt to Total Assets</i>	-5.007	1.613	2.19	-0.85	-2.947	-4.368
	[0.224]	[0.744]	[0.886]	[0.769]	[0.439]	[0.362]
<i>Cash to Total Assets</i>	7.395	12.323**	7.326	10.803**	11.290**	-23.000*
	[0.379]	[0.031]	[0.761]	[0.029]	[0.049]	[0.076]
<i>Ln. No. Shares Issued</i>	-3.465	-7.606***	-37.482*	-4.279**	-2.909	-6.933
	[0.370]	[0.009]	[0.097]	[0.043]	[0.257]	[0.114]
<i>% Secondary Shares</i>	0.013	0.003	0.4	0.038	0.045	-0.002
	[0.799]	[0.961]	[0.391]	[0.218]	[0.250]	[0.962]
<i>IPO Proceeds to TA</i>	0.213	1.308	12.117*	0.241	0.226	4.581***
	[0.428]	[0.111]	[0.095]	[0.329]	[0.374]	[0.000]
<i>Technology Stock</i>	14.169***	3.99	32.238**	9.978***	10.231***	8.439
	[0.000]	[0.332]	[0.017]	[0.000]	[0.003]	[0.167]
<i>NASDAQ</i>	-3.037	-3.174	-27.712	-2.55	-2.731	7.109
	[0.454]	[0.332]	[0.333]	[0.304]	[0.401]	[0.211]

<i>Venture Backed</i>	0.478 [0.904]	2.603 [0.400]	20.637* [0.095]	0.248 [0.924]	0.687 [0.825]	-2.866 [0.590]
<i>Lock-up Period (days)</i>	-0.023 [0.584]	-0.123** [0.040]		-0.027 [0.624]	-0.054 [0.176]	0.083 [0.155]
<i>Lead Underwriter Rank</i>	3.764** [0.049]	2.061 [0.656]	20.21 [0.230]	0.726 [0.601]	1.815 [0.265]	1.41 [0.841]
<i>Co-Managers Rank</i>	-0.347 [0.802]	-0.213 [0.862]	-1.311 [0.819]	-0.591 [0.464]	-0.242 [0.804]	-4.449 [0.277]
<i>Constant</i>	59.772 [0.269]	50.033 [0.391]	269.071 [0.453]	80.385** [0.034]	42.746 [0.335]	106.981 [0.296]
Underwriter Fixed Effects	YES	YES	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES
Stability of Coeff. (P-Value)	[0.002]		[0.406]		[0.000]	
R-squared	0.427	0.443	0.502	0.401	0.391	0.685
Observations	1175	1176	173	2178	1814	183

Table 13 Propensity Score Matching Results on the role of Homophily

	Matched Firms	Underpricing Mean	Diff. in Means (Connected-Non- Connected)	Diff. (p-value)	P-Score (p- value)
<i>Panel A: All Connections</i>					
<i>Connected</i>	218	22.815	-14.534	0.003	0.731
<i>Non-Connected</i>	218	37.348			
<i>Panel B: Past Connections</i>					
<i>Connected</i>	210	21.648	-12.772	0.001	0.670
<i>Non-Connected</i>	210	34.420			
<i>Panel C: Professional Connections</i>					
<i>Connected</i>	201	25.223	-13.380	0.010	0.744
<i>Non-Connected</i>	201	38.602			
<i>Panel D: Educational Connections</i>					
<i>Connected</i>	157	19.702	-18.862	0.001	0.896
<i>Non-Connected</i>	157	38.564			

In this table, for each set of companies whose directors are connected to directors from their IPO underwriters (*Connected*), we identify a control sample of firms that are run by directors that are not connected to those of their IPO underwriters (*Non-Connected*). The sample contains all U.S. IPOs by industrial companies between 1999 and 2020 which meet the data requirements explained in detail in Section 3. We use the propensity score matching procedure. In the first stage, the likelihood of being connected is a function of all managerial characteristics included in our regression analyses reported in Table 7 (MBA, MSc, PhD, Other, Total Qualifications, University Rank, Quoted Boards, Total Boards, Avg. Manager Age), as well as year and underwriter dummies. We require that the difference between the propensity score of the firm which is connected to its underwriter and its matching peer does not exceed 0.1% in absolute value. Moreover, the matching is performed within each SIC4 industry. We then compare the average underpricing between connected and non-connected companies. *Underpricing* is the percentage difference between the initial offer price and the first-day closing price for the IPO. We also report the difference in underpricing means across the two groups, as well as the *p*-value of the significance of the difference and the *p*-value of the Propensity Score. Panel A presents the results where the observations are grouped based on the existence of connections between the issuer and underwriter (*All Connections*); while Panel B shows tests for past connections (*Past Connections*) and Panels C and D present the results for professional (*Professional Connections*) and educational (*Educational Connections*) connections respectively.