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Is money really left on the table? The role of regular investors in IPO pricing

Manuela Geranio[1] | **Camilla Mazzoli**[2] | **Fabrizio Palmucci**[3]

[1]Department of Management, University of Bergamo, Bergamo, Italy

[2]Dipartimento di Management, Università Politecnica delle Marche, Ancona, Italy

[3]Department of Management, University of Bologna, Bologna, 40126, Italy

Correspondence
Fabrizio Palmucci, University of Bologna, Via Capo di Lucca, 34, Bologna, BO40126, Italy.
Email: f.palmucci@unibo.it

Abstract

We study how ongoing relationships between lead underwriters and institutional investors affect initial public offering (IPO) pricing. By introducing a new approach, we find that stronger relationships reduce the partial adjustment of the offer price, leaving 'excess underpricing' that favors regular investors, especially in hot IPOs, while generating an agency cost for issuers. At the same time, stronger relationships lead to higher offer prices, since they reduce information asymmetries and uncertainty in the primary market. This 'excess price adjustment' creates value for issuers. Taken together, these two apparently contradictory results reveal a win-win outcome for issuers and regular investors.

KEYWORDS

initial public offerings, information asymmetries, regular investors, repeated interactions, underpricing

JEL CLASSIFICATION

G23, G24, G31

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1 | INTRODUCTION

Underwriters are the initial public offering (IPO) players ultimately responsible for the pricing and allocation of shares in the bookbuilding method. Ideally, they should fairly price and allocate the shares in a way that serves the interests of both the issuing firms and investors.

In the last decade, regulators and financial authorities have taken up concerns about underwriters' unfair behavior in IPOs: in particular, the growing concentration in the investment banking and mutual fund industries threatens to produce an exclusive club that favors its own interests at the expense of both investors outside of the club and issuers.[1] Indeed, the underpricing and opacity of traditional IPO procedures foster firms' interests in alternatives to traditional bookbuilding, particularly direct listings and special purpose acquisition vehicles (SPACs), which have gained a non-negligible market share (SPACs represented around 50% of the US IPO market in 2020, as reported by Gahng et al., 2021).

However, bookbuilding remains the predominant method of going public around the world and will probably retain its supremacy in the near future. On the one hand, direct listings are less expensive but only viable for large and well-known firms that need less support from underwriters; on the other hand, SPACs are eventually an even more expensive way of going public than a traditional IPO (Gahng et al., 2021).

In addition, opacity and underpricing might be just part of the story: issuers could benefit from staying with more traditional, bookbuilt IPOs more than one might expect. In this paper, we show that underwriter–investor relationships create a win-win outcome for both issuers and investors.

The academic literature has studied bookbuilt IPOs with regular investors from two perspectives: information production, supported by bookbuilding theory, and agency-based opportunistic behavior. These two streams of literature have debated for years to investigate on the overall effects of the underwriter-investors relationships.

The bookbuilding literature stems largely from the seminal contribution of Benveniste and Spindt (1989, henceforth BS), who theorized that regular investors are rewarded for providing truthful information with larger allocations in the current IPO, as well as priority in the allocation of future underpriced IPOs. BS provided a rationale (Theorem 1) for the partial adjustment—introduced by Ibbotson et al. (1988) and empirically demonstrated by Hanley (1993)—of the offer price based on the information collected by the bookrunner, which gives rise to underpricing for investors. At the same time, when regular investors are involved in an IPO, BS expected such underpricing to be smaller, to the benefit of the issuer (Theorem 2). While the existence of a partial adjustment has been subject to empirical investigation, the literature has not directly tested BS's Theorem 2 (i.e., how the partial adjustment is related to the presence of regular investors).

[1]In particular, US Financial Industry Regulatory Authority (FINRA) Rule 5131—approved by the U.S. Securities and Exchange Commission (SEC) in 2010—prohibits quid pro quo in the allocation of shares in an IPO. More recently, European and UK regulators have also compelled investment banks to implement disclosure policies, to address conflicts of interest in IPO markets: the Markets in Financial Instruments Directive II regulation in January 2018 introduced by the European Union requires bookrunners to keep a written record to justify the rationale adopted in the allocation policy of an IPO offer. Similarly, in 2016, the UK Financial Conduct Authority revealed the potential for conflicts of interest in the allocation of shares in IPOs and declared that underwriters should manage these potential conflicts of interest appropriately, including the implementation of allocation policies.

This paper adds to the literature by demonstrating the existence of a win–win outcome for issuers and regular investors and by directly measuring and quantifying the partial adjustment as related to established underwriter–investor relationships. More specifically, we test whether and how the strength of such relationships leads to variation of the partial adjustment: all else being equal, a larger partial adjustment would result in lower underpricing (benefiting the issuer), as predicted by BS, while a lesser partial adjustment would result in 'excess underpricing'[2] (favoring regular investors, as first suggested by Reuter, 2006). This last result, if confirmed, would contribute to the agency-based literature, which has highlighted the opportunistic behaviors that underwriters adopt in terms of preferential allocation to regular investors, either in exchange for analyst coverage (Degeorge et al., 2007) or in a quid pro quo for brokerage commissions (Fjesme, 2019; Jenkinson & Jones, 2009; Reuter, 2006). Different from this literature, which is mainly based on IPO allocations, our intent is to add evidence on the effects that repeated interactions have on IPO pricing. In particular, we study how underwriter–investor relationships affect the costs that issuers sustain in terms of IPO pricing.

To the best of our knowledge, only Binay et al. (2007) have studied the pricing issue; however, given their methodology, they found that institutional investors' propensity to participate repeatedly in IPOs led by the same underwriter is positively related to the underpricing level. The authors' evidence is not enough to conclude that any agency cost is dumped on the issuer. Moreover, we find that their results are likely driven by between variation and are, then, not robust to a time-variant specification of the model. Deeper investigation of the partial adjustment mechanism is needed to draw any conclusion about the impact of regular investors on the costs borne by issuers. This is precisely the contribution of our paper.

Based on a sample of 2552 US IPOs between 1997 and 2016, our methodology allows us to provide clear evidence that stronger relationships between underwriters and funds are associated with a smaller partial adjustment, which results in excess underpricing that suggests an agency cost paid to regular investors to the detriment of issuers. This result contradicts BS's Theorem 2, in that the underpricing is larger (instead of smaller) than expected in the presence of regular investors. We also document that such excess underpricing is more likely in hot[3] IPOs than in cold ones. We also find evidence that stronger relationships have a positive effect on the offer price (an 'excess price adjustment' consistent with BS Theorem 1 and related bookbuilding theory), favoring issuers.

We conclude that the agency-based opportunistic behaviors and information production supported by bookbuilding theory are not mutually exclusive, as previously argued by Jenkinson et al. (2018). Offering a deeper and new perspective to the literature, we demonstrate the coexistence of excess underpricing and excess price adjustment, which suggests that issuers and regular investors share the benefits of stronger relationships. More specifically, we maintain that this sort of win-win outcome for issuers and regular investors is the result of the value creation that originates from regular investors providing better information and thereby reducing uncertainty in IPO pricing (Bajo et al., 2016; Bhattacharya et al., 2020; Chuluun, 2015). Our findings are robust to different specifications of the relationship measures.

We also propose a quantification of the aforementioned effects: the informative function played by relationships in the primary market is responsible for an excess price adjustment (i.e., an increase in the price adjustment) of 2.62% on average; at the same time, we find evidence

[2]In excess with respect to the expected underpricing, given the level of price adjustment. The latter is defined here as the percentage difference between the offer price and the midpoint of the initial filing price range.
[3]We define an IPO as hot if the underpricing is higher than the median underpricing, and as cold otherwise.

that relationships lead to an average excess underpricing of 4.01%.[4] Such excess underpricing is greater in hot IPOs, but still positive in cold IPOs (+6.10% and +1.99%, respectively). This result suggests that, to avoid market failure similar to the winner's curse (Rock, 1986), the underwriter must offer, on average, positive excess underpricing to regular investors, even in cold IPOs.

We consider the possibility of an endogeneity issue, where the causality is reversed so that the underwriter calls regular investors only when managing a hot IPO. As for the partial adjustment analysis, endogeneity is not an issue, since we focus on the relation between price adjustment and underpricing rather than on their levels. However, endogeneity could affect our results regarding the positive effect of relationships on the information production process and, by extension, the value created that benefits the issuers. We discard this interpretation, since the excess price adjustment that we quantify is similar in cold and hot IPOs (2.47% vs. 2.78%, respectively); we also show that the results are robust to additional primary market measures that are less affected by endogeneity.

The remainder of the paper is organized as follows. In Section 2, we review the literature on the effects of repeated interactions on IPOs. In Section 3, we present our models and hypotheses. Section 4 reports the data and methodology adopted in the empirical analyses, while Section 5 presents a discussion of our key findings. In Section 6, we discuss the role of the issuer, while, in Section 7, we explore alternative models and robustness checks. Section 8 offers our final conclusions.

2 | RELATED LITERATURE AND CONTRIBUTION

The repetitive nature of the relationships between IPO underwriters and institutional investors has raised doubts about the potential for conflicts of interest. The relationships between underwriters and investors can facilitate greater information production in IPOs, but it can also lead to underwriters' opportunistic behaviors in favor of their regular investors, to the detriment of the issuing companies and non-regular investors. The room for opportunistic behavior originates from the underwriters' complete discretion in allocations and pricing choices in bookbuilt IPOs. Nonetheless, bookbuilding is still by far the most adopted practice in the United States and worldwide (Derrien & Womack, 2003; Lowry et al., 2017; Sherman, 2005). International evidence shows that bookbuilding IPOs typically experience less underpricing than fixed-price offerings (Ljungqvist & Wilhelm, 2002; Loughran et al., 1994; Ritter, 1998), suggesting that bookbuilding allows for more effective production of information about the true value of stocks and, by extension, more accurate pricing. However, compared to auction IPOs, the initial returns of bookbuilt IPOs are significantly higher (Bonini & Voloshyna, 2013), especially in hot markets (Derrien & Womack, 2003; Kaneko & Pettway, 2003). One explanation for why the bookbuilding method is preferable to auctions is that it circumvents flippers and involves long-term investors (Kutsuna & Smith, 2003; Neupane et al., 2017).

Bookbuilding theory (BS; Benveniste & Wilhelm, 1990; Sherman, 2000; Spatt & Srivastava, 1991) predicted that underwriters involve regular informed investors when building the book to improve the information production process, leading to more efficient pricing of the IPO and

[4]All the aforementioned outcomes are robust to different relationship measures and different time frames in which the relationships were analyzed.

maximizing the proceeds in the interests of the issuing firm (see also Bajo et al., 2016; Chuluun, 2015). What bookbuilding theory implies is that the underpricing and, by extension, the money left on the table by the issuers as a reward for investors who provide truthful information, are reduced when underwriters develop regular relationships with investors. Indeed, in this case, investors are rewarded with priority allocations in the current IPO and future underpriced IPOs and can then accept lower current underpricing (Cornelli & Goldreich, 2001).

Another stream of literature has focused on how underwriters' opportunistic behaviors benefit regular investors. These agency-based contributions (Loughran & Ritter, 2002; Ritter & Welch, 2002) have maintained that lead underwriters could favor regular investors with preferential allocations of highly underpriced shares in a quid pro quo exchange for other business lines, such as commission revenues from aftermarket trading (Fjesme, 2019; Goldstein et al., 2011; Jenkinson & Jones, 2009; Jenkinson et al., 2018; Nimalendran et al., 2007; Reuter, 2006) or analyst coverage (Degeorge et al., 2007). Nevertheless, scholars have yet to produce direct evidence that such opportunistic behaviors also affect pricing and ultimately represent a cost to the issuer.

Gondat-Larralde and James (2008) argued that underwriters underprice each offering to the extent necessary to make participation in all IPOs managed by the same bank the most profitable choice for regular investors, but the authors did not provide direct evidence or quantification of the agency cost borne by the issuers. Binay et al. (2007) found institutional investors' propensity to participate in an IPO based on their involvement in past IPOs led by the same underwriter is positively related to the level of underpricing (and only for the 1999–2000 subsample), but this result is still not enough to conclude that any agency cost is dumped on the issuer. As we will discuss in the methodology, to draw any conclusion about the costs that issuers might sustain, we must first evaluate the impact of the underwriter–investor relationships on the underpricing within the partial adjustment framework. In short, the literature has found no conclusive result regarding the effects of underwriter–investor relationships on IPO pricing. Further, no measure has been provided to estimate the possible consequent agency cost to the issuers.

The framework adopted in this paper fills this gap, in that it allows agency costs and information production to coexist, leading to both greater underpricing and a larger price adjustment. If these are confirmed, the question would be which of the two effects, if any, prevails over the other.

3 | FRAMEWORK AND HYPOTHESES

Most of the literature on IPO pricing has focused on underpricing (UP) as a measure of the IPO results. According to the standard literature, we calculate the underpricing as the percentage difference between the market price (MP, i.e., the first-day closing market price)[5] and the offer price (OP), as in the following equation:

$$UP = (MP - OP)/OP. \tag{1}$$

The underpricing is typically seen as the amount of money left on the table by the issuing firm. Nonetheless, the underpricing is a single measure that reflects both primary and

[5]Net of the market return of the first trading day.

secondary market pricing outcomes. To provide a complete picture of the way regular investors affect the different stages of the IPO pricing (i.e., the primary and secondary markets), the underpricing must be related to the price adjustment (PA), which is the percentage difference between the final offer price (OP) and the midpoint of the initial filing price range (MFP), as in the following equation:

$$PA = (OP - MFP)/MFP. \tag{2}$$

According to the partial adjustment mechanism, the offer price only partially adjusts to the information collected in the bookbuilding to compensate investors for the information they provide.

Building on the aforementioned theories of the partial adjustment, we provide a direct empirical calculation of such a measure by relating the difference between the offer price (OP) and the midpoint of the filing price range (MFP) to the difference between the market price (MP) and the same MFP, as in the following equation:

$$Partial\ Adjustment = \frac{(OP - MFP)}{(MP - MFP)}, \tag{3}$$

Therefore, the adjustment is partial with respect to the realized market price.

Within this framework, BS maintained that, when regular investors are involved in the IPO, the underpricing is reduced and IPO proceeds are maximized for the issuer (Theorem 2), implicitly meaning an increase in the partial adjustment. The rationale is that regular investors are rewarded with preferential allocations in the current IPO (if UP is positive) and are given priority in the allocation of future underpriced IPOs.

However, underwriters can apply a lower partial adjustment to produce an extra reward on behalf of regular investors in exchange for future business. In this case, there would be a real agency cost to the issuer. Although recent empirical literature has confirmed this quid pro quo on allocations (e.g., Jenkinson et al., 2018), we speculate that it could also have an impact on pricing. Indeed, issuers are aware of share allocations (which are finite), but they do not necessarily know what the exact offer price should be. Therefore, we argue that, in the presence of strong underwriter–investor relationships, underwriters could intentionally raise the offer price by less than the ordinary partial adjustment would predict, leaving an excess underpricing to benefit closer regular investors. From this, we propose the following hypothesis:

H1: *Stronger relationships between lead underwriters and regular investors induce the former to apply a lower partial adjustment, leading to excess underpricing.*

We also explore the intuition that the incentives behind the underwriter's agency conflicts could change, depending on how effortless the completion of the IPO is. We argue that favoritism towards regular investors mainly arises when IPOs are more easily priced and allocated. Consequently, we expect the excess underpricing discussed to be more likely in hot IPOs than in cold IPOs. In the latter case, the issuing company could resist leaving money on the table. This could induce the underwriter to adopt a dumping ground strategy against its regular institutional investors, who will then participate in cold IPOs in exchange for promised future allocations of more underpriced IPOs. Accordingly, we propose our second hypothesis as follows.

H2: *Stronger relationships between lead underwriters and regular investors induce lower partial adjustment, leading to greater excess underpricing in hot IPOs*; *conversely, larger partial adjustment and lower excess underpricing are expected in cold IPOs.*

Confirming the two hypotheses would suggest that the relationship between underwriters and funds does affect the fairness of the IPO pricing process at the expense of issuers.

Nevertheless, bookbuilding theory suggests that the presence of ongoing relationships between underwriters and investors in IPOs increase the trustworthiness of the investor information, which should then lead to a more efficient information production process, as well as lower the uncertainty and risk related to underwriter mispricing. Ultimately, this information production should lead to a higher offer price (Bajo et al., 2016). Thus, further analyses are needed to resolve this puzzle. Consequently, we test the following hypothesis.

H3: *Stronger relationships between lead underwriters and regular investors improve the information production process and reduce the uncertainty and risk associated with the IPO pricing, resulting in a larger price adjustment.*

We seek to complete the analysis of the primary market pricing by employing a different variable that is less affected by endogeneity. We build on the intuition of Bradley and Jordan (2002), that the amendment of the filing price range before the offer date is the result of a revision in valuation, which, in turn, is the result of unexpected (positive or negative) information collected before the offer price is set. The amended return, which is the change from the initial to the final amended mid filing price,[6] helps to alleviate endogeneity concerns for the following reason: the amended return represents an unexpected revision in the IPO evaluation that takes place during the bookbuilding and once the underwriter has likely already involved regular investors. It is therefore more likely that the investors' information will change the valuation, rather than the opposite; that is, (better) valuation attracts regular investors to join the bookbuilding. We consistently hypothesize that stronger relationships exert a positive effect on the amended return due to improvement in the information production process.

4 | DATA AND METHODOLOGY

4.1 | Data and relationship measures

We obtain the data for all the IPOs on the American Stock Exchange, New York Stock Exchange and NASDAQ from the Thomson One Deals database, covering from January 1997 to December 2016. As a standard procedure, we exclude financial firms, American depositary receipts, real estate investment trusts, closed-end funds, non-common shares and shares with an offer price below $5. We find 3219 IPOs that match our criteria.

We then retrieve ownership data from the Thomson One Ownership database on the institutional investors from quarterly 13F filings[7] with the SEC. We use the first holdings reported within the first 6 months[8] after the offer for each IPO as a proxy for the initial IPO

[6]As a formula, MFP(final)/MFP(initial) − 1.
[7]The 13F data cover both mutual funds and other institutional investors, such as pension funds and insurance companies.

allocations. The actual allocations are not publicly available, but these reports are a common proxy in this literature. Hanley and Wilhelm (1995) demonstrated that such a proxy is highly reliable, since the correlation with the actual allocations is up to 91%. Searching the database, we arrive at 2889 IPO observations that match the ownership data. The sample size drops again after we introduce the relationship measures, since their computation implies the use of a time window preceding IPOs. The 3-year time window applied in our models reduces the sample to 2537 entries.

We obtain the lead underwriter and investor names from the Thomson One Deals and Ownership databases. We then match each lead underwriter–investor pair and observe their repeated interactions over time. We collect the names of the lead underwriters as well as those of the colead underwriters (if any) of the same IPO.[9] Consistent with previous literature (Binay et al., 2007; Boehmer et al., 2006), we base our relationship measures on the number of past relationships (PR) between lead underwriters (LU) and institutional investors (II) in the IPO. Adding to previous contributions, we explore several dimensions of these relationships. First, we analyze both the connections to the lead underwriter alone (LU) and those encompassing all lead underwriters involved in the bookbuilding (ALU). Second, we investigate the time dimension of the relationships. Third, we propose three different measures of the relationships' strength, each stressing a different aspect. Finally, we add a diffusion measure to test for the quality of the connections in each IPO.

Our first relationship measure involves the number of times the institutional investors taking part in IPO *j* participated in IPOs managed by the same lead underwriter in a given time window. The measure is the average of this count among all the investors in IPO *j*, as follows:

$$Average\ PR\ LU_j = \frac{\sum_{i=1}^{II\_N_j} D_i}{II\_N_j}. \tag{4}$$

where D_i is the number of past relationships (PR) between the first LU and the *i*th II, while II_N_j is the number of institutional investors participating in IPO *j*.

Given that an IPO is frequently managed by more than one lead underwriter, we want to study if the relationship that matters the most is that of the first lead underwriter or that of all the lead underwriters involved in an IPO. We thus recalculate the formula to find the relationship measure that refers to all the lead underwriters:

$$Average\ PR\ ALU_j = \frac{\sum_{k=1}^{LUj} \sum_{i=1}^{II\_N_j} D_{ik}}{LUj \cdot II\_N_j}, \tag{5}$$

where LU_j is the number of lead underwriters in IPO *j,* and D_{ik} is the number of past relationships between lead underwriter *k* and institutional investor *i*.

We also propose two alternative measures. The first is the 'excess past relationships' which corrects for the average connection of all IPOs in the same quarter as the IPO considered; this measure represents a sort of relationship that exceeds what was expected in that quarter (see Equation 6). The second measure, the 'weighted past relationship', weights each pair of past

[8]Which means the first two reported filings after the IPO, as discussed by Ritter and Zhang (2007).

[9]The taxonomy of the Thomson One Deals database distinguishes between bookrunners and underwriters, since it is not mandatory for a bookrunner to underwrite shares, but this practice is fairly common. We decided to be consistent with previous literature and use the generic term *lead underwriters*.

relationships between the lead underwriter and the institutional investor with the allocations,[10] thus stressing the strength of the connection with allocations (Equation 7). The following equations represent these two measures, respectively:

$$Excess\ PR\ LU_j = \frac{\sum_{i=1}^{II\_N_j} D_i}{II\_N_j \cdot E(PR\ LU_j)}, \tag{6}$$

$$Weighted\ PR\ LU_j = \frac{\sum_{i=1}^{II\_N_j} D_i \cdot wa_i}{II\_N_j}, \tag{7}$$

where $E(PR\,LU_j)$ is the average connection in the quarter of the jth IPO and wa_i is the weighted allocation of institutional investor i, that is, its allocation divided by total allocations to all institutional investors in the IPO, such that

$$\sum_{i=1}^{F\_Nj} wa_i = 1. \tag{8}$$

The intuition behind the excess relationship measure is that the average level of connections can change with time, according to various factors (e.g., the concentration of investment bank or mutual fund industries or market trends). With this indicator, we stress the relative strength of the relationship for a given period and test its effect on the IPO pricing. We use weighted relationship measures to weight past relationships for the (percentage of) shares that were allocated, thus overweighting (underweighting) interactions that are followed by large (small) allocations of shares.

As we did for the average relationship measure, for both excess and weighted relationships, we also compute the expanded versions by including past relations with all lead underwriters:

$$Excess\ PR\ ALU_j = \frac{\sum_{k=1}^{LUj} \sum_{i=1}^{II\_Nj} D_{ik}}{LUj \cdot II\_Nj \cdot E(PR\ ALU_j)}, \tag{9}$$

$$Weighted\ PR\ ALU_j = \frac{\sum_{k=1}^{LUj} \sum_{i=1}^{II\_Nj} D_{ik} \cdot wa_i}{LUj \cdot II\_Nj}. \tag{10}$$

Finally, we explore another dimension of the underwriter–investor relationships that previous studies overlooked: diffusion. The aforementioned measures are based on the average number of past interactions between underwriters and institutional investors; they can therefore result from either intense relationships between a few players or diffused interactions involving a larger number of players. The diffusion measure we propose here captures the dispersion in the relationships; it is calculated as one minus the relationship concentration, measured as the Herfindahl index of lead underwriter–institutional investor past interactions:

$$Diffusion\ \mathrm{PR\ LU}_j = 1 - \sum_{i=1}^{II_{Nj}} \left(\frac{D_i}{\sum_{i=1}^{II_{Nj}} D_i} \right)^2. \tag{11}$$

[10]We refer to the allocations, but, as anticipated, we use as a proxy the reported holdings in the 13F filings in the two following quarters after the IPO, which is common in the literature (e.g., Reuter, 2006).

For a given level of the average PR LU variable and the number of investors, diffusion is greater when many investors contribute with their past relationships and lower when there are only a few investors with more intense past relationships. In other words, this measure represents the equality of underwriter–investor relationships in a deal: the lowest value indicates the extreme case in which only one institutional investor has many past relationships with the lead underwriter, while the highest value suggests that all institutional investors have the same number of past relationships with the lead underwriter.

If H3 is confirmed, more diffused relationships should produce more information, due to the higher number of players contributing to the bookbuilding; a positive effect is then expected on the price adjustment and, given the partial adjustment mechanism, on the underpricing. As for the effect of relationship diffusion on the partial adjustment, we have no a priori expectations and we leave this issue for our empirical investigation. Its outcomes will reveal whether diffused relationships provide greater compensation to investors or only to a few important members of the network.

With reference to the period over which our relationship measures are computed, we run all the models with a 3-year time horizon, based on an established view in the literature (BS) that the bookbuilding method allows underwriters to form long-term relationships with a pool of banks. In other words, we consider the relationships between funds and underwriters in the 3 years before the IPO.

We perform an additional analysis by running all the models with relationship measures against several different windows, spanning from a minimum of three months before the IPO up to a maximum of 3 years before the IPO. Despite the core results not changing qualitatively, the 3-year time frame has the best explanatory power.

In addition, the relationships between underwriters and institutional investors possibly extend to other type of issues, such as seasoned equity offerings and bond issuances. Exploring these types of interactions could increase our understanding of the effects that relationships exert on IPO pricing. However, we believe that the analysis of time windows up to 3 years limits this concern, in that players typically have many interactions in this time window. We therefore leave this possible extension for future research.

4.2 | Methodology

Equation (12) captures the ordinary partial adjustment phenomenon, which is the positive relationship between UP and PA (coefficient β_{PA}), where we control for our relationship measures that affect the underpricing level:

$$UP = \alpha + \beta_{PA} \cdot PA + \beta_R \cdot Relationships + \gamma \cdot Controls + \varepsilon. \quad (12)$$

The independent variables are divided into two groups. The first group is represented by the core relationship variables already described in Equations (4), (6) and (7), with the average, excess and weighted relationships, respectively, all capturing a different aspect of underwriter–investor relations, as discussed above. We also test the relationship diffusion.

The second group of independent variables (*Controls*) includes the control variables commonly used in the literature on IPO pricing: II_{pct} is the percentage of shares held by all institutional investors after the IPO; D_{VC} is a dummy that equals one when the IPO is venture backed; $D_{Lock\text{-}up}$ is a dummy variable that equals 1 when the venture capitalists (VCs) have a

lockup obligation (which forces them to wait until a certain lockup expiration date before liquidating their stake), and 0 otherwise; LU Reputation is the reputation of the lead underwriter of the IPO according to the publicly available database provided by Ritter;[11] Size is the natural logarithm of the total assets of the company reported before the IPO; D_{Tech} is a dummy variable that equals 1 if the company is in a high-tech industry,[12] and 0 otherwise; LU_N is the number of lead underwriters of the IPO; RM_{bb} measures the equity market return during the 2 weeks before the IPO, since such a period usually matches with the bookbuilding interval; and, finally, to control for the time and sector variability of our dependent variables, we add year and industry dummies.

Nonetheless, Equation (12) by itself is not suitable for describing how the partial adjustment changes when the IPO is characterized by stronger or weaker relationships; it only describes their direct effect on the underpricing level. To investigate such an effect and then capture all the possible components of excess underpricing, we need to introduce an interaction term between PA and the relationship variables (see Figure 1 for a graphical interpretation), based on the methodology suggested by Geranio et al. (2017), to modify Equation (12) into the following equation:

$$UP = \alpha + \beta_{PA} \cdot PA + \beta_R \cdot Relationships + \beta_{PA,R} \cdot PA \cdot Relationships + \gamma \cdot Controls + \varepsilon. \quad (13)$$

Based on the above discussion, a positive value for the coefficient $\beta_{PA,R}$ of the interaction term (which corrects the coefficient β_{PA} representing the ordinary partial adjustment) would mean that, all else being equal, the same amount of information production will result in greater underpricing when the past relationships are stronger. In other words, the offer price will be raised less than it could have been (smaller partial adjustment), thus eventually producing excess underpricing. Therefore, a positive coefficient for the interaction term would suggest that the stronger the past relationship with the underwriter, the greater the excess underpricing granted to regular investors. On the contrary, a negative coefficient would suggest that bookbuilding effects prevail over agency-based effects, favoring issuers at the expense of regular investors.

Finally, Equation (13) captures the change in the partial adjustment even if β_{PA} is zero (meaning that underpricing is not affected, on average, by the regular investors), thanks to the interaction term coefficient $\beta_{PA,R}$. Equation (13) represents the entire partial adjustment due to the presence of regular investors (considering both the coefficients β_{PA} and $\beta_{PA,R}$). Panel (a) of Figure 1 (upward shift) reports the baseline relationship between the underpricing and the price adjustment (β_{PA}, solid line), compared with the case in which a positive impact of the relationships is considered (β_R, dotted line). Similarly, panel (b) (downward shift) compares the baseline UP/PA relationship and the case in which the relationships exert a negative impact on it. Differently, panels (c) and (d) highlight the positive and negative effects, respectively, of the interaction term ($\beta_{PA,R}$), which indeed influences the function slope and represents an innovative contribution of this paper (partial adjustment).

The models proposed are easily comparable with the literature, in that the dependent variable is the underpricing. However, given that our framework is specifically focused on the

[11]Which is basically the Carter–Manaster (1990) measure, adapted for more recent data. See: https://site.warrington.ufl.edu/ritter/ipo-data/.

[12]As defined by the Thomson Financial Macro Sectors classification, this includes software, semiconductors and information technology (IT).

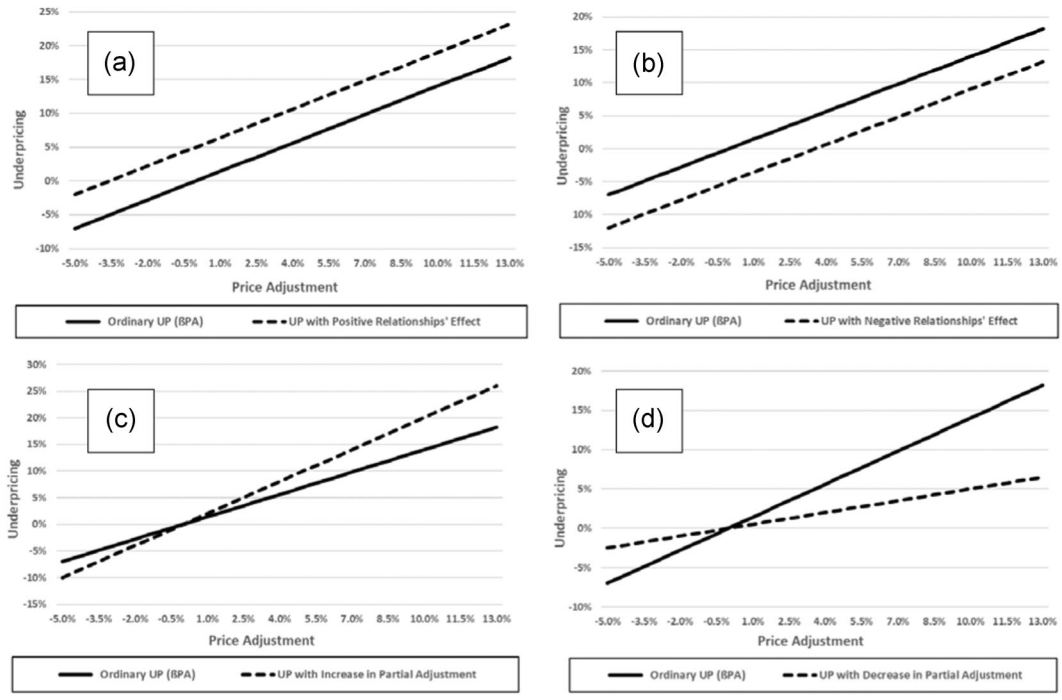

FIGURE 1 Relationship effects on underpricing as a function of price adjustment. This figure shows graphically Equation (13) as a function of price adjustment and relationship's measures. The solid line (ordinary underpricing) is the estimate of the underpricing as a function of the price adjustment with zero relationships. The dotted line represents the same function but considering relationships. The figure plots Equation (13), showing the four possible outcomes: a positive or negative shift due to the relationships' effect (positive or negative β_R coefficient, depicted in panels (a) and (b), respectively) and a positive or negative slope change due to the interaction term (positive or negative $\beta_{PA,R}$ coefficient, depicted in panels (c) and (d), respectively)

variation of the partial adjustment, we propose an additional model to better highlight this effect.

The partial adjustment (as in Equation 3) then becomes the dependent variable of Equation (14), where the effect of the relationships is directly revealed: a negative (positive) coefficient β_R reveals a lower (higher) partial adjustment when the relationship becomes stronger, which, in turn, leads to excess underpricing:

$$\text{Partial Adjustment} = \alpha + \beta_R \cdot \textit{Relationships} + \gamma \cdot \textit{Controls} + \varepsilon. \tag{14}$$

Following our research design, we then distinguish between cold and hot IPOs: in cold (vs. hot) IPOs, underwriters can have more incentives to dump shares on (vs. compensate) their regular investors, increasing (decreasing) the partial adjustment. To test this additional hypothesis, we split the sample into cold and hot IPOs and rerun regression (13) for the two subsamples. We split the subsamples with respect to the median UP of the same quarter as the IPO, assuming (as in Ritter & Zhang, 2007) that deals that are easier (more difficult) for the underwriter to complete because of the high (low) demand during the bookbuilding are also those with a subsequently higher (lower) UP.

To test H3 regarding the impact of relationships on the primary market pricing, we estimate the following regression:

$$PA = \alpha + \beta_R \cdot Relationships + \gamma \cdot Controls + \varepsilon, \quad (15)$$

where the dependent variable is the price adjustment (PA), which is the output of the roadshow and bookbuilding efforts of the lead underwriter in the primary market.

5 | EMPIRICAL RESULTS

5.1 | Descriptive statistics

Table 1 reports the descriptive statistics of all the variables for the full sample, while Table 2 shows the variability of our dependent variables and relationship measures in subsamples with respect to key pricing factors related to time, size, underwriter reputation and hot/cold market conditions.

The average past relationships measure (Average PR LU) in Table 1 shows that institutional investors took part in an IPO previously managed by the same lead underwriter[13] an average of 2.91 times (2.88 times if we consider all lead underwriters). Table 2 shows that these interactions increase in hot and bigger IPOs and in deals with higher-ranked lead underwriters.

Table 3 shows the correlation matrix of our main variables; the correlations are all strongly statistically significant. At first glance, stronger relationships are associated with both a larger price adjustment and greater underpricing, as well as with a smaller initial price range. This result suggests that relationships allow for a better information production process, which leads to less uncertainty in the IPO pricing. However, greater underpricing is expected, due to the ordinary partial adjustment mechanism that we previously discussed. The same is observed for the relationship diffusion, meaning that the results are stronger when the connections represent larger numbers of regular investors.

Table 4 shows that all the relationship variables are positively correlated with each other, suggesting that they consistently describe the phenomena while highlighting slightly different aspects of it.

5.2 | Multivariate analyses

Table 5 presents the results of Equation (12), which replicates the common underpricing methodology in the literature (e.g., Binay et al., 2007; Ritter & Zhang, 2007): column (1) in Table 5 shows that underpricing increases when stronger relationships are in place. This result is in line with expectations, given the well-known partial adjustment mechanism.

However, as mentioned in the methodology section, our innovative approach includes the interaction term between the price adjustment and the relationship variables, to ascertain the impact of the strength of such relationships on the partial adjustment (Equation 13). Column

[13]This figure could seem low, but, being an average count of the past relationships of all IPO investors, it means that regular investors have much higher levels of previous participation in IPOs managed by the same lead underwriter.

TABLE 1 Summary statistics

This table presents the descriptive statistics of the main variables in our sample. The variable Initial Price Range is the percentage difference between the initial low and high filing prices; AR is the amended return, or the change in the mid filing price from the initial to the final amended one; PA is the price adjustment (the percentage difference between the final offer price and the midpoint of the initial filing price range); UP is the underpricing (the percentage difference between the first trading day closing market price and the IPO offer price, net of the market return); Partial Adjustment is the difference between the offer price (OP) and the midpoint of the filing price range (MFP) with respect to the difference between the market price (MP) and the same MFP; Size is the natural logarithm of the total assets of the company reported before the IPO; LU_N is the number of lead underwriters of the IPO; $D_{Lock\text{-}up}$ is a dummy variable that is equal to 1 when VCs have a lockup obligation, and 0 otherwise; D_{VC} is a dummy that is equal to 1 when the IPO is venture backed, and 0 otherwise; LU Reputation is measured by the Carter–Manaster ranking according to the publicly available database provided by Ritter (https://site.warrington.ufl.edu/ritter/ipo-data/); D_{Tech} is a dummy variable that is equal to 1 if the company is in a high-tech industry (as defined by the Thomson Financial Macro Sectors classification, which includes software, semiconductors, and IT), and 0 otherwise; RM_{bb} measures the equity market return during the 2 weeks before the IPO (bookbuilding interval); II_{pct} is the percentage of shares held by all institutional investors after the IPO; Average PR LU is the average number of past relationships between the first lead underwriter and the institutional investors participating in the IPO in the semester preceding the deal; Excess PR LU corrects the previous indicator for the average relationship of all IPOs in the same quarter as the IPO considered; Weighted PR LU weights each pair of past relations between the lead underwriter and the institutional investor with the allocations received by the latter; and Diffusion PR LU is one minus the relationship concentration, measured as the Herfindahl index of past interactions between the lead underwriter and institutional investors participating in an IPO in the semester preceding the deal. If computed considering all lead underwriters participating in the IPO, the same relationship indicators have the suffix ALU.

	N	Min	Mean	Median	Max	Std. dev.
Initial Price Range	2537	0.00%	13.86%	13.95%	28.57%	5.43%
AR	2537	−50.00%	−0.22%	0.00%	63.64%	15.32%
PA	2537	−53.57%	−0.05%	0.00%	81.82%	23.34%
UP	2537	−20.93%	24.93%	8.29%	264.44%	47.74%
Partial Adjustment	2537	14.11%	87.05%	92.35%	180.19%	20.25%
Size	2537	0.836	6.108	5.595	14.448	2.664
LU_N	2537	1	2.167	2	13	1.652
$D_{Lock\text{-}up}$	2537	0	0.616	1	1	0.486
D_{VC}	2537	0	0.537	1	1	0.499
LU Reputation	2537	1.001	7.853	9.001	9.001	1.761
D_{Tech}	2537	0	0.331	0	1	0.471
RM_{bb}	2537	−16.68%	0.35%	0.23%	18.70%	0.038
II_{pct}	2537	0	0.300	0.204	1.111	0.278
Average PR LU	2537	0	2.907	3.113	6.066	1.529
Average PR ALU	2537	0	2.878	3.063	5.654	1.421
Excess PR LU	2537	0	0.585	0.601	1.593	0.421

TABLE 1 (Continued)

	N	Min	Mean	Median	Max	Std. dev.
Excess PR ALU	2537	0	0.545	0.567	1.331	0.368
Weighted PR LU	2537	0	2.841	2.968	6.478	1.616
Weighted PR ALU	2537	0	3.336	3.402	7.433	1.879
Diffusion PR LU	2537	0.307	0.936	0.975	1	0.123
Diffusion PR ALU	2537	0.307	0.932	0.975	1	0.129

(2) in Table 5 shows that the coefficient of the interaction term is positive and significant. When the relationships are stronger, the underpricing is even greater for a given level of price adjustment. This means that underwriters set an offer price that implies a smaller partial adjustment, which then induces excess underpricing, consistent with H1. In other words, the stronger the relationships, the lower the upward adjustment of the offer price to the demand, at least when given an ordinary partial adjustment, which is always necessary as compensation for regular investors participating in the bookbuilding. We thus find the first empirical evidence that underwriter–investor relationships impact pricing by producing an extra cost for issuers, to the advantage of regular investors, although this is a figurative cost (money left on the table) rather than real cash outflow. Columns (4) and (6) in Table 5 (as opposed to the naïve alternatives of columns (3) and (5)) show that our results persist across different relationship measures, namely, the excess and weighted relationships. Again, we can see that the significance of the coefficients is slightly higher than in models with the simple average relationship measure, suggesting that both the expected relationships in a given period and the allocations exert important effects on the IPO pricing.

Table 6 presents the results of the additional model in Equation (14), where the partial adjustment is the dependent variable. The results are consistent with the previous evidence of model (13) in Table 5: columns (1)–(3) show that the partial adjustment decreases when stronger relationships are in place, suggesting excess underpricing for regular investors. The results are robust to all three relationships measures (average, excess and weighted) and confirm our interpretation of the interaction term in the previous analysis.

Following our framework, we then test how the above evidence changes when considering hot and cold IPOs (H2). Here we assume that underwriters, given their experience and insider role in the primary market, are best positioned to produce unbiased forecasts of the underpricing; thus, they can distinguish hot from cold IPOs in advance. The results in Table 7 confirm H2 for both hot and cold IPOs: a positive coefficient of the interaction term implies greater excess underpricing in hot IPOs, while the opposite is true in cold IPOs, revealing less excess underpricing.

As the last step in our framework (H3), we analyze the effects of the underwriter–investor relationship on the IPO information production process and, ultimately, on the offer price in the primary market (Equation 15).

The positive and significant coefficients of all the relationship measures support the information production theory and confirm our hypothesis: underwriters with stronger relationships seem to better serve the interests of the issuing firm. When starting with the average relationship measure, we note that the excess relationship and weighted relationship measures also exert a positive—and even stronger—effect. Such additional measures aim to better

TABLE 2 Descriptive statistics for subsamples

This table presents the breakdown of the sample according to a few relevant dimensions. Hot and cold deals are categorized in two ways: first, according to the median underpricing registered for the whole sample and, second, with reference to the average underpricing reported in the specific quarter of the IPO completion. The variable Issuer's Size is the total assets of the issuing firm the year before the IPO, where small and large refer to sizes below and above the median value, respectively; the lead underwriter's reputation is measured by the Carter–Manaster ranking (where top reputation underwriters have a rank of nine); Initial Price Range is the percentage difference between the initial low and high filing prices; PA is the price adjustment (the percentage difference between the final offer price and the midpoint of the initial filing price range); UP is the underpricing (the percentage difference between the first trading day closing market price and the IPO offer price, net of the market return); Average PR LU is the average number of past relationships between the first lead underwriter and the institutional investors participating in the IPO in the semester preceding the deal; Average PR ALU is the same indicator, but referring to all the lead underwriters in the deal; Diffusion PR LU is one minus the relationship concentration, measured as the Herfindahl index of past interactions between the lead underwriter and institutional investors participating in an IPO in the semester preceding the deal; and Diffusion PR ALU is the same indicator, but referring to all the lead underwriters in the deal. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

	Obs.	Initial price range (%)	Amended return (%)	PA (%)	UP (%)	Average PR LU	Average PR ALU	Diffusion PR LU	Diffusion PR ALU
UP									
Cold	1273	12.96	−4.06	−9.43	−1.37	2.83	2.81	0.92	0.91
Hot	1264	14.77	3.64	9.40	51.41	2.98	2.95	0.96	0.95
Difference		1.81***	7.69***	18.83***	52.78***	0.15***	0.14***	0.04***	0.041***
UP within quarter									
Cold	1293	13.47	−3.31	−7.06	1.69	2.74	2.71	0.92	0.92
Hot	1244	14.27	2.98	7.24	49.09	3.09	3.05	0.95	0.95
Difference		0.8***	6.29***	14.3***	47.4***	0.35***	0.33***	0.03***	0.028***
Issuer's Size									
Small	1268	15.76	1.27	3.80	37.41	2.486	2.461	0.946	0.946
Big	1269	11.96	−1.72	−3.89	12.45	3.329	3.294	0.926	0.919
Difference		−3.8***	−3.0***	−7.69***	−24.96***	0.84***	0.83***	−0.021***	−0.027***

TABLE 2 (Continued)

	Obs.	Initial price range (%)	Amended return (%)	PA (%)	UP (%)	Average PR LU	Average PR ALU	Diffusion PR LU	Diffusion PR ALU
LU Reputation									
Top Reputation (<9)	1113	14.14	−2.57	−4.36	19.19	2.02	2.05	0.91	0.90
Non-Top Reputation (9)	1424	13.65	1.61	3.32	29.41	3.60	3.52	0.96	0.96
Difference		−0.49	4.18***	7.68***	10.22***	1.58***	1.47***	0.05***	0.053***
Total	2537	13.86	−0.22	−0.05	24.93	2.91	2.88	0.94	0.93

TABLE 3 Correlation matrix of the main variables

The table presents the correlations among the main variables, where AR is the change in the mid filing price from the initial to the final amended one; UP is the underpricing (the percentage difference between the first trading day closing market price and the IPO offer price, net of the market return); PA is the price adjustment (the percentage difference between the final offer price and the midpoint of the initial filing price range); II_{pct} is the percentage of shares held by all institutional investors after the IPO; Size is the total assets (as a natural logarithm and corrected for inflation) of the issuing firm the year before the IPO; LU Reputation is measured by the Carter–Manaster ranking; Average PR LU is the average number of past relationships between the first lead underwriter and the institutional investors participating in the IPO in the semester preceding the deal; Average PR ALU is the same indicator, but referring to all the lead underwriters in the deal; Diffusion PR LU is one minus the relationship concentration, measured as the Herfindahl index of past interactions between the lead underwriter and institutional investors participating in an IPO in the semester preceding the deal; and Diffusion PR ALU is the same indicator, but referring to all the lead underwriters in the deal.

	1	2	3	4	5	6	7	8	9	10
1. AR	1									
2. UP	0.477	1								
	0.000									
3. PA	0.823	0.569	1							
	0.000	0.000								
4. IIpct	0.071	0.064	0.093	1						
	0.000	0.001	0.000							
5. Size	−0.052	−0.24	−0.116	−0.32	1					
	0.001	0.000	0.000	0.000						
6. LU Reputation	0.125	0.148	0.171	0.138	−0.023	1				
	0.000	0.000	0.000	0.000	0.24					
7. Average PR LU	0.083	0.043	0.069	−0.103	0.338	0.431	1			
	0.000	0.03	0.000	0.000	0.000	0.000				
8. Average PR ALU	0.09	0.045	0.075	−0.112	0.361	0.43	0.95	1		
	0.000	0.024	0.000	0.000	0.000	0.000	0.000			
9. Diffusion PR LU	0.124	0.128	0.15	0.232	−0.092	0.297	0.239	0.259	1	
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
10. Diffusion PR ALU	0.116	0.125	0.132	0.245	−0.11	0.298	0.287	0.295	0.904	1
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

explain the information production effect in the primary market. More specifically, they highlight that information is more efficiently extracted from institutional investors, both when their relationship with the underwriter is stronger than one would expect in a given time frame and when they have been rewarded with larger allocations.

TABLE 4 Correlation matrix of the relationship variables

The table presents the correlations and their related statistical significance in terms of *p* values among the relationship variables, where Average PR LU is the average number of past relationships between the first lead underwriter and the institutional investors participating in the IPO in the semester preceding the deal; Excess PR LU corrects the previous indicator for the average relationship of all IPOs in the same quarter as the IPO considered; Weighted PR LU weights each pair of past relations between the lead underwriter and the institutional investor with the allocations received by the latter; and Diffusion PR LU is one minus the relationship concentration, measured as the Herfindahl index of lead underwriter–institutional investor past interactions. All the relationship variables were also considered with reference to all the lead underwriters in the deal.

	1	2	3	4	5	6	7	8
1. Average PR LU	1							
2. Average PR ALU	0.95	1						
	0.000							
3. Excess PR LU	0.842	0.771	1					
	0.000	0.000						
4. Excess PR ALU	0.767	0.802	0.916	1				
	0.000	0.000	0.000					
5. Weighted PR LU	0.966	0.92	0.801	0.726	1			
	0.000	0.000	0.000	0.000				
6. Weighted PR ALU	0.889	0.932	0.678	0.676	0.923	1		
	0.000	0.000	0.000	0.000	0.000			
7. Diffusion PR LU	0.239	0.259	0.31	0.332	0.253	0.241	1	
	0.000	0.000	0.000	0.000	0.000	0.000		
8. Diffusion PR ALU	0.287	0.295	0.337	0.359	0.295	0.265	0.904	1
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Table 8 also illustrates the impact of the relationships on amended returns, an alternative measure of primary market pricing. As discussed in Section 3, this measure captures the early trend of securities placement. The results show that involving regular investors contributes to the pricing process, even before the bookbuilding's conclusion, suggesting that the information extraction from regular investors improves the information production process during the IPO roadshow.

A possible alternative explanation, unexplored by the previous literature, is that, when stronger (weaker) relationships are in place, underwriters could set an initial lower (higher) price range to favor their regular investors with subsequent excess underpricing while still providing issuers with a larger (lower) price adjustment. However, we compute the price-to-book values using the initial middle price of the price range and find no statistically significant differences in IPOs with high and low relationship levels (with multiples equal to 4.13 and 4.26,

TABLE 5 Underwriter–investor relationships and underpricing

This table presents the estimation of the Equations (12) and (13). UP is the underpricing (the percentage difference between the first trading day closing market price and the IPO offer price, net of the market return); PA is the price adjustment (the percentage difference between the final offer price and the midpoint of the initial filing price range); Average PR LU is the average number of past relationships between the first lead underwriter and the institutional investors participating in the IPO in the semester preceding the deal; Excess PR LU corrects the previous indicator for the average relationship of all IPOs in the same quarter as the IPO considered; Weighted PR LU weights each pair of past relations between the lead underwriter and the institutional investor with the allocations received by the latter; LU_N is the number of lead underwriters of the IPO; $D_{Lock\text{-}up}$ is a dummy variable that is equal to 1 when VCs have a lockup obligation, and 0 otherwise; D_{VC} is a dummy that is equal to 1 when the IPO is venture backed, and 0 otherwise; LU Reputation is measured by the Carter–Manaster ranking; Size is the natural logarithm of the total assets of the company reported before the IPO; D_{Tech} is a dummy variable that is equal to 1 if the company is in a high-tech industry, and 0 otherwise; RM_{bb} measures the equity market return during the 2 weeks before the IPO (bookbuilding interval); and II_{pct} is the percentage of shares held by all institutional investors after the IPO. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	UP	UP	UP	UP	UP	UP
PA	0.921***	0.658***	0.918***	0.590***	0.917***	0.619***
	19.079	6.923	19.027	7.984	19.010	7.143
Average PR LU	0.012**	0.013**				
	2.272	2.318				
Average PR LU × PA		0.083***				
		2.832				
Excess PR LU			0.051***	0.047**		
			2.643	2.439		
Excess PR LU × PA				0.487***		
				4.623		
Weighted PR LU					0.014***	0.015***
					2.725	2.822
Weighted PR LU × PA						0.095***
						3.475
LU_N	−0.025*	−0.022*	−0.025*	−0.016	−0.027**	−0.024*
	−1.882	−1.653	−1.856	−1.203	−2.005	−1.793
$D_{Lock\text{-}up}$	−0.029	−0.023	−0.027	−0.015	−0.029	−0.022
	−1.477	−1.180	−1.370	−0.796	−1.451	−1.104
D_{VC}	−0.000	0.001	0.000	0.002	−0.000	0.002
	−0.005	0.088	0.030	0.116	−0.005	0.112
LU Reputation	0.006	0.007*	0.005	0.007*	0.005	0.006
	1.489	1.715	1.192	1.701	1.327	1.556

TABLE 5 (Continued)

	(1) UP	(2) UP	(3) UP	(4) UP	(5) UP	(6) UP
Size	−0.016***	−0.016***	−0.016***	−0.016***	−0.017***	−0.016***
	−3.523	−3.455	−3.573	−3.533	−3.597	−3.548
D_{Tech}	0.031	0.038	0.031	0.038	0.032	0.039
	0.568	0.700	0.579	0.713	0.581	0.716
RM_{bb}	1.296***	1.273***	1.294***	1.254***	1.299***	1.283***
	5.117	5.059	5.111	4.999	5.131	5.107
II_{pct}	−0.015	−0.011	−0.013	−0.007	−0.015	−0.008
	−0.428	−0.315	−0.380	−0.189	−0.428	−0.233
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.242***	0.218***	0.251***	0.211***	0.245***	0.216***
	4.742	4.214	4.891	4.134	4.800	4.189
Observations	2537	2537	2537	2537	2537	2537
R^2	0.442	0.446	0.442	0.453	0.442	0.448

respectively).[14] This result suggests that underwriters do not undervalue the initial price range to favor their regular investors.

In any case, the evidence supporting H3 suggests a beneficial effect of underwriter–investor relationships for the IPO issuing firm.

We also tried an alternative specification of the primary market pricing measure, namely, the standardized price adjustment, which relates the price adjustment (PA) to the width of the initial price range (IPR). No significant variations with reference to the relationship variables shown in Table 8 emerged (see Appendix A).

Overall, our results underscore that stronger relationships with underwriters are beneficial to institutional investors, so long as the institutional investors are provided with an extra reward (excess underpricing), which represents a hidden agency cost for the issuer. Nevertheless, such relationships are not totally unfavorable to listing firms: they allow for a higher offer price and thus benefit issuers in terms of IPO proceeds.

As far as the control variables are concerned, our results confirm most of the findings from earlier studies. The lead underwriter's reputation (LU Reputation) is positively and significantly related to PA (as for Hanley, 1993), but not to UP.[15] Company size (Size) never has a significant impact on PA, although it shows a significant and negative relation with underpricing. The presence of a venture capital shareholder (D_{VC}) does not exert any significant impact on IPO results. However, the presence of a lockup agreement for venture capitalist ($D_{Lock\text{-}up}$) reduces

[14]We obtain the same results with earnings per share, even though the sample was halved due to missing data.
[15]For a further discussion of the effects of reputation on the partial adjustment mechanism, see Section 6.

TABLE 6 Underwriter–investor relationships and partial adjustment

This table presents the estimation of the Equation (14). The variable Partial Adjustment is the difference between the offer price (OP) and the midpoint of the filing price range (MFP) with respect to the difference between the market price (MP) and the same MFP; Average PR LU is the average number of past relationships between the first lead underwriter and the institutional investors participating in the IPO in the semester preceding the deal; Excess PR LU corrects the previous indicator for the average relationship of all IPOs in the same quarter as the IPO considered; Weighted PR LU weights each pair of past relations between the lead underwriter and the institutional investor with the allocations received by the latter; $D_{Lock\text{-}up}$ is a dummy variable that is equal to 1 when VCs have a lockup obligation, and 0 otherwise; LU reputation is measured by the Carter–Manaster ranking; Size is the natural logarithm of the total assets of the company reported before the IPO; D_{Tech} is a dummy variable that is equal to 1 if the company is in a high-tech industry, and 0 otherwise; RM_{bb} measures the equity market return during the 2 weeks before the IPO (bookbuilding interval); and II_{pct} is the percentage of shares held by all institutional investors after the IPO. Other control variables include: LU_N that is the number of lead underwriters of the IPO; D_{VC} that is a dummy equal to 1 when the IPO is venture backed, and 0 otherwise; D_{Tech} that is a dummy variable equal to 1 if the company is in a high-tech industry, and 0 otherwise. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

	Partial adjustment		
Average PR LU	−0.006**		
	−2.091		
Excess PR LU		−0.034***	
		−3.351	
Weighted PR LU			−0.010***
			−3.689
$D_{Lock\text{-}up}$	0.031***	0.029***	0.030***
	3.287	3.057	3.134
LU Reputation	−0.010***	−0.008***	−0.008***
	−4.339	−3.611	−3.634
Size	0.007***	0.007***	0.007***
	2.777	2.916	2.992
RM_{bb}	−0.792***	−0.789***	−0.793***
	−6.944	−6.931	−6.971
II_{pct}	−0.055***	−0.056***	−0.054***
	−3.454	−3.527	−3.450
Industry dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Other control variables	Yes	Yes	Yes
Constant	0.928***	0.921***	0.924***
	36.950	36.510	36.782
Observations	2537	2537	2537
R^2	0.261	0.263	0.264

TABLE 7 Underwriter–investor relationships and underpricing in hot and cold IPOs

This table presents the result of Equation (13) in hot and cold IPOs defined as having, respectively, higher or lower underpricing than the median level in the IPO quarter; the variable UP is the underpricing (the percentage difference between the first trading day closing market price and the IPO offer price, net of the market return); PA is the price adjustment (the percentage difference between the final offer price and the midpoint of the initial filing price range); Average PR LU is the average number of past relationships between the first lead underwriter and the institutional investors participating in the IPO in the semester preceding the deal; Excess PR LU corrects the previous indicator for the average relationship of all IPOs in the same quarter; Weighted PR LU weights each pair of past relations between the lead underwriter and the institutional investor with the allocations received by the latter; LU_N is the number of lead underwriters of the IPO; $D_{Lock\text{-}up}$ is a dummy variable that is equal to 1 when VCs have a lockup obligation, and 0 otherwise; D_{VC} is a dummy that is equal to 1 when the IPO is venture backed, and 0 otherwise; LU reputation is measured by the Carter–Manaster ranking; Size is the natural logarithm of the total assets of the company reported before the IPO; D_{Tech} is a dummy variable that is equal to 1 if the company is in a high-tech industry, and 0 otherwise; RM_{bb} measures the equity market return during the 2 weeks before the IPO (bookbuilding interval); and II_{pct} is the percentage of shares held by all institutional investors after the IPO. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

	(1) Cold UP	(2) Cold UP	(3) Cold UP	(4) Hot UP	(5) Hot UP	(6) Hot UP
PA	0.275***	0.209***	0.262***	0.530***	0.527***	0.505***
	8.183	7.963	8.318	5.018	6.018	4.993
Average PR LU	−0.010***			0.007		
	−3.652			0.698		
Average PR LU × PA	−0.038***			0.101***		
	−3.835			3.702		
Excess PR LU		−0.024***			0.039	
		−2.587			1.190	
Excess PR LU × PA		−0.078**			0.457***	
		−2.188			4.790	
Weighted PR LU			−0.009***			0.009
			−3.663			1.003
Weighted PR LU × PA			−0.034***			0.107***
			−3.628			4.165
LU_N	−0.000	−0.002	0.001	−0.041	−0.036	−0.042
	−0.031	−0.327	0.095	−1.461	−1.321	−1.507
$D_{Lock\text{-}up}$	−0.005	−0.005	−0.005	−0.034	−0.022	−0.031
	−0.695	−0.628	−0.621	−1.204	−0.777	−1.107
D_{VC}	0.000	−0.000	−0.000	0.035	0.034	0.035
	0.002	−0.036	−0.000	1.589	1.545	1.609

(Continues)

TABLE 7 (Continued)

	(1) Cold UP	(2) Cold UP	(3) Cold UP	(4) Hot UP	(5) Hot UP	(6) Hot UP
LU Reputation	0.002	0.002	0.002	−0.002	−0.004	−0.002
	1.119	0.787	1.123	−0.190	−0.435	−0.270
Size	0.000	0.000	0.000	−0.021**	−0.022***	−0.022***
	0.077	0.048	0.138	−2.510	−2.591	−2.614
D_{Tech}	0.022	0.024	0.022	0.026	0.026	0.027
	1.217	1.280	1.203	0.421	0.414	0.424
RM_{bb}	0.588***	0.596***	0.589***	1.401***	1.414***	1.421***
	7.143	7.196	7.142	4.748	4.815	4.821
II_{pct}	0.071***	0.071***	0.071***	−0.049	−0.044	−0.044
	5.049	5.058	5.022	−0.951	−0.871	−0.865
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.021	0.013	0.019	0.452***	0.456***	0.451***
	0.926	0.562	0.863	5.077	5.111	5.072
Observations	1293	1293	1293	1244	1244	1244
R^2	0.321	0.313	0.320	0.580	0.585	0.582

both PA and UP. The participation of institutional investors (II_{pct}) has a positive impact on PA (but not on UP), while a positive market return in the 2 weeks preceding the IPO (RM_{bb}) seems to increase both PA and UP. Lastly, the number of lead managers (LU_N) has a weak effect on IPO outcomes.

In the next paragraph, we assume the issuer's perspective to quantify and compare the gains in the primary market (excess price adjustment) with the cost emerging from the secondary market (excess underpricing). Therefore, we offer a discussion on the comprehensive net effect that underwriter–investor relationships have on IPO pricing from the issuer's perspective.

6 | IMPLICATIONS FOR ISSUERS

According to our results, stronger relationships between institutional investors and underwriters exert an extra positive impact on both the underpricing and the price adjustment. To better understand how these findings can be detrimental or favorable to the issuing firm, we propose a quantification of the monetary effects of our analysis. In Table 9, we estimate the underpricing and the price adjustment for all IPOs in our database with and without the impact

TABLE 8 Underwriter–investor relationships and primary market pricing measures: Price adjustment and amended return

This table presents the estimation of Equation (15). The variable PA is the price adjustment (the percentage difference between the final offer price and the midpoint of the initial filing price range); AR is the amended return (the change in the mid filing price from the initial to the final amended one); Average PR LU is the average number of past relationships between the first lead underwriter and the institutional investors participating in the IPO in the semester preceding the deal; Excess PR LU corrects the previous indicator for the average relationship of all IPOs in the same quarter as the IPO considered; Weighted PR LU weights each pair of past relations between the lead underwriter and the institutional investor with the allocations received by the latter; LU_N is the number of lead underwriters of the IPO; $D_{Lock\text{-}up}$ is a dummy variable that is equal to 1 when VCs have a lockup obligation, and 0 otherwise; D_{VC} is a dummy that is equal to 1 when the IPO is venture backed, and 0 otherwise; LU Reputation is measured by the Carter–Manaster ranking; Size is the natural logarithm of the total assets of the company reported before the IPO; D_{Tech} is a dummy variable that is equal to 1 if the company is in a high-tech industry (as defined by the Thomson Financial Macro Sectors classification, which includes software, semiconductors, and IT), and 0 otherwise; RM_{bb} measures the equity market return during the 2 weeks before the IPO (bookbuilding interval); and II_{pct} is the percentage of shares held by all institutional investors after the IPO. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	PA	PA	PA	AR	AR	AR
Average PR LU	0.009***			0.007***		
	2.594			2.949		
Excess PR LU		0.053***			0.035***	
		4.445			4.470	
Weighted PR LU			0.017***			0.012***
			5.102			5.300
LU_N	−0.003	−0.004	−0.007	0.002	0.001	−0.001
	−0.275	−0.428	−0.792	0.274	0.182	−0.198
$D_{Lock\text{-}up}$	−0.066***	−0.062***	−0.063***	−0.042***	−0.039***	−0.040***
	−6.079	−5.756	−5.860	−5.574	−5.304	−5.377
D_{VC}	−0.006	−0.005	−0.006	0.005	0.005	0.005
	−0.678	−0.638	−0.711	0.809	0.858	0.788
LU Reputation	0.010***	0.007***	0.007***	0.003*	0.001	0.001
	4.129	3.033	2.858	1.694	0.790	0.579
Size	−0.002	−0.002	−0.003	0.002	0.002	0.002
	−0.596	−0.779	−0.954	1.238	1.092	0.931
D_{tech}	0.038	0.038	0.038	0.018	0.018	0.018
	1.401	1.414	1.423	1.017	1.033	1.036
RM_{bb}	0.751***	0.748***	0.753***	0.372***	0.369***	0.373***
	5.722	5.709	5.761	3.906	3.890	3.932

(Continues)

TABLE 8 (Continued)

	(1) PA	(2) PA	(3) PA	(4) AR	(5) AR	(6) AR
II_{pct}	0.073***	0.074***	0.072***	0.032**	0.033**	0.032**
	3.850	3.946	3.849	2.439	2.520	2.431
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	−0.102***	−0.090***	−0.094***	−0.059***	−0.052**	−0.054***
	−3.577	−3.147	−3.298	−2.886	−2.503	−2.649
Observations	2537	2537	2537	2537	2537	2537
R^2	0.221	0.225	0.227	0.140	0.144	0.146

of the underwriter–investor relationships.[16] When comparing the results, we find that the presence of relationships leads to greater underpricing, meaning a larger amount of money that issuers leave on the table. In detail, the underpricing is equal to 20.92% with no underwriter–investor relationships, but 24.93% with them; the excess underpricing due to the relationships then equals 4.01%, which amounts to an average $7.41 million left on a table in each IPO. Such value will benefit regular investors and can be interpreted as the net compensation they receive for being loyal participants in a series of deals (either hot or cold) managed by the same underwriter.

At the same time, when regular investors are in place, we observe a price adjustment equal to −0.05% (on average), and their absence leads to a price adjustment equal to −2.67%. Therefore, the excess price adjustment implied by the relationships amounts to 2.62%. This result means that underwriter–investor connections allow issuers to collect extra cash value for the shares they sell, or $4.85 million in each IPO, on average.

When confronting the two effects we found, the excess UP and the excess PA, we show that the net effect of the relationships seems to be negative for the issuer: a net loss of 1.39%, or around $2.56 million. However, we must consider that, while excess PA corresponds to additional monetary cash inflow for the issuer, the excess UP does not represent an effective cash outflow and is, rather, an implicit cost (or, better said, a missed gain, as in Loughran & Ritter, 2002).

Finally, we analyze the excess underpricing and the excess price adjustment separately based on hot and cold issues. The presence of the relationships generates excess underpricing equal to 6.10% in hot IPOs and only 1.99% in cold ones, which translates into an average of $11.29 million and $3.68 million left on the table, respectively. Again, however, the excess underpricing is only an additional implicit cost. Companies are better off in both hot and cold IPOs when relationships are in place, because their offer prices will be higher, no matter if such circumstances will require leaving more money on the table.[17] From a different point of view, the fact that the underwriter leaves positive compensation for regular investors in both cold and

[16]This methodology is intended to approximate the excess price adjustment and underpricing, even if we are aware of the caveats, particularly that, by leaving all other explanatory variables unchanged when removing the relationship variable, we do not fully consider their possible interactions.

TABLE 9 Impact of underwriter–investor relationships on issuers

This table presents the estimation of price adjustment and underpricing (both in percentage and in dollar terms) with (column (A)) and without (column (B)) the impact of the underwriter–investor relationships. Their differences (column (C)) measure the net impact of the relationship, that is Excess PA and Excess UP. Hot and cold IPOs are defined with respect to the median underpricing of the same quarter as the IPO. Percentage values are then applied to the case of the average IPO (offer value = $185 million) to exemplify the impact of the relationship on monetary and nonmonetary flows.

	With relationships (A)			Without relationships (B)			Net impact of relationships (C = A − B)		
	All deals	Hot	Cold	All deals	Hot	Cold	All deals	Hot	Cold
Price Adjustment (PA %)	−0.05	1.45	−1.49	−2.67	−1.33	−3.95	2.62	2.78	2.47
Underpricing (UP %)	24.93	33.29	16.88	20.92	27.18	14.90	4.01	6.10	1.99
Price Adjustment (mln $)	−0.09	2.68	−2.75	−4.94	−2.46	−7.31	4.85	5.15	4.56
Underpricing (mln $)	46.12	61.58	31.24	38.70	50.29	27.56	7.41	11.29	3.68

hot IPOs confirms the intuition provided by Gondat-Larralde and James (2008). Regular investors always expect to do better when they maintain their relationships rather than lemon-dodge cold IPOs. Regular investors also generate a positive impact on the offer price in both cold and hot IPOs, with an excess price adjustment of 2.78% and 2.47%, respectively, leading to a larger amount of cash collected by the issuer (equal to $4.56 million and $3.68 million, respectively). This result is also reassuring for the possible endogeneity of our results. If the underwriter uses his or her connections only in IPOs expected to be hot, we would only observe a positive effect on price adjustment in such IPOs, followed by excess underpricing that benefits regular investors because of the smaller partial adjustment (H1).

Finally, given the long time span of our sample, we split our analysis into subperiods marked by important events: the bursting of the 2001 Internet bubble, the subprime-related financial crisis in 2008, and the 2010 FINRA regulation on IPO allocations. The results (Table 10) confirm previous conclusions for all subperiods except after 2010, where the coefficients are still positive but lose significance. A possible explanation is that, in 2010, FINRA Rule 5131 asked for greater transparency on the IPO process, reducing the room for underwriters to act opportunistically in favor of their regular investors. Eventually, it seems that the new regulation weakened the win-win outcome for both issuers and regular investors.

7 | ALTERNATIVE MODELS AND ROBUSTNESS OF RESULTS

In this section, we present alternative models to improve our understanding of the results above and to verify that they are robust to different specifications.

The first alternative model we propose is one with lead underwriter fixed effects. So far, the interpretation of our results is indeed that IPOs managed by different lead underwriters have different levels of relationships and different pricing effects. By introducing lead underwriter fixed effects, we focus on the time-variant dimension and test if their behavior is still driven by the relationships. If the results are robust, we would have further confirmation that the pricing effects we discussed are driven by the relationships.

The positive sign and statistical significance of the interaction term in Table 11 confirms the presence of excess underpricing when relationships are stronger, even after controlling for the lead underwriter's identity; conversely, the underpricing is no more significantly affected by the relationships alone. Therefore, the lead underwriter fixed effects model corroborates our contribution, since the partial adjustment framework we introduce proves to be crucial in fully investigating the possible effects of investor–underwriter relationships on underpricing.

To fully highlight our incremental contribution, we now replicate the model of Binay et al. (2007) and run it with LU fixed effects.[18] The results are presented in Table 12 and show that the significance of the relationship measures disappears when the LU fixed effects are introduced. Therefore, the results of Binay et al. become questionable, in that they are likely

[17]It might be useful to add that fees paid by the issuer to the global coordinator do not change according to underwriter–investor relationships: they amount to an average of 6.2% of the total IPO value if relationships are in place, and to 6.7% without such relationships.

[18]We also run our model under the methodology of Binay et al. (2007), in a seemingly unrelated regression model, where underpricing and relationships are simultaneously determined. Our results remain unchanged (see Table A2in the Appendix).

TABLE 10 Underwriter–investor relationship effects on price adjustment and underpricing in subperiods

This table presents the estimation of Equations (15) and (13) in relevant subperiods. PA is the price adjustment (the percentage difference between the final offer price and the midpoint of the initial filing price range); UP is the underpricing (the percentage difference between the first trading day closing market price and the IPO offer price, net of the market return); Weighted PR LU is the average number of relationships where each pair of past relationships between the lead underwriter and the institutional investor are weighted with the allocations received by the latter; LU_N is the number of lead underwriters of the IPO; $D_{Lock\text{-}up}$ is a dummy variable that is equal to 1 when VCs have a lockup obligation, and 0 otherwise; D_{VC} is a dummy that is equal to 1 when the IPO is venture backed, and 0 otherwise; LU Reputation is measured by the Carter–Manaster ranking; Size is the natural logarithm of the total assets of the company reported before the IPO; D_{Tech} is a dummy variable that is equal to 1 if the company is in a high-tech industry, and 0 otherwise; RM_{bb} measures the equity market return during the 2 weeks before the IPO (bookbuilding interval); and II_{pct} is the percentage of shares held by all institutional investors after the IPO. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

	1997–2001		**2002–2008**		**2009–2010**		**2011–2016**	
	PA	**UP**	**PA**	**UP**	**PA**	**UP**	**PA**	**UP**
PA		0.962***		0.316***		0.110		0.243***
		7.632		4.305		0.764		2.764
Weighted PR LU	0.084***	0.067	0.008	−0.016	0.076	0.133***	0.037**	0.022
	2.728	1.152	0.334	−0.596	1.277	2.858	2.339	0.999
Weighted PR LU × PA		0.578***		0.236**		0.333*		0.147
		3.618		2.322		1.979		1.178
LU_N	−0.010	−0.057	−0.008	−0.011	−0.001	−0.035	0.003	0.006
	−0.315	−0.959	−0.394	−0.729	−0.011	−0.860	0.277	0.422
$D_{Lock\text{-}up}$	−0.101***	0.057	0.020	0.064***	0.131***	0.042	−0.018	−0.012
	−4.957	1.487	0.700	2.878	2.926	0.859	−1.442	−0.722
D_{VC}	−0.012	0.010	−0.004	−0.003	0.033	−0.034	−0.006	0.002
	−0.682	0.299	−0.320	−0.305	0.845	−1.242	−0.478	0.088
LU Reputation	0.010	0.038**	0.016**	0.019***	−0.027*	0.009	0.006**	0.001
	1.398	2.548	2.510	3.550	−1.851	0.777	1.989	0.230
Size	−0.013*	−0.038***	−0.002	−0.013***	0.016	−0.016	0.002	0.004
	−1.950	−3.271	−0.308	−2.767	0.958	−1.608	0.626	0.925
D_{Tech}	0.100***	0.087	0.017	−0.067*	0.010	−0.109*	−0.145**	−0.030
	2.588	1.032	0.406	−1.953	0.108	−1.809	−1.974	−0.350
RM_{bb}	0.868***	1.306***	0.480*	0.342*	0.165	0.264	0.822	0.078
	5.401	4.102	1.873	1.727	0.366	0.873	1.181	0.090
II_{pct}	0.087***	−0.067	0.049*	0.060***	−0.017	0.056	0.212***	−0.071
	2.603	−0.935	1.791	2.862	−0.309	1.233	3.650	−1.030

(Continues)

TABLE 10 (Continued)

	1997–2001		2002–2008		2009–2010		2011–2016	
	PA	UP	PA	UP	PA	UP	PA	UP
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	−0.084	0.011	−0.228***	−0.009	−0.054	0.069	−0.107**	0.083
	−1.384	0.088	−3.450	−0.162	−0.348	0.573	−2.274	1.291
Observations	867	867	675	675	126	126	869	869
R^2	0.222	0.487	0.148	0.358	0.318	0.445	0.151	0.120

driven by between variation and are not robust to a time-variant specification of the model. This evidence further strengthens the reliability of our model in which the introduction of the interaction term captures the partial adjustment behavior, leading to a better understanding of the excess underpricing.

The second alternative model we propose is one that uses a measure capturing a different dimension of the relationships, namely, their level of diffusion (as defined by Equation 11). For any given level of relationship measure in an IPO, diffusion represents the extent to which information has been extracted by a plurality of institutional investors. The results presented in Table 11 show that the interaction term (representing the change in the partial adjustment) is positive and significant. From this, we can supplement previous results with the following interpretation: more diffused relationships lead to excess underpricing, which means that many (instead of fewer) regular investors are more likely to be compensated with higher underpricing. Furthermore, greater relationship diffusion is beneficial to the price adjustment, which confirms our expectations (see the discussion in Section 4) that greater diffusion improves the information production process. Again, when we split our IPOs between hot and cold, the effect on partial adjustment is only confirmed among the former (columns (4) and (6)) (Table 13).

Another dimension we explore is that of multiple lead underwriters, which happens fairly often in medium and large IPOs. Given that each lead underwriter could have his or her own group of regular investors, such an analysis should reveal whether the relationships of all lead underwriters, rather than just the first one, add to our results. Thus, we run our models with the relationship measures while referring to all lead underwriters (Table 12). The results do not change, nor does the explanatory power of the models improve, suggesting that the important regular investor group belongs mostly to the first lead underwriter (Table 14).[19]

We also deepen the analysis of lead underwriter quality, splitting the sample into subsamples, differentiating those with a top reputation level[20] from the others and between top lead underwriters in terms of the number of IPOs they have managed. We find that the win-win mechanism holds only in the subsample of top-reputation lead underwriters and in the subsample of lead underwriters who managed at least 30 IPOs in the whole period.[21] This result

[19]Another interpretation could be that the other lead underwriters in an IPO usually have the same relationships as the first lead underwriter.

[20]The lead underwriter ranking equals nine, involving 60% of the sample.

TABLE 11 Underwriter–investor relationships and underpricing with lead underwriter fixed effects

This table presents the estimation of Equations (12) and (13) with lead underwriter fixed effects. UP is the underpricing (the percentage difference between the first trading day closing market price and the IPO offer price, net of the market return); PA is the price adjustment (the percentage difference between the final offer price and the midpoint of the initial filing price range); Average PR LU is the average number of past relationships between the first lead underwriter and the institutional investors participating in the IPO in the semester preceding the deal; Excess PR LU corrects the previous indicator for the average relationship of all IPOs in the same quarter as the IPO considered; Weighted PR LU weights each pair of past relations between the lead underwriter and the institutional investor with the allocations received by the latter; LU_N is the number of lead underwriters of the IPO; $D_{Lock\text{-}up}$ is a dummy variable that is equal to 1 when VCs have a lockup obligation, and 0 otherwise; D_{VC} is a dummy that is equal to 1 when the IPO is venture backed, and 0 otherwise; LU Reputation is measured by the Carter–Manaster ranking; Size is the natural logarithm of the total assets of the company reported before the IPO; D_{Tech} is a dummy variable that is equal to 1 if the company is in a high-tech industry, and 0 otherwise; RM_{bb} measures the equity market return during the 2 weeks before the IPO (bookbuilding interval); and II_{pct} is the percentage of shares held by all institutional investors after the IPO. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	UP	UP	UP	UP	UP	UP
PA	0.898***	0.620***	0.899***	0.562***	0.897***	0.582***
	18.130	6.212	18.193	7.147	18.225	6.455
Average PR LU	−0.000	0.000				
	−0.007	0.019				
Average PR LU × PA		0.087***				
		2.851				
Excess PR LU			0.015	0.014		
			0.493	0.453		
Excess PR LU × PA				0.494***		
				4.504		
Weighted PR LU					0.005	0.007
					0.715	0.893
Weighted PR LU × PA						0.099***
						3.543
LU_N	−0.039***	−0.036**	−0.039***	−0.032**	−0.039***	−0.037**
	−2.644	−2.484	−2.638	−2.195	−2.677	−2.530
$D_{Lock\text{-}up}$	−0.032*	−0.029	−0.032*	−0.026	−0.032*	−0.029
	−1.654	−1.513	−1.656	−1.356	−1.663	−1.498
D_{VC}	0.003	0.004	0.003	0.003	0.003	0.004
	0.230	0.269	0.223	0.214	0.211	0.266
LU Reputation	0.013	0.016	0.013	0.017	0.013	0.016
	1.237	1.522	1.229	1.584	1.232	1.543

(Continues)

TABLE 11 (Continued)

	(1) UP	(2) UP	(3) UP	(4) UP	(5) UP	(6) UP
Size	−0.021***	−0.020***	−0.021***	−0.020***	−0.021***	−0.020***
	−4.277	−4.217	−4.262	−4.172	−4.281	−4.222
D_{Tech}	0.045	0.052	0.045	0.053	0.045	0.053
	0.817	0.958	0.815	0.964	0.816	0.968
RM_{bb}	1.256***	1.244***	1.255***	1.231***	1.258***	1.252***
	4.900	4.878	4.896	4.832	4.907	4.922
II_{pct}	−0.014	−0.010	−0.014	−0.009	−0.014	−0.008
	−0.379	−0.286	−0.385	−0.243	−0.391	−0.218
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
LU fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.235***	0.200***	0.236***	0.186**	0.236***	0.196***
	3.185	2.678	3.201	2.526	3.203	2.635
Observations	2537	2537	2537	2537	2537	2537
R^2	0.457	0.461	0.457	0.468	0.457	0.463

suggests that lead underwriter quality matters more than quantity (with only 30 IPOs being sufficient for providing the win-win mechanism resulting from relationships).

8 | CONCLUSIONS

In this paper, we analyzed the effects of underwriter–institutional investor relationships on IPO pricing. Previous empirical literature revealed a positive informational effect of regular investors on the offer price, while underwriters' opportunistic behaviors can impact allocation. However, no contribution in the literature has directly studied how the partial adjustment changes depend on the strength of underwriter–investor relationships.

To address this gap, we investigated the overall effect of underwriter–investor relationships on the different stages of IPO pricing, namely primary and secondary markets, from both the issuers' and investors' perspectives. As a first contribution, we studied how regular investors influence the partial adjustment, showing that underwriters provide regular investors with excess underpricing that grows as relationships become stronger, suggesting an agency cost paid by the issuers. Nonetheless, we also find evidence of a positive effect that stronger

[21]We tried several cutoff levels and found 30 deals to be the determinant threshold, reached in our sample by 23 lead underwriters. The results are available on request.

TABLE 12 Replication of the model of Binay et al. (2007) with and without lead underwriter fixed effects

This table presents the estimation of the model of Binay et al. (2007) with lead underwriter fixed effects. The term UP is the underpricing (the percentage difference between the first trading day closing market price and the IPO offer price, net of the market return); PA is the price adjustment (the percentage difference between the final offer price and the midpoint of the initial filing price range); Average PR LU is the average number of past relationships between the first lead underwriter and the institutional investors participating in the IPO in the semester preceding the deal; Excess PR LU corrects the previous indicator for the average relationship of all IPOs in the same quarter as the IPO considered; Weighted PR LU weights each pair of past relations between the lead underwriter and the institutional investor with the allocations received by the latter; LU_N is the number of lead underwriters of the IPO; $D_{Lock\text{-}up}$ is a dummy variable that is equal to 1 when VCs have a lockup obligation, and 0 otherwise; D_{VC} is a dummy that is equal to 1 when the IPO is venture backed, and 0 otherwise; LU Reputation is measured by the Carter–Manaster ranking; Size is the natural logarithm of the total assets of the company reported before the IPO; D_{Tech} is a dummy variable that is equal to 1 if the company is in a high-tech industry, and 0 otherwise; RM_{bb} measures the equity market return during the 2 weeks before the IPO (bookbuilding interval); and II_{pct} is the percentage of shares held by all institutional investors after the IPO. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

	Without LU fixed effects			**With LU fixed effects**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	UP	**UP**	**UP**	**UP**	**UP**	**UP**
PA	0.918***	0.910***	0.909***	0.898***	0.900***	0.897***
	26.704	26.412	26.354	25.125	25.193	25.162
Average PR LU	0.023***			−0.001		
	3.649			−0.093		
Excess PR LU		0.099***			0.033	
		4.674			0.974	
Weighted PR LU			0.026***			0.009
			4.375			1.026
LU_N	−0.025	−0.025	−0.027	−0.039**	−0.039**	−0.039**
	−1.460	−1.442	−1.548	−2.155	−2.150	−2.178
$D_{Lock\text{-}up}$	−0.029	−0.027	−0.029	−0.032	−0.032	−0.032
	−1.620	−1.485	−1.594	−1.626	−1.629	−1.635
D_{VC}	−0.000	0.000	−0.000	0.003	0.003	0.003
	−0.005	0.030	−0.005	0.235	0.228	0.215
LU Reputation	0.002	−0.001	0.000	0.013	0.013	0.013
	0.305	−0.180	0.057	1.138	1.118	1.129
Size	−0.017***	−0.018***	−0.018***	−0.021***	−0.021***	−0.021***
	−3.438	−3.538	−3.598	−4.028	−3.998	−4.049
D_{Tech}	0.030	0.031	0.031	0.045	0.045	0.045
	0.711	0.739	0.738	1.066	1.059	1.061

(Continues)

TABLE 12 (Continued)

	Without LU fixed effects			With LU fixed effects		
	(1)	(2)	(3)	(4)	(5)	(6)
	UP	UP	UP	UP	UP	UP
RM_{bb}	1.293***	1.289***	1.295***	1.256***	1.255***	1.257***
	6.677	6.659	6.690	6.470	6.461	6.475
II_{pct}	−0.015	−0.013	−0.015	−0.014	−0.014	−0.014
	−0.452	−0.401	−0.452	−0.412	−0.417	−0.424
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
LU fixed effects	NO	NO	NO	Yes	Yes	Yes
Constant	0.261***	0.301***	0.263***	0.276***	0.263***	0.256***
	3.860	4.445	3.890	3.005	2.906	2.800
Observations	2537	2537	2537	2537	2537	2537
R^2	0.441	0.441	0.441	0.457	0.457	0.457

TABLE 13 IPO relationship diffusion, price adjustment and underpricing

This table presents the estimation of Equation (13) with the measure of relationships' diffusion. Columns (1) and (2) present the results over the full sample. Columns (3) and (4) show the results for hot and cold IPOs, separately, defined as having, respectively, underpricing above and below the median, while columns (5) and (6) distinguish between hot and cold IPOs according to the median underpricing of the quarter of the IPO. PA is the price adjustment (the percentage difference between the final offer price and the midpoint of the initial filing price range); UP is the underpricing (the percentage difference between the first trading day closing market price and the IPO offer price, net of the market return); Diffusion PR LU is one minus the relationship concentration, measured as the Herfindahl index of the lead underwriter and institutional investors' past interactions; LU_N is the number of lead underwriters of the IPO; $D_{Lock\text{-}up}$ is a dummy variable that is equal to 1 when VCs have a lockup obligation, and 0 otherwise; D_{VC} is a dummy that is equal to 1 when the IPO is venture backed, and 0 otherwise; LU Reputation is measured by the Carter–Manaster ranking; Size is the natural logarithm of the total assets of the company reported before the IPO; D_{Tech} is a dummy variable that is equal to 1 if the company is in a high-tech industry, and 0 otherwise; RM_{bb} measures the equity market return during the 2 weeks before the IPO (bookbuilding interval); and II_{pct} is the percentage of shares held by all institutional investors after the IPO. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

	PA	UP	Cold UP	Hot UP
PA		−0.079	−0.004	0.192
		−0.341	−0.036	1.021
Diffusion PR LU	0.190***	0.149***	0.072***	0.003
	6.191	2.885	2.641	0.025

TABLE 13 (Continued)

	PA	UP	Cold UP	Hot UP
Diffusion PR LU × PA		0.987***	0.172	0.648***
		4.260	1.457	3.766
LU_N	−0.003	−0.021	−0.005	−0.042
	−0.379	−1.603	−0.769	−1.524
$D_{Lock\text{-}up}$	−0.066***	−0.031	−0.002	−0.048*
	−6.172	−1.592	−0.299	−1.717
D_{VC}	−0.006	0.000	−0.000	0.033
	−0.714	0.031	−0.074	1.473
LU Reputation	0.011***	0.010***	−0.001	0.002
	4.668	2.778	−0.545	0.309
Size	−0.002	−0.016***	−0.001	−0.021**
	−0.691	−3.446	−0.453	−2.481
D_{Tech}	0.037	0.037	0.024	0.026
	1.393	0.676	1.299	0.415
RM_{bb}	0.750***	1.205***	0.596***	1.365***
	5.741	4.734	7.181	4.620
II_{pct}	0.062***	−0.019	0.069***	−0.054
	3.309	−0.548	4.864	−1.047
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Constant	−0.257***	0.095	−0.045	0.446***
	−6.704	1.412	−1.447	3.450
Observations	2537	2537	1293	1244
R^2	0.227	0.451	0.312	0.580

relationships have on the offer price (an excess price adjustment consistent with bookbuilding theory) that favors issuers. Such an apparently contradictory result is only possible in the presence of value creation generated by a reduction in information asymmetry, as well as the uncertainty that results from the information provided by regular investors in the primary market. The value created is then shared between issuers and regular investors, leading to a win-win outcome among both regular investors and issuers.

We then separately analyzed hot and cold IPOs under the intuition that the degree of incentive towards regular investors could depend on how easily the IPO can be completed. We

TABLE 14 All IPO lead underwriters' relationships with investors, price adjustment and underpricing

This table presents the results of Equations (15) and (13), where the relationship indicators are computed considering all lead underwriters participating in the IPO; PA is the price adjustment (the percentage difference between the final offer price and the midpoint of the initial filing price range); UP is the underpricing (the percentage difference between the first trading day closing market price and the IPO offer price, net of the market return); Average PR ALU is the average number of past relationships between all lead underwriters and the institutional investors participating in the IPO in the semester preceding the deal; Excess PR ALU corrects the previous indicator for the average relationship of all IPOs in the same quarter; Weighted PR ALU weights each pair of past relations between the lead underwriter and the institutional investor with the allocations received by the latter; LU_N is the number of lead underwriters of the IPO; $D_{Lock\text{-}up}$ is a dummy variable that is equal to 1 when VCs have a lockup obligation, and 0 otherwise; D_{VC} is a dummy that is equal to 1 when the IPO is venture backed, and 0 otherwise; LU Reputation is measured by the Carter–Manaster ranking; Size is the natural logarithm of the total assets of the company reported before the IPO; D_{Tech} is a dummy variable that is equal to 1 if the company is in a high-tech industry, and 0 otherwise; RM_{bb} measures the equity market return during the 2 weeks before the IPO (bookbuilding interval); and II_{pct} is the percentage of shares held by all institutional investors after the IPO. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

	(1) PA	(2) PA	(3) PA	(4) UP	(5) UP	(6) UP
PA				0.608***	0.514***	0.781***
				6.099	6.740	8.594
Average PR ALU	0.012***			0.014**		
	3.029			2.225		
Average PR ALU × PA				0.099***		
				3.186		
Excess PR ALU		0.069***			0.051**	
		4.811			2.175	
Excess PR ALU × PA					0.627***	
					5.390	
Weighted PR ALU			0.020***			0.015***
			5.482			2.652
Weighted PR ALU × PA						0.038
						1.566
LU_N	−0.004	−0.002	−0.026**	−0.022*	−0.012	−0.038**
	−0.382	−0.242	−2.374	−1.648	−0.937	−2.526
$D_{Lock\text{-}up}$	−0.065***	−0.061***	−0.063***	−0.022	−0.011	−0.027
	−6.045	−5.658	−5.892	−1.109	−0.578	−1.346
D_{VC}	−0.006	−0.005	−0.006	0.001	0.002	0.000
	−0.667	−0.588	−0.683	0.093	0.163	0.027

TABLE 14 (Continued)

	(1) PA	(2) PA	(3) PA	(4) UP	(5) UP	(6) UP
LU Reputation	0.009***	0.007***	0.006***	0.007*	0.007*	0.006
	3.804	2.743	2.587	1.731	1.895	1.476
Size	−0.002	−0.003	−0.003	−0.016***	−0.016***	−0.017***
	−0.710	−0.984	−1.162	−3.471	−3.551	−3.616
D_{Tech}	0.038	0.038	0.038	0.040	0.040	0.035
	1.393	1.426	1.425	0.743	0.751	0.647
RM_{bb}	0.752***	0.750***	0.754***	1.265***	1.226***	1.297***
	5.736	5.741	5.779	5.031	4.895	5.137
II_{pct}	0.073***	0.074***	0.072***	−0.010	−0.004	−0.013
	3.854	3.951	3.845	−0.300	−0.122	−0.360
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	−0.102***	−0.090***	−0.092***	0.212***	0.198***	0.232***
	−3.575	−3.175	−3.231	4.080	3.866	4.469
Observations	2537	2537	2537	2537	2537	2537
R^2	0.222	0.226	0.229	0.447	0.458	0.443

found that underwriters demonstrate favoritism towards regular investors in hot IPOs, with lower excess underpricing observed in cold IPOs.

Overall, we concluded that issuers are better off when regular investors contribute to the bookbuilding, because offer prices will be higher in both hot and cold IPOs, leading to higher IPO proceeds. This is a gain for issuers, regardless of whether more money is left on the table, especially in hot IPOs, since the excess underpricing is ultimately an implicit cost. This evidence helps to explain why bookbuilding still represents the dominant method of bringing companies public in the United States and many other countries.

At the same time, institutional investors are similarly better off when they have strong relationships with underwriters, possibly earning overall higher returns from their investments. Whether this is true and why some investors exploit such opportunities more than others are left as questions for future research.

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CONFLICT OF INTERESTS

The authors declare no conflict of interests.

DATA AVAILABILITY STATEMENT

Data subject to third party restrictions—The main data that support the findings of this study are available from Refinitiv (the provider was Thomson Reuters at the time). Restrictions apply to the availability of these data, which were used under license for this study. Data are available from the authors with the permission of Refinitiv.

ORCID

Manuela Geranio https://orcid.org/0000-0003-0084-5225
Camilla Mazzoli https://orcid.org/0000-0002-8453-2607
Fabrizio Palmucci https://orcid.org/0000-0002-8786-2409

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APPENDIX A

Tables A1 and A2.

TABLE A1 Underwriter–investor relationships and primary market pricing measures: Standardized price adjustment

This table presents the estimation of Equation (15) with a standardized version of the price adjustment (PA), computed as the price adjustment divided by the initial price range (PA/IPR). In this table, Average PR LU is the average number of past relationships between the first lead underwriter and the institutional investors participating in the IPO in the semester preceding the deal; Excess PR LU corrects the previous indicator for the average relationship of all IPOs in the same quarter as the IPO considered; Weighted PR LU weights each pair of past relations between the lead underwriter and the institutional investor with the allocations received by the latter; LU_N is the number of lead underwriters of the IPO; $D_{Lock\text{-}up}$ is a dummy variable that is equal to 1 when VCs have a lockup obligation, and 0 otherwise; D_{VC} is a dummy that is equal to 1 when the IPO is venture backed, and 0 otherwise; LU Reputation is measured by the Carter–Manaster ranking; Size is the natural logarithm of the total assets of the company reported before the IPO; D_{Tech} is a dummy variable that is equal to 1 if the company is in a high-tech industry (as defined by the Thomson Financial Macro Sectors classification, which includes software, semiconductors, and information technology), and 0 otherwise; RM_{bb} measures the equity market return during the 2 weeks before the IPO (bookbuilding interval); and II_{pct} is the percentage of shares held by all institutional investors after the IPO. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

	Standardized PA		
Average PR LU	0.046*		
	1.815		
Excess PR LU		0.113***	
		4.535	
Weighted PR LU			0.293***
			3.511
LU_N	−0.006	−0.031	−0.013
	−0.081	−0.421	−0.182
D_{Lock_up}	−0.450***	−0.426***	−0.429***
	−5.894	−5.611	−5.639
D_{VC}	−0.036	−0.038	−0.035
	−0.600	−0.642	−0.589
LU Reputation	0.072***	0.046**	0.055***
	3.638	2.339	2.772
Size	−0.013	−0.021	−0.017
	−0.656	−1.016	−0.825
D_{Tech}	0.167	0.170	0.169
	0.969	0.993	0.979
RM_{bb}	4.654***	4.674***	4.642***
	5.420	5.462	5.416

TABLE A1 (Continued)

	Standardized PA		
II_{pct}	0.534***	0.536***	0.542***
	4.135	4.177	4.211
Industry dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Constant	−0.677***	−0.603***	−0.590***
	−3.247	−2.910	−2.808
Observations	2,352	2,352	2,352
R^2	0.214	0.220	0.217

TABLE A2 Systems of equations with underpricing and relationship measures as dependent variables

This table presents the estimation of a simultaneous equations model similar to that of Binay et al. (2007) with different relationship measures. UP is the underpricing (the percentage difference between the first trading day closing market price and the IPO offer price, net of the market return); PA is the price adjustment (the percentage difference between the final offer price and the midpoint of the initial filing price range); Average PR LU is the average number of past relationships between the first lead underwriter and the institutional investors participating in the IPO in the semester preceding the deal; Excess PR LU corrects the previous indicator for the average relationship measure of all IPOs in the same quarter; Weighted PR LU weights each pair of past relations between the lead underwriter and the institutional investor with the allocations received by the latter; LU_N is the number of lead underwriters of the IPO; $D_{Lock\text{-}up}$ is a dummy variable that is equal to 1 when VCs have a lockup obligation; D_{VC} is a dummy that is equal to 1 when the IPO is venture backed, and 0 otherwise; LU Reputation is measured by the Carter–Manaster ranking; Size is the natural logarithm of the total assets of the company reported before the IPO; D_{Tech} is a dummy variable that is equal to 1 if the company is in a high-tech industry, and 0 otherwise; RM_{bb} measures the equity market return during the 2 weeks before the IPO (bookbuilding interval); and II_{pct} is the percentage of shares held by all institutional investors after the IPO. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

	(1)		(2)		(3)	
	UP	Average PR LU	UP	Excess PR LU	UP	Weighted PR LU
PA	0.655***	0.108	0.584***	0.079**	0.612***	0.360***
	9.242	0.868	10.279	2.142	9.122	2.748
UP		0.216***		0.085***		0.271***
		3.401		4.558		4.070
Average PR LU	0.023***					
	3.720					
Average PR LU × PA	0.083***					
	4.241					
Excess PR LU			0.094***			
			4.492			

(Continues)

TABLE A2 (Continued)

	(1)		(2)		(3)	
	UP	**Average PR LU**	**UP**	**Excess PR LU**	**UP**	**Weighted PR LU**
Excess PR LU × PA			0.485***			
			7.174			
Weighted PR LU					0.027***	
					4.523	
Weighted PR LU × PA					0.094***	
					5.149	
LU_N	−0.022		−0.016		−0.024	
	−1.274		−0.918		−1.384	
$D_{Lock\text{-}up}$	−0.023		−0.015		−0.022	
	−1.289		−0.859		−1.213	
D_{VC}	0.001		0.002		0.002	
	0.088		0.115		0.112	
LU Reputation	0.002	0.394***	0.001	0.116***	0.001	0.396***
	0.485	27.903	0.222	27.887	0.238	26.722
Size	−0.017***	0.119***	−0.017***	0.033***	−0.018***	0.141***
	−3.372	7.472	−3.477	7.014	−3.558	8.475
D_{tech}	0.037	0.080	0.038	0.005	0.038	0.030
	0.881	0.591	0.911	0.128	0.909	0.207
RM_{bb}	1.270***		1.249***		1.279***	
	6.579		6.520		6.639	
II_{pct}	−0.011		−0.007		−0.008	
	−0.331		−0.199		−0.244	
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.232***	−1.324***	0.236***	−0.543***	0.233***	−1.477***
	4.272	−8.288	4.363	−11.548	4.309	−8.815
Observations	2537	2537	2537	2537	2537	2537
R^2	0.445	0.431	0.452	0.350	0.447	0.439