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The valuation of IPOs and its influence on a private firm's exit decision

Doctoral Dissertation

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When you want to build a ship
do not begin by gathering wood, cutting boards, and distributing work
but awaken within the heart of men the desire for the vast and endless sea

Antoine de Saint-Exupéry, *The Wisdom of the Sands* (1948)

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ABSTRACT

The current research investigates the valuation of companies going public in different phases of the IPO process, and unveils the implication that such valuation may have on a private firm's exit decision. The first paper focuses on how IPO firms are valued. Specifically, we analyze how underwriters make use of the discretion in the selection of comparable firms when valuing IPOs. Differently from the US, the peers chosen by underwriters are frequently published in European prospectuses. We take advantage of such an extensive disclosure to investigate how underwriters select comparable firms. We document that underwriters perform a biased, left-truncated selection, as they omit those with the poorest valuations compared to peers selected by sell-side analysts or obtained from matching algorithms. On average, comparable firms published in official prospectuses have 13.5% to 36.9% higher valuation multiples than those of alternatively selected peers. Even if IPOs are priced at a discount compared to the peers selected by the underwriters, they still are priced at a premium with regards to alternatively selected peers. These results persist even by considering peers chosen by the same underwriter who provides analyst coverage to the same firm after the IPO. We argue that underwriters adopt such behavior to obtain higher IPO valuations that still look conservative in the eye of investors.

The second paper deals with the aftermarket valuation of IPOs, focusing on the relation between the fees paid to IPO underwriters and the services they provide to the issuer, such as price stabilization. Controlling for the characteristics of the firm going public, the risk associated with the offering, and the reputation of the underwriter, we study whether a formal commitment by underwriters to provide ancillary services allows them to charge higher fees. Using a sample of IPOs in Italy, we document that asking underwriters to support aftermarket valuation (i.e., stabilize stock price) is costly to the issuer, while to support liquidity is not. We also show that underwriters stabilize IPOs that really need it, whereas the provision of liquidity support does not seem to be always aligned with the issuer's interest.

The third paper examines how the possibility to go public and be acquired shortly thereafter (two-stage exit) at a higher valuation alters a private firm's initial exit trade-

off between IPO and acquisition. We find that firms that suffer from greater information asymmetry and more severe financial constraints are more likely to go public before being acquired, rather than be directly acquired when still private. After controlling for listing costs and endogeneity in the exit choice, these firms benefit from a 77% higher valuation, on average, than that obtained by similar private targets found using propensity score matching. On the other hand, we shed light on the risk associated with two-stage exits, such as the inability to find an acquirer or the risk of being delisted after the IPO. We document that more successful firms, both on the financial and product market, are more likely to attract an acquirer, while less successful firms face a higher probability of being delisted. The valuation of these firms ends up being similar to what they would have obtained by directly selling out when still private.

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CHAPTER ONE.

Introduction

One of the main reasons pushing companies to conduct an Initial Public Offering (IPO) is to establish a publicly observable market value for the firm (Brau and Fawcett, 2006; Bancel and Mittoo, 2009). The valuation a company is able to obtain when going public is crucial not only for the success of the IPO decision per se, but also because it determines the availability of capital that can be invested to sustain the firm's growth. The process of valuing IPO firms is extremely challenging, as these are often young, entrepreneurial companies with limited track records and uncertain growth prospects. Nevertheless, very little is known about how the valuation of the companies going public is set. For instance, there is no publicly available information on how investment banks value IPO firms in the United States. In contrast, the European Securities and Markets Authority (ESMA) recommends disclosure of the valuation methods used to determine the offer price, although disclosure policies vary by country.

Once the valuation of the IPO firm is set and trading activity begins, the initial offer price is subject to the market equilibrium. On average, IPOs experience a positive return after the first day of trading, namely underpricing (Ritter, 1987). A negative return would suggest that the market has considered the company overvalued at the time of the offering. To avoid sending such a bad signal to the market, issuers can ask underwriters to sustain their stock price and prevent it from falling below the primary market valuation (Ruud, 1993). This service is called price stabilization, with underwriters buying shares during the first month of trading to avoid price drops that would result in a poor performance of the newly listed firm. This activity clearly affects the valuation of the company, and is therefore crucial for its success on the financial market (Ellis, Michaely, and O'Hara, 2000). Therefore, an issuer may be willing to pay a higher fee to an investment bank who guarantees support to its aftermarket valuation. As in the case of establishing the company's primary market value, the underwriters' conduct after the offering, when price is supported, remains opaque (Aggarwal, 2000).

Both primary and secondary market valuations of IPO firms play a role in a private firm's exit decision. In recent years, a private firm is much more likely to be acquired than to go public because valuations obtained in M&As are increasingly better than

those recognized by the public market (Gao, Ritter, and Zhu, 2013). Existing empirical analyses of IPOs versus acquisitions treat private firms' exit decision as a one-time choice between the two (e.g., Poulsen and Stegemoller, 2008; Chemmanur, He, He, and Nandy, 2012). However, a significant proportion of firms first go public and is acquired shortly thereafter, exploiting the possibility to sell at a better valuation than that otherwise obtained by directly selling out as private firms (e.g., Brau, Sutton, and Hatch, 2010). Firms that choose to go public are able to increase their valuation as potential targets because IPOs can ameliorate inefficiencies of the M&A market in a number of ways. For instance, by successfully going through the listing process, a firm reduces information asymmetry faced by potential acquirers; it enhances liquidity of its shares by becoming a publicly traded company; and it may invest the fresh capital raised during the IPO to exploit its growth opportunities. Since the option to undertake such a two-stage exit path affects the private firm's initial trade-off between IPO and acquisition, this choice may be better modelled as a dynamic rather than a one-time decision.

1.1 PURPOSE

The purpose of this research is to shed light on the way in which the valuation of IPO firms is determined, how and at what cost it is supported in the aftermarket, and how it influences a private firm's exit strategy. The first paper investigates how firms going public are valued by investment banks. The value of companies going public often needs to be established without observing any prior market valuation. Given the substantial uncertainty surrounding IPO firms, forecasting future cash flows can be difficult and may undermine the reliability of the discounted cash flow method (Kim and Ritter, 1999). Therefore, the most common technique for valuing IPOs is the use of comparable firm multiples (Ritter and Welch, 2002). We take advantage of the availability of information in Europe to investigate how underwriters carry out this methodology, especially focusing on how they select comparable firms. This issue is of interest because underwriters face a trade-off in the selection of peers. On the one hand, they seek high valuation to increase the issuer's proceeds and immediate profit from fees. On the other hand, they may intentionally limit valuation to ensure a certain level

of underpricing and stimulate investor demand. We argue that underwriters have the possibility to exploit the discretion in peer selection to raise the valuation of the firm going public and, at the same time, to attract investors' attention by presenting the IPO as discounted. The main research question of the first paper is then the following: do underwriters select mostly comparable firms with the highest valuation multiples, in order to raise the offer price and still make the IPO look discounted compared to peers published in the prospectus?

The second paper focuses on the ancillary services provided by underwriters to the companies they take public, such as price stabilization and liquidity support. Official prospectus declarations disclose whether underwriters are 'available' to provide ancillary services, but their provision is not compulsory. The first research question of the paper is aimed at testing whether underwriters are able to charge higher fees for being ready to sustain the issuer's valuation and/or liquidity after the IPO. Furthermore, since a legally binding contract could be too costly to define and enforce (Lewellen, 2006), underwriters do not specify ex-ante any detail about their commitment, i.e. when they should intervene and to what extent. As a consequence, they may have an incentive to engage in trading activities to make their own profits (Ellis, Michaely, and O'Hara, 2000), or they may be reluctant to stabilize the price or to support liquidity when it is too costly. The second research question is therefore aimed at investigating whether underwriters are aligned with the issuer's interest when supplying ancillary services in the aftermarket.

If the valuation of the firm at the IPO is satisfactory, and the market's positive assessment is confirmed also after the beginning of trading activity, private firms looking for an acquirer may consider the possibility to go public before selling out, in order to obtain a better valuation as target. The third paper investigates how this opportunity affects a private firm's initial exit trade-off between IPO and acquisition. We attempt to assess benefits and costs of a two-stage exit (IPO and subsequent acquisition) over a direct acquisition as a private firm, which, in turns, allow us to draw implications for a firm's dynamic choice between IPOs and acquisitions. First, we compare firms that are directly acquired as private with those that first go public and are acquired subsequently. We address two research questions: what are the characteristics of firms that choose to be acquired directly as private firms versus first going public and

being subsequently acquired? What is the valuation premium, if any, obtained by firms that go through a two-stage exit? We consider several dimensions in assessing the benefits a firm could obtain from a two-stage exit, such as the level of information asymmetry towards potential buyers, the firm's degree of liquidity, the possibility to exploit its growth opportunities, and its viability on the financial and product market. However, the decision to go public before selling out entails some risks compared to the immediate acquisition. For instance, firms may convey a negative signal if the IPO turns out to be unsuccessful, resulting in the inability to find an acquirer; or, by delaying the sellout, the firm may endanger its survival by remaining independent and exposing itself to product market competition. Thus, we investigate three possible post-IPO scenarios faced by a firm: remain stand-alone; be acquired; be delisted. Again, we address two research questions. First, what are the characteristics of firms that go through each of the above three scenarios? Second, we compare the payoffs (valuations) associated with each outcome, and compare them to the valuations obtained by private firms in a direct acquisition.

1.2 EMPIRICAL DESIGN

The empirical setting of this research is the European market. Our main source of information is the EurIPO database, covering more than 4,000 companies going public in Europe during the period 1995-2012. It includes offerings on official (regulated) and second-tier (unregulated) markets of the main European stock exchanges (Vismara, Paleari, and Ritter, 2012).

The selection of comparable firms made by underwriters is available in the official prospectus of 348 IPOs taking place in France and Italy between 1999 and 2011, disclosing both the names and the valuation multiples of the comparable firms. We conduct our empirical tests by comparing the valuation of peers chosen by the underwriter with that of peers obtained from alternative selection criteria. We implement both algorithmic selection methodologies, such as the list proposed by an external database and the one obtained from a propensity score-matching procedure, and non-algorithmic criteria, such as the selection made by sell-side analysts, including the same underwriter providing analyst coverage to the IPO firm in the aftermarket.

The second paper focuses exclusively on the Italian market, where we can access unique data kindly provided by the Italian stock exchange (Borsa Italiana) about the provision of ancillary services. These data cover the population of 171 IPOs occurring in the period 1999-2008, and include information about price stabilization and liquidity support from the MarketConnect database. We access the amounts of shares bought and sold by underwriters both for stabilization and liquidity support purposes, throughout the first month of trading. This information allows us to identify which IPOs are price-stabilized and/or liquidity-supported by underwriters, and to what extent. We also collect data on the fees charged by underwriters from official IPO prospectuses available in EurIPO. We address our research questions by using two main methodologies. First, we investigate the influence of ancillary services, i.e. price stabilization and liquidity support, on the fees paid by issuers to their underwriters, by means of a cross-sectional regression. The aim is to test whether issuers are willing to pay more for these services. Second, we focus on the underwriter's behaviour in supplying these services. To control for unobservable factors that may drive both the provision and the intensity of the underwriter's intervention, we employ a two-stage Heckman (1979) procedure that corrects the sample selection bias. For instance, underwriters may anticipate the extent to which an IPO needs to be stabilized, and therefore avoid intervening if the provision of this service would be too costly. Then, in the first stage we model the underwriter's decision to intervene (e.g., to stabilize the aftermarket price of the IPO firm), while in the second stage we model the intensity of the underwriter's intervention.

The data used in the third paper, investigating a private firm's exit decision with reference to the valuation it can obtain by going public, are drawn from several databases. The sample of private firms that choose to be directly acquired is from Thomson One Banker database, cross-checked with Amadeus, and includes 4,573 deals completed during 1995-2012 and involving private European targets. The sample of European IPOs is from EurIPO and includes 3,755 companies going public in the stock exchanges of the four largest European economies (London, Euronext, Frankfurt and Milan stock exchanges) from 1995 to 2009. In the first part of the analysis, we shed light on the characteristics of private firms that go public and are subsequently acquired (two-stage) versus those that are directly acquired, in a multivariate logistic regression

framework. Then, we assess the valuation premium obtained by firms that complete a two-stage exit compared to the valuation they would have obtained by selling out as private, by adopting a propensity score matching methodology (Dehejia and Wahba, 2002). Then, to control for the intentionality of the firm in pursuing a two-stage exit, we investigate the drivers of the valuation premium by using a two-step Heckman (1979) procedure. In the second part of our analysis, we investigate the determinants of three possible scenarios at the firm's three-year IPO anniversary (being acquired, remaining stand-alone, being delisted) by employing a multinomial logistic regression. Then, we compare firm valuations associated with each of the possible outcomes by correcting for self-selection in the exit choice and time-matching bias (De and Jindra, 2012).

1.3 MAIN FINDINGS

There are several contributions stemming from this research. The first paper sheds light on how the valuation of companies going public is set, offering a three-fold contribution. First, we document that underwriters value IPOs by selecting comparable firms with significantly higher valuations than peers obtained by alternative selection methodologies. Surprisingly, this is true even by comparing the peers with those selected by the same underwriter in the analyst report released, on average, 4 months after the listing. Second, we show that the biased selection is obtained by left-truncating the sample of potential peers, as underwriters omit those with the poorest valuations. Third, we find that underwriters price IPOs at a discount compared to peers published in the prospectus, but still at a premium compared to the alternative groups of peers.

The second paper clarifies how and at what cost the valuation of a newly listed firm is supported by financial intermediaries once trading activity starts. Results show that underwriters are paid more for their availability to stabilize stock price. This also provides issuers with the opportunity to pay lower fees by accepting the risk of no aftermarket support. Concerning the actual provision of price stabilization and liquidity support services, only half of the IPOs that require price stabilization are then stabilized. After controlling for endogeneity in the stabilization decision, we find that these offerings exhibit poor aftermarket performance, therefore underwriters seem to act properly by stabilizing those IPOs that really need it. Liquidity support is instead carried

out in the majority of IPOs, but the drivers of its provision are less clear, raising concerns about the alignment of incentives between underwriter and issuing firm.

The third paper documents that IPO valuations play a role in a private firm's exit choice. Evidence shows that two-stage exits can be a valuable decision, allowing firms to subsequently sell at a considerably higher valuation than that otherwise obtained as a private target. Firms that suffer greater information asymmetry and more severe financial constraints are more likely to prefer two-stage exits over direct acquisitions. Furthermore, the comparison among firms that are acquired, remain stand-alone, or are delisted after the IPO indicates that two-stage exit firms are characterized by the most successful IPOs and tend to embed considerable growth opportunities. In terms of valuation, the best is recognized to firms acquired subsequent to IPO, while firms delisted after IPO and those that were directly acquired obtain the worst valuations. Overall, firms having viable business models can obtain significant benefits from two-stage exits over direct acquisitions, but firms experiencing less successful IPOs and poorer financial market performance may end up being delisted at low valuations.

CHAPTER TWO.

How do underwriters select peers when valuing IPOs?

2.1 INTRODUCTION

"The most common method for valuing firms going public is the use of comparable firm multiples" (Ritter and Welch, 2002, p. 1816). Nevertheless, very little is known about how underwriters implement this approach, and how they select comparable firms. In the absence of explicit directives from the Securities and Exchange Commission (SEC), there is no publicly available information on how an IPO firm is valued in the United States. In contrast, the European Securities and Markets Authority (ESMA) recommends disclosure of the valuation methods used to determine the offer price, although disclosure policies vary by country (ESMA/2012/468)[1]. We take advantage of the availability of information in Europe to investigate how underwriters select the peers used to value the companies they take public. We compare peers selected by the underwriter at the time of the IPO with those selected by sell-side analysts (including the same underwriter providing aftermarket analyst coverage) or by alternative selection methodologies. For the first time in the literature, we document that the underwriters' selection of comparable firms is biased.

This paper is closely related to Kim and Ritter (1999) and Purnanandam and Swaminathan (2004), which compare the valuation of IPO firms with that of peers selected using alternative procedures (e.g. industry matching), although neither study provides information on how underwriters actually set the valuation of the company

[1] In 2003, the Prospectus Directive (2003/71/EC) established a harmonized format for IPO prospectuses in Europe. At the Commission's request, the ESMA developed recommendations for a consistent implementation of the Directive. The "level of disclosure concerning price information" is defined in Article 8.1 of the Directive (and item 5.3.1 of Annex III Regulation) and in Chapter 58 of the document "Questions and Answers on Prospectuses", published by ESMA in the 16th updated version in July 2012 (www.esma.europa.eu/system/files/2012-468.pdf). The ESMA reports that some member states consider that a general indication of the valuation method or combination of methods used to value the company would be sufficient without the need to give any kind of approximate figures. In contrast, other members consider that underwriters should include in the prospectuses the "indication of the method(s) of valuation of the issuer, together with an indication of the approximate non-binding value(s) of the share that would result from the application of such method(s)" (p.48). The ESMA is currently "working in this area towards a common understanding among its members" (p.49).

going public[2]. Underwriters face a trade-off in the selection of comparable firms. On the one hand, they seek high valuation to increase the issuer's proceeds and immediate profit from fees. On the other hand, they may want to limit valuation, to ensure a certain level of underpricing and stimulate investor demand. We argue that underwriters are capable of exploiting the discretion in peer selection, such that they can raise the valuation of the firm going public while simultaneously attracting investors' attention by presenting the IPO as valued conservatively. If underwriters select mostly comparable firms with the highest valuation multiples, then they might be able to raise the offer price and still make the IPO look discounted compared to peers published in the prospectus.

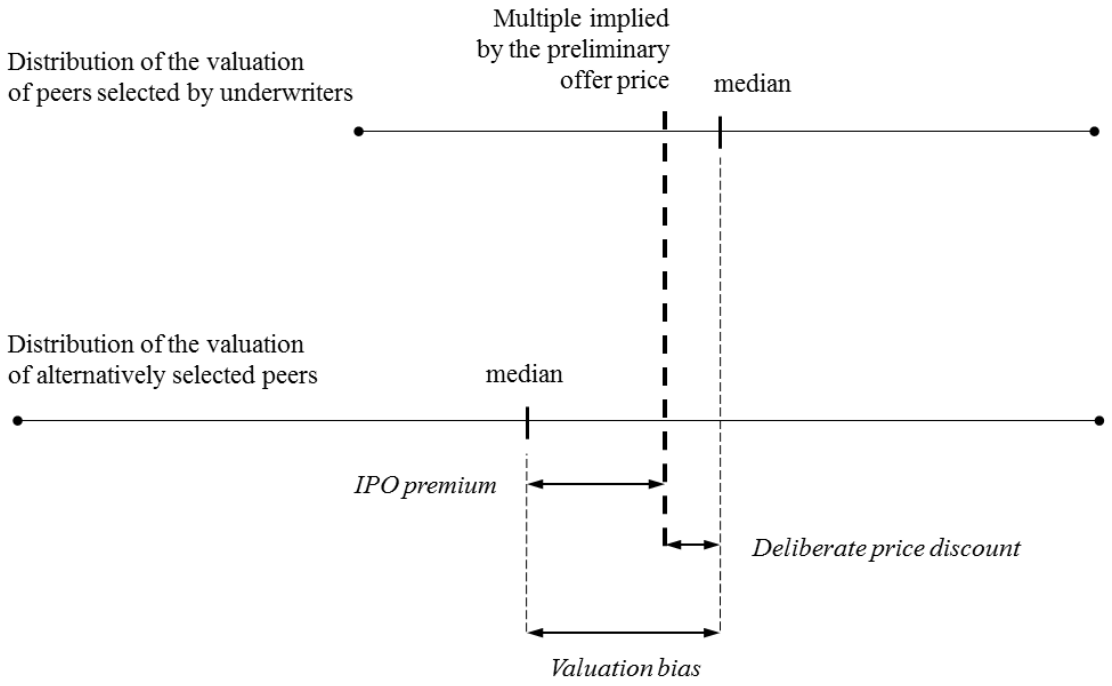
We compare peers selected by underwriters with 5 groups of alternative peers. Three are obtained from algorithmic procedures: (1) the list of peers proposed by an external source of information and analysis, as done by Kim and Ritter (1999); (2) a propensity score-matching methodology, in which IPO firms are matched with public companies according to industry, country, size, and profitability, similar to Chemmanur and Krishnan (2012); and (3) a propensity score-matching on the warranted Enterprise Value-to-Sales (EV/Sales) ratio, based on the median industry EV/Sales ratio, adjusted for growth, profitability, and cost of capital, as proposed by Bhojraj and Lee (2002). Two non-algorithmic selections refer to the choice of sell-side analysts. We use (4) comparable firms chosen by the same underwriter shortly after the IPO, when providing aftermarket analyst coverage for the same company taken public, and (5) peers published by other sell-side analysts in their first equity report. Additional specifications are used as robustness checks.

We employ a sample of 348 IPOs in France and Italy in the period from 1999 to 2011. First, we find that underwriters select peers with significantly higher valuations than peers obtained by alternative selection methodologies (on average, 13.5% to 36.9%). This result persists between peers selected by the same underwriter in the IPO prospectus and in the analyst report released, on average, 4 months after the listing. Second, we document that the biased selection is obtained by left-truncating the sample

[2] A number of studies on European IPOs shed some light on the valuation techniques implemented by underwriters, with evidences from the Italian (Cassia, Paleari, and Vismara, 2004), French (Roosenboom, 2007, 2012) and Belgian (Deloof, De Maeseneire, and Inghelbrecht, 2009) markets. However, these papers do not investigate how underwriters select the comparable firms.

of potential peers, as underwriters omit those with the poorest valuations. The minimum valuation multiple of underwriter-chosen peers is, on average, 19.2% to 119.1% higher compared to alternatively selected peers. Moreover, 60.5% to 72.4% of underwriter-selected peers are valued above the median valuation of alternatively selected peers. Third, we find that underwriters price the IPOs at a discount compared to peers published in the prospectus, but still at a premium compared to the alternative groups of peers. Figure 1 provides a synthetic picture of our results, robust to the effects of growth opportunities embedded in IPO valuations, the presence of concurrent valuation methodologies used by the underwriter, secondary market prices, changes in the regulatory framework, and different definitions of the valuation multiples.

Figure 1. The use of the peer comparables approach by IPO underwriters.



The remainder of the article is organized as follows. Section 2 presents the testable hypotheses. Section 3 defines the sample and methodology used. Section 4 offers a clarifying example of our methodology in a real IPO case. Section 5 presents and comments on the results, and Section 6 provides additional robustness checks. Section 7 concludes the paper.

2.2 TESTABLE HYPOTHESES

Many firms going public are young companies with limited track records, for which it is difficult to forecast future cash flows (Kim and Ritter, 1999). In such an uncertain context, traditional information asymmetry-related theories view IPO underwriters as certifying agents. Their function is to alleviate the effects of information asymmetries between firm insiders and outsiders by producing information about the IPO firm (Beatty and Ritter, 1986). However, since information production is costly and subject to moral hazard, underwriters have a short-term incentive to increase the valuation of the firm they take public. A higher valuation would indeed increase the amount of capital raised and the immediate profit arising from fees. Kim and Ritter (1999) and Purnanandam and Swaminathan (2004) document that the average IPO is significantly overvalued at the offer price compared to its industry peers.

Valuation using multiples is the most common methodology used for valuing IPOs (Ritter and Welch, 2002). Its outcome strictly depends on how peers are selected (Bhojraj and Lee, 2002). We argue that underwriters may take advantage of this discretion in peer choice, using a biased sample of peers to justify a higher offer price and to present the IPO as conservatively valued to investors. Therefore, we propose the following hypothesis:

Hypothesis 1: The valuation of comparable firms selected by the underwriter is significantly higher than that of peers obtained by alternative selection criteria.

Underwriters can upwardly bias the selection of comparable firms in various ways. Whereas the inclusion of outliers with extremely high multiples among comparable firms could be suspicious for investors, they may not notice the exclusion of low-valued peers. Accordingly, in selecting comparable firms, underwriters can disregard some peers with the poorest valuation multiples, which are often not very well known. Therefore, we formulate the following hypothesis:

Hypothesis 2: Underwriters left-truncate the sample of potential comparable firms compared to peers obtained by alternative selection criteria, by excluding some peers with the poorest multiples.

Underwriters often deliberately discount their fair-value estimates when setting the IPO price in order to stimulate investor demand, thereby reducing marketing efforts, and attract the favor of buy-side clients (Rock, 1986; Benveniste and Spindt, 1989; Loughran and Ritter, 2002). Even if the chosen comparable firms have higher valuations than alternatively selected peers, the valuation implied by the offer price (i.e. net of the discount) could eventually be in line with that of alternative peers. We believe that the upwardly biased selection of comparable firms allows underwriters to raise their value estimates so that a significant difference persists even after accounting for the deliberate price discount. In this way, underwriters are able to attract investor demand by presenting the IPO as discounted compared to peers in the prospectus. At the same time, they increase the profit arising from fees by setting the IPO price at a higher valuation than otherwise suggested by alternatively selected peers. Therefore, we propose the following hypothesis:

Hypothesis 3: The valuation of the company going public, net of the deliberate price discount applied by underwriters, remains significantly higher than that of peers obtained by alternative selection criteria.

Selecting an upwardly biased set of comparable firms entails some risk for underwriters, as repeatedly engaging in opportunistic behaviors, especially in the valuation process, may damage their reputation. Underwriters that systematically misprice offerings tend to be avoided by investors in subsequent IPOs, causing a loss of market share (Beatty and Ritter, 1986). Nanda and Yun (1997) demonstrate that underwriters who overprice IPOs suffer from a significant reduction in their market value. The expected loss caused by persistently overpricing IPOs becomes more severe when other market participants are able to detect such opportunistic behavior. Institutional investors are sophisticated market players who benefit from informational advantage in assessing the value of a firm's shares (Rock, 1986). A larger presence of institutional investors in an IPO increases the expected loss caused by the biased selection of comparable firms. Therefore, we formulate the following hypothesis:

Hypothesis 4: Bias in the selection of comparable firms is lower when a greater fraction of IPO shares is reserved for institutional investors.

Chemmanur and Krishnan (2012) argue that underwriters seek the highest possible valuation for their IPOs, rather than pricing the equity close to the intrinsic value. High-reputation underwriters set the offer price at a higher level compared to low-reputation underwriters. We test whether reputation influences the way in which underwriters value IPOs also in the European setting, where the level of disclosure about valuation practices is higher. We argue that the trade-off between short-term profits and long-term losses associated with a biased selection of comparable firms can be affected by underwriter reputation. Underwriters with a higher reputation may benefit from increased bargaining power vis-à-vis other market participants, allowing them to act with more discretion in the selection of comparable firms. In the case of opportunistic behavior, their lower expected loss compared to young, less-established banks strengthens the incentive to maximize short-term profits and select only comparable firms with high valuations. In contrast, less-established underwriters with limited reputational capital are expected to be more cautious in the selection of comparable firms. Therefore, we propose the following hypothesis:

Hypothesis 5: Bias in the selection of comparable firms is higher when the reputation of the underwriter is greater.

2.3 SAMPLE, DATA AND METHODOLOGY

2.3.1 Sample and data

The original population includes 434 IPOs (Table 1, panel A) that occurred in France and Italy from January 1999 to December 2011 and that are valued using multiples[3]. Our source of information is IPO prospectuses. The 434 IPOs include 141 IPOs valued using multiples alone, 274 IPOs valued using multiples and Discounted Cash Flow (DCF), and 19 French companies valued using multiples and Dividend Discount Model (DDM). Since we compare peers chosen by underwriters with peers obtained by

3 We use the French Paris Bourse stock exchange until the creation of Euronext (with the merger of the stock exchanges of Belgium, France, the Netherlands, and Portugal) on January 27, 2005. Afterwards, we consider Euronext in its entirety. The sample includes offerings on main markets (Eurolist and MTA), new markets (Nouveau Marché and Nuovo Mercato), and other second-tier markets (Second Marché, Marché Libre, Alternext, and Expandi) of the Paris and Milan stock exchanges. See Vismara, Paleari, and Ritter (2012) for a detailed description of European IPO markets. IPO prospectuses are collected in the EurIPO database (www.euripo.it). Descriptive statistics of the sample and definitions of the valuation multiples are reported in Appendix A.

alternative selection methodologies, only those IPOs that disclose the comparable firms and valuation multiples used by the underwriters in their prospectuses are included. Based on these criteria, the final sample used throughout the paper comprises 348 IPOs[4], including companies valued using the comparables approach with or without other methods (i.e. comparables plus DCF or DDM). The concurrent use of different valuation methods may impact our results; thus, in our regression analysis and in Section 6, we control for this potential effect by introducing control dummies and replicating the analyses on a reduced sample of 102 IPOs[5] valued using only multiples.

Six multiples (valuation ratios) are used by underwriters to price IPOs (Table 1, panel B). The Price-to-Earnings ratio (P/E) is the most frequently adopted multiple, used to value 265 IPOs in the sample (76.1%). The Enterprise Value-to-Sales (EV/Sales) and Enterprise Value-to-EBITDA (EV/EBITDA) multiples are used to value 184 (52.9%) and 170 (48.9%) companies, respectively. EV/EBITDA is particularly frequent among IPOs in Milan (81.5%). Other multiples are the Enterprise Value-to-EBIT (EV/EBIT), Price-to-Cash Flow (P/CF), and Price-to-Book Value (P/BV), which are used to price approximately 100 IPOs each. On average, sample firms are valued by underwriters using 2.6 multiples and 5.8 comparable firms (Table 1, panel C). We quantify the underwriter's valuation bias for each IPO firm, and we also detail our measure for each multiple used.

In this paper, we refer to multiples calculated for IPO firms at the preliminary offer price (POP), defined as the midpoint of the initial price range[6], which is the reference price in the prospectus where the comparables are disclosed. The POP is set from the underwriter's valuations, performed before information on demand is gathered through

[4] Initially, we considered 461 IPOs in France and Italy in 1999-2011 that disclosed information about the valuation method used by the underwriter in the prospectus, and excluded 27 IPOs valued using techniques other than the comparable firms approach (25 DCF and 2 Net Asset Value methods). These numbers are consistent with previous studies that find the comparables approach to be the most widespread methodology used to price IPOs in Europe (Cassia, Paleari, and Vismara, 2004; Cogliati, Paleari, and Vismara, 2011; Roosenboom, 2012). The comparables approach is used as the sum-of-parts valuation for 5 Italian companies included in the final sample.

[5] 141 IPOs were valued using multiples only. For 39 of these, the peers were not disclosed.

[6] In Italy, the book building procedure was adopted as the only pricing methodology in 1995; therefore, a POP is always available. In France, 152 of 229 IPOs of our sample are priced using book building, either in its modified version (*Offre à Prix Ouvert*) that allows a fraction of shares to be reserved for individual investors (Derrien, 2005), or in the traditional form (*Placement Garanti*). In the remaining 77 IPOs, a preliminary price range is not defined because 39 of them are auctions (*Offre à Prix Minimal*) and 38 are fixed-price offers (*Offre à Prix Ferme*). In these cases, we take the minimum tender price and the fixed-offer price, respectively.

road-shows and meetings with investors. In Section 6, we test whether our results obtained with the POP are robust using the offer price and first-day market price. Our sample shows an average price revision from the POP to the offer price of -0.9%, and an average underpricing from the offer price to the first-day closing price of 8.3% (Table 1, panel D)[7].

Table 1. Sample. The original population includes 434 IPOs in Paris and Milan during 1999-2011. Panel A shows that, of the 434 IPOs, 141 IPOs are valued using only the multiples approach, 274 IPOs using both multiples and Discounted Cash Flow (DCF), and 19 IPOs using both multiples and Dividend Discount Model (DDM). Percentages are calculated with respect to the population of 434 IPOs. Of the 434 IPOs, 86 are excluded because they do not disclose the peers selected by underwriters. Therefore, the final sample used throughout the paper includes 348 IPOs. Panel B shows the valuation multiples used by underwriters in the sample of 348 IPOs. Panel C reports the average and median number of multiples and comparable firms used by underwriters, as disclosed in IPO prospectuses. Panel D reports the average and median price revision and underpricing. Price revision is defined as (offer price - preliminary offer price)/preliminary offer price; underpricing is calculated as (first day closing price - offer price)/offer price. Preliminary offer price equals the midpoint of the price range for 271 IPOs that use the book-building procedure. It is set equal to the minimum tender price for 39 IPO auctions, and to the fixed offer price for 38 fixed-price offerings. Significance levels at 1% (***) are based on the *t*-test and Wilcoxon signed-rank test for the difference from zero of price revision and underpricing.

	Total		Paris		Milan	
Panel A. IPOs valued using multiples	*no.*	*%*	*no.*	*%*	*no.*	*%*
Original population of IPOs valued using multiples	434	-	276	63.6	158	36.4
valued using multiples only	141	32.5	115	26.5	26	6.0
valued using both multiples and DCF	274	63.1	142	32.7	132	30.4
valued using both multiples and DDM	19	4.4	19	4.4	0	0.0
Sample using multiples, peers disclosed	348	-	229	65.8	119	34.2
Panel B. Multiples used to value IPOs	*no.*	*%*	*no.*	*%*	*no.*	*%*
EV/Sales	184	52.9	126	55.0	58	48.7
EV/EBITDA	170	48.9	73	31.9	97	81.5
EV/EBIT	117	33.6	84	36.7	33	27.7
P/E	265	76.1	181	79.0	84	70.6
P/CF	83	23.9	43	18.8	40	33.6
P/BV	97	27.9	51	22.3	46	38.7
Panel C. Number of peers selected to value IPOs	*mean*	*median*	*mean*	*median*	*mean*	*median*
No. multiples (valuation ratios)	2.6	2.0	2.4	2.0	3.0	3.0
No. peers (comparable firms)	5.8	5.0	5.0	4.0	7.3	5.0
Panel D. Price revision and underpricing (%)	*mean*	*median*	*mean*	*median*	*mean*	*median*
Price revision	-0.9	0.0	0.1	0.0	-2.9	-2.3
Underpricing	8.3***	2.9***	5.9***	2.5***	12.6***	3.5***

[7] Price revision is defined as (offer price - POP)/POP, underpricing as (first day closing price - offer price)/offer price. The negative price revision on average is in contrast with Edelen and Kadlec (2005), who report an average price revision of 1.9% in US, and Roosenboom (2012), who finds an average 4.6% on French second-tier markets. However, our evidence is affected by IPOs experiencing highly negative price revisions in 2001 and in 2007-2008, due to conditions related to the technology bubble burst and to the financial crisis, respectively. As a robustness check, we include control dummies for companies going public in 2001 and in 2007-2008 in our regressions. Our results do not change substantially, and the coefficients of these two dummies are both not statistically different from zero.

2.3.2 Alternative methodologies for selecting comparable firms

We compare the valuation of peers chosen by the underwriter with that of peers obtained from alternative selection criteria by implementing algorithmic and non-algorithmic selection methodologies. We build five alternative groups of peers. Three groups are obtained from algorithmic methods, by (1) taking the list of comparable firms proposed by the Thomson One Banker database, (2) implementing a propensity score-matching model, and (3) performing a 'warranted' EV/Sales matching with a sample of public companies. Although the algorithms allow us to choose comparables that are not influenced by an attempt to justify a high or low valuation, they do not necessarily pick the best peers that a practitioner would choose (Kim and Ritter, 1999). Therefore, we use two non-algorithmic approaches referring to the choice made by sell-side analysts, i.e. (4) the peers published by underwriters providing post-IPO analyst coverage to the company they take public, and (5) the peers published by other sell-side analysts (that do not coincide with the underwriter), in their first post-IPO equity report.

To identify our first alternative list of comparable firms, we rely on reports from an external source of information and analysis, as done by Kim and Ritter (1999). We refer to the 'Company Analysis' section of Thomson One Banker database, which proposes a prebuilt set of peers, in which matching is performed with other public companies.

Our second methodology uses a propensity score-matching model (Dehejia and Wahba, 2002) to find up to 10 nearest neighbors from a control sample of all Datastream equities available in each sample year (on average, approximately 100,000 firms each year). We employ a two-step procedure. First, on a yearly basis, we estimate a logistic regression, with firm size, profitability, industry, and country dummies as predictive variables. Second, we match treatment units from the IPO sample with control units from Datastream on the basis of the propensity score, or fitted value, of the logistic regression. To avoid the risk of bad matching, we use the caliper approach with a maximum tolerance of 0.01 for score distance, and discard any control company with a score outside the range exhibited by IPOs (common support criterion). Hence, the neighbor's score must be the closest to the IPO score, distant by no more than 0.01, and inside the range of scores associated with the reference sample.

Our third algorithm also relies on a propensity score-matching model, but the score is based on the mean industry EV/Sales ratio, adjusted for key firm-specific characteristics

(i.e. growth rate, profitability, and cost of capital), as in Bhojraj and Lee (2002). This algorithm is similar to the second one, but less constrained by industry membership. It allows, to a larger extent, companies from different industries to be selected as comparable firms. The first step of the model is performed through an OLS regression, estimating the 'warranted' EV/Sales ratio on which the matching is made. In this case, the tolerance level (caliper) is raised to 0.1, due to the wider range of the fitted values.

For the non-algorithmic methodologies, we first consider comparable firms published in the first post-IPO equity report of the company under valuation released by the same investment bank that previously underwrote the offering. Underwriters provide aftermarket coverage to 125 sample companies they take public, but choose not to publish any peer in the equity report in 26 cases. Therefore, we can compare the selections of peers before and after the IPO in 99 cases. On average, underwriters acting as analysts release their first equity report 4 months after the IPO. For the second group, we consider peers selected by other sell-side analysts and published in the first post-IPO equity report. Analyst reports are available in Investext Investment Research for 176 IPOs, but no peers are published in 23 cases. Therefore, we are able to compare the underwriter's selection of peers with selection by sell-side analysts in the aftermarket for 153 IPOs. The average time window between the IPO and the first available analyst report is 10 months[8].

2.3.3 Valuation bias

The valuation bias associated with each IPO firm is obtained by comparing the valuation of peers selected by the underwriter with that of peers from alternative procedures. For each multiple *M* (i.e. P/E, EV/Sales, etc.), we compute the average and median of the peers selected by the underwriter and those of our alternatively selected groups of peers. Then, we calculate the natural logarithm of their ratio. The average across the multiples used to value the IPO firm gives the valuation bias:

$$valuation\ bias = \frac{1}{N}\sum_{j=1}^{N} ln\left(\frac{M_{(j)\,underwriter}}{M_{(j)\,peers,i}}\right)$$

[8] Changing market conditions from the IPO date to the release date of the report could affect our results by altering firm valuations. Therefore, we take the valuation multiples of the peers published in the equity reports on the IPO date of the company they are compared with. Moreover, although the limited time between the IPO and the first equity report generally makes it very unlikely that firms change their business so radically as to undermine comparability, we acknowledge a potential bias in the degree of comparability of firms.

where $M_{(j)}$ represents each single multiple of the N used to value the IPO firm (i.e. EV/Sales, EV/EBITDA, EV/EBIT, P/E, P/BV, P/CF, with N varying from 1 to 6), and i represents alternative selection methodologies, namely (1) peers proposed by Thomson One Banker, (2) propensity score matching with public companies, (3) warranted EV/Sales matching with public companies, (4) peers selected by the underwriter as analyst, and (5) peers selected by sell-side analysts.

For instance, we compute the average EV/Sales values of peers selected by the underwriter ($EV/Sales_{underwriter}$) and peers proposed by Thomson One Banker ($EV/Sales_{peers,1}$). Next, we calculate the natural logarithm of their ratio. We repeat this procedure for each multiple used to value the IPO firm, and obtain the valuation bias associated with each IPO firm by computing the average across multiples. If the valuation bias is statistically positive, as predicted by Hypothesis 1, then the valuation of comparable firms selected by the underwriter is significantly higher than that of peers obtained from alternative selection criteria. We also perform this analysis for each single multiple used to value the IPO[9].

Hypothesis 2, which states that underwriters obtain a biased selection of comparable firms by omitting some of those with the poorest valuations, is tested by computing the valuation bias between the minimum and maximum multiples of the group of peers selected by the underwriter vis-à-vis the groups of alternatively selected peers. Although this procedure allows us to compare the valuations of the top and bottom peers, it does not provide information about how valuation multiples are distributed between the extremes. Therefore, we also compute the percentage of peers selected by the underwriter that are valued higher than the median valuation associated with each alternative group of peers. If underwriters select peers in perfect agreement with our alternative procedures, then this percentage would be 50%; a higher figure would imply that underwriters tend to exclude some peers with below-median valuations. In our sample, this percentage ranges from 0% to 100%. In a very few cases, none of the peers chosen by the underwriter is valued above the median valuation of the alternatively selected peers (0%), whereas in other cases, all of the underwriter's peers have above-median valuations (100%).

[9] Because the number of peers and multiples used varies across firms, the number of multiple-specific valuation biases changes accordingly. Consequently, multiples with a higher adoption rate, such as P/E, concur more frequently to the calculations of the valuation bias.

2.3.4 IPO premium

Hypothesis 3 argues that the valuation of the company going public, net of the deliberate price discount applied by underwriters, remains significantly higher than that of alternative peers. To empirically address this hypothesis, we calculate the valuation bias from the multiple implied by the POP of our sample of IPOs. We define the 'IPO premium' as follows:

$$IPO\ premium = \frac{1}{N}\sum_{j=1}^{N} ln\left(\frac{M_{(j)\ POP}}{M_{(j)\ peers,i}}\right)$$

where $M_{(j)\ POP}$ represents each single multiple of the IPO firm calculated using its preliminary offer price, $M_{(j)\ peers}$ is the corresponding multiple associated with alternatively selected peers, and *i* represents the alternative selection methodologies, as defined above for the valuation bias. The IPO premium is calculated with respect to the average and median multiples of the sample of alternatively selected peers in the denominator. The numerator refers to the multiple implied by the POP of the company going public. Among the alternative selections, we add the set of peers chosen by underwriters to value the IPO and published in the prospectus, with the aim of assessing the magnitude of the discount applied to their value estimates.

2.3.5 Determinants of valuation bias

We test our hypotheses about the cross-sectional variation of the valuation bias (Hypotheses 4 and 5) in a multivariate setting. The dependent variable is the valuation bias. To obtain a unique value for each IPO, we take the median value of the valuation biases across all alternative selection methodologies. Our explanatory variables are defined as follows. We test the deterrent effect of the presence of more sophisticated investors on the underwriter's bias, as predicted by Hypothesis 4, by defining the institutional offer variable as the fraction of shares reserved for institutional investors over the total number of shares offered in each IPO. A negative and significant coefficient for this variable means that bias in the selection of comparable firms decreases as the participation of institutional investors increases.

Hypothesis 5 predicts that the bias in the selection of peers becomes more pronounced if the underwriter is a highly reputable bank. We proxy underwriter reputation by computing each underwriter's market share, based on the amount of capital raised in Europe during 1995-2011 (Megginson and Weiss, 1991). Controlling

for the endogeneity in matching between issuer and underwriter, we expect a positive and significant effect of the underwriter reputation on valuation bias.

Control variables are supported by the following theoretical explanations. Firm size (natural logarithm of the last fiscal year's sales) and age (logarithm of one plus firm age at the IPO) account for informational asymmetry and risk associated with the IPO. The bias in the selection of comparable firms is expected to be higher in larger offerings also because the underwriter's monetary benefit from increasing the offer price increases with the amount of capital raised. We account for the effect of greater incentives to setting a higher offer price in larger IPOs by including the offer size variable, defined as the logarithm of the offer price multiplied by the number of offered shares. Instead, the monitoring activity of debt-holders (Jensen, 1986) can limit the tendency to bias valuations. We include leverage as the ratio of pre-IPO total debt over total assets, to account for the increased control on the underwriter's valuation process. Higher intangibility of assets makes it harder for market investors to value the firm, with potential effects on the underwriters' selection of peers. We control for the firm's ratio of non-physical assets over total assets. We employ a dummy for negative earnings because IPO firms with negative earnings are likely to be investing and tend to receive higher valuations (Aggarwal, Bhagat, and Rangan, 2009). The influence of market conditions is accounted for by a dummy for companies going public during the technology bubble of 1999-2000 (Loughran and Ritter, 2004), and by the pre-IPO market return. The latter is computed as the index return over the 100 trading days prior to the listing date of the FTSE Euromid for IPOs in Euronext and of the FTSE MIB for IPOs in Italy.

We control for the potential impacts of using different valuation and pricing techniques by including dummies for the presence of DCF and DDM as complementary valuation methods used by the underwriter, as well as for auctions and fixed price offers. We also employ a Prospectus Directive dummy variable, equal to 1 if an IPO occurs after July 1, 2005, to account for the effects of the regulatory change on the valuation process.

One concern with the analysis of the cross-sectional determinants of valuation bias is the potential endogeneity associated with the matching between IPO firms and underwriters. Fernando, Gatchev, and Spindt (2005) document that underwriter ability

and issuer quality are complementary, as they evaluate each other in the matching process. Reputable underwriters are highly sought after and, thus, are able to select higher-quality issuers. At the same time, higher-quality issuers desire more reputable underwriters, to convey a more credible signal about their quality and to increase the probability of a successful IPO. Without accounting for the endogenous nature of the issuer and underwriter matching process, the OLS estimation is biased, as higher-quality issuers can be valued using comparable firms with higher multiples not because of a biased selection of peers, but because of their truly superior quality.

We address this issue by employing a special case of the instrumental variable approach that is commonly used to address endogeneity concerns in the IPO setting (e.g., Corwin and Schultz, 2005): namely, the two-stage least squares (2SLS) regression. In the first stage, we estimate the portion of endogenous and exogenous variables that can be attributed to the instrument, which is correlated with the endogenous variable and underwriter reputation, and is uncorrelated with the error terms. In the second stage, we estimate the original regression with the endogenous variable replaced by its fitted values from the first-stage regression. We instrument underwriter reputation following Chemmanur and Krishnan (2012), who use the location concentration of the underwriter. We define this variable as the Herfindahl index of the amount of IPOs underwritten by the lead underwriter across the stock exchanges of the 4 largest European economies (London, Euronext, Frankfurt, and Milan) measured over the sample period (see Vismara, Paleari, and Ritter, 2012). IPO underwriters that concentrate on fewer geographic locations are less likely to gain large market shares; therefore, we expect a negative relationship between this variable and underwriter reputation[10].

2.4 EXAMPLE

In this section, we present an application of the proposed methodology to a real IPO, with the aims of clarifying how we measure valuation bias and IPO premium, and how the underwriter's selection of peers can be biased. We discuss the case of Ferretti, an

[10] To account for the presence of country-specific effects on the firms that may affect this variable, we control for the fixed effects of the country in which IPO firms are taken public.

Italian luxury yacht manufacturer that went public on the Milan stock exchange on June 23rd, 2000. The offering prospectus is still publicly available on the stock exchange website. The list of multiples selected by the underwriter and by alternative methodologies, the valuation bias, and the IPO premium are reported in Appendices B and C.

The underwriter valued the company using 4 comparable firms whose average P/E ratio was 50.7. With a P/E ratio of 40.4, the valuation of Ferretti looked conservative for investors at the IPO, being below the average (50.7) and median (48) P/E ratio of peers in the prospectus. Valuation bias is highly positive across all alternative selection criteria, both between the average (from 29.1% to 80.2%) and median (from 34.5% to 126.9%) multiples. Thus, the valuations of peers selected by the underwriter are considerably higher than those of peers from alternative criteria, as predicted by Hypothesis 1.

Valuation bias is positive between the minimum multiples (except for peers selected by sell-side analysts). However, it is often equal to zero between the maximum multiples, as the comparable firm with the highest valuation coincides (again, except for peers selected by sell-side analysts). All 4 peers selected by the underwriter are valued above the median valuation of peers obtained from algorithmic selections, whereas 3 of the 4 peers still remain above the median if compared to non-algorithmic selections. This result documents that underwriters exclude some peers with lower valuations, consistent with Hypothesis 2.

The IPO is priced at a 22.7% discount compared to the average valuation of peers selected by the underwriter. However, compared to that of the alternatively selected peers, the IPO premium is positive and ranges from 6.4% for peers selected by sell-side analysts to 57.5% for those proposed by Thomson One Banker. These results are consistent with Hypothesis 3, which states that the valuation of IPO firms, even after the deliberate price discount, is higher than that of alternatively selected peers. Curiously, the set of comparable firms published by the underwriter in the post-IPO equity report is enlarged from 4 to 7 peers. With this new selection of comparable firms, the valuation of Ferretti at the IPO would not look conservative.

Appendix C provides a synthetic picture of the valuation of this IPO by plotting the P/E ratios of the peers published in the official IPO prospectus and those obtained from

alternative criteria. Black vertical lines represent the distribution of the P/E ratios of each group of peers, and white dots identify peers published in the prospectus and present in other control groups. The underwriter's left-truncation can clearly be observed. The maximum P/E values look aligned across the different selection criteria. The valuations of the 4 peers added by the same underwriter acting as analyst are all lower than that of Ferretti. These results persist when we consider the final offer price (implied P/E of 43) and the first-day closing price (implied P/E of 43.4), instead of the POP.

2.5 EMPIRICAL TESTS AND RESULTS

2.5.1 Valuation bias

In this subsection, we empirically test our first two hypotheses. Table 2 reports the valuation bias between the average and median multiples of the underwriter-selected peers and those of the alternatively selected peers. Consistent with Hypothesis 1, we find a positive and significant valuation bias between the average and median multiples. Overall, the bias ranges from 13.5% to 36.9%. It is smaller for peers selected using propensity score matching and for peers selected by underwriters acting as analysts. The highest valuation biases are reported for peers selected by the warranted EV/Sales methodology and for peers selected by sell-side analysts. Valuation bias is not insensitive to the choice of multiples used to value the IPO firm. Specifically, the highest values of multiple-specific valuation bias are associated with the adoption of EV-based ratios, such as EV/Sales and EV/EBITDA.

Hypothesis 2 predicts that underwriters select and publish a left-truncated sample of potential comparable firms. Panels A and B of Table 3 report the valuation biases between the minimum and maximum multiples, respectively, of the underwriter's peers and each of our alternative sets of peers. We observe a positive and significant valuation bias between the minimum multiples, ranging from 19.2% for peers selected by the underwriter as analyst to 119.1% for warranted EV/Sales matching. The peer with the lowest valuation multiple in the underwriter's group still has a higher valuation than the lowest peer in each of the alternative groups. Bias between the maximum multiples is less pronounced and often not significant, suggesting that the peer with the highest

valuation selected by the underwriter is typically the same as or similar to that of the alternative groups. An exception is given by peers selected by underwriters acting as analysts, where even the maximum multiples are statistically lower than those selected at the IPO. In the aftermarket, therefore, the underwriter downward-shifts the valuation range of the peers compared to those published in the IPO prospectus[11].

Table 2. Valuation bias between average and median multiples of peers selected by underwriters and by alternative selection methodologies. The table reports average (median) values of valuation bias, computed as the percentage logarithm of the ratio between the multiples associated with peers selected by the underwriter and by alternative selection methodologies. In Panel A (B), the multiple considered in the ratio is the average (median) of the multiples of the peers selected by the underwriter over the average (median) of the multiples of alternative peers selected following the methodology in the header of the column (e.g. 1: peers proposed by Thomson One Banker). The logarithm of the ratio at the single multiple-level is also reported. Groups of peers are obtained from the following criteria: (1) 'Peers proposed by Thomson One Banker' are comparable firms proposed by Thomson One Banker database, based on industry matching (primary SIC code); (2) 'Propensity score matching with public companies' are nearest neighbors obtained from propensity score matching with all equities alive in Datastream each year; (3) 'Warranted EV/Sales matching with public companies' are nearest neighbors obtained from warranted EV/Sales matching (Bhojraj and Lee, 2002) with all equities alive in Datastream each year; (4) 'Peers selected by the underwriter as analyst' are comparable firms published by underwriters who provide also post-IPO analyst coverage, in their first equity report of the company after the IPO; (5) 'Peers selected by sell-side analysts' are comparable firms published by sell-side analysts in the first equity report of the company after the IPO. The total number of observations in each methodology is the entire sample of 348 IPOs, except for methodologies (4) and (5), that are implemented in 99 and 153 IPOs respectively, as reported in the specific columns. Coherently with Kim and Ritter (1999), we use the post-issue book values to avoid upward bias in P/BV ratios. Significance levels at 1% (***), 5% (**) and 10% (*) are based on the *t*-test and Wilcoxon signed-rank test for the difference from zero.

		Algorithmic selections						Non-algorithmic selections					
		(1)		(2)		(3)		(4)			(5)		
	Obs	Peers proposed by Thomson One Banker		Propensity score matching with public companies		Warranted EV/Sales matching with public companies		Obs	Peers selected by the underwriter as analyst		Obs	Peers selected by sell-side analysts	
Panel A. Valuation bias between mean multiple of underwriter's peers and mean multiple of alternative peers													
Val. bias	348	22.4***	(20.7***)	13.5***	(3.5***)	27.5***	(21.3***)	99	17.0***	(20.4***)	153	36.9***	(28.4***)
EV/Sales	184	29.7***	(36.8***)	37.4***	(44.9***)	49.7***	(39.9***)	34	22.0**	(15.0**)	53	43.8***	(37.1***)
EV/EBITDA	170	26.4***	(21.9***)	20.2***	(16.9**)	21.9***	(13.7***)	71	18.3***	(21.3***)	80	35.9***	(27.7***)
EV/EBIT	117	10.8	(-0.6)	17.7**	(0.0)	13.2	(0.1)	18	4.6	(13.4)	14	43.3**	(22.3***)
P/E	265	17.7***	(13.8**)	-8.1*	(-9.4*)	17.7***	(18.2***)	64	16.8***	(23.0***)	84	32.8***	(27.6***)
P/CF	83	9.8	(20.0)	17.0	(14.8)	8.9	(16.0)	3	-13.7	(-13.4)	6	91.4	(115.3)
P/BV	97	34.1***	(33.1***)	6.2	(8.4)	50.0***	(49.8***)	1	37.3	(37.3)	7	9.8	(23.6)
Panel B. Valuation bias between median multiple of underwriter's peers and median multiple of alternative peers													
Val. Bias	348	36.0***	(28.5***)	27.4***	(24.0***)	53.8***	(41.7***)	99	23.1***	(23.5***)	153	35.4***	(29.3***)
EV/Sales	184	47.7***	(51.1***)	54.4***	(57.4***)	85.4***	(79.3***)	34	32.6***	(22.3***)	53	39.2***	(36.5***)
EV/EBITDA	170	33.5***	(27.6***)	37.4***	(37.5***)	39.8***	(37.3***)	71	20.2***	(21.1***)	80	31.9***	(24.7***)
EV/EBIT	117	20.5**	(8.8)	25.7***	(11.5***)	27.8***	(10.4***)	18	11.9	(18.1)	14	40.8**	(29.2***)
P/E	265	34.0***	(31.1***)	5.9	(-0.6)	44.1***	(31.8***)	64	25.0***	(28.8***)	84	35.5***	(32.0***)
P/CF	83	26.8*	(23.6**)	24.2**	(32.4**)	53.3***	(46.9***)	3	-10.8	(-9.0)	6	74.7*	(84.4)
P/BV	97	46.3***	(38.6***)	18.2**	(11.2)	74.9***	(72.8***)	1	36.1	(36.1)	7	19.9	(23.6)

[11] Valuation bias between minimum multiples is more pronounced than that between maximum multiples; therefore, this is not exactly a downward shift. The minimum valuation is lowered to a larger extent than the maximum.

Panel C of Table 3 shows that more than half of the underwriter's peers have valuations that are higher than the median valuation of the alternatively selected peers. On average, 60.5% to 72.4% of peers published in the official IPO prospectus have above-median valuation multiples compared to the alternatively selected peers. These percentages are statistically higher than the 50% threshold across all alternative selection criteria, both in means and medians. Such a large fraction of peers with above-median valuations within the underwriter's selection is consistent with Hypothesis 2.

Table 3. Valuation bias between minimum and maximum multiples and percentage of peers selected by the underwriter with above-median valuation. Panel A and B report the average (median) values of valuation bias, computed as the average of the logarithm of the ratio between multiples associated with peers selected by the underwriter and multiples associated with alternative peers (%). In Panel A (B), the multiple considered in the ratio is the minimum (maximum) of the multiples of the peers selected by the underwriter over the minimum (maximum) of the multiples of alternative peers selected following the methodology in the header of the column (e.g. 1: peers proposed by Thomson One Banker). The logarithm of the ratio at the single-multiple level is also reported. Alternative groups of peers are obtained from the same criteria defined in Table 2. Panel C reports the percentage of peers selected by the underwriter that are valued higher than the median valuation of peers obtained from the methodology in the header of the column. The overall percentage considers all multiples altogether. Coherently with Kim and Ritter (1999), we use the post-issue book values to avoid an upward bias in P/BV ratios. Significance levels at 1% (***), 5% (**), and 10% (*) are based on the *t*-test and Wilcoxon signed-rank test for the difference from zero in Panels A and B, and from 50% in Panel C.

		Algorithmic selections						Non-algorithmic selections					
		(1)		(2)		(3)		(4)			(5)		
	Obs	Peers proposed by Thomson One Banker		Propensity score matching with public companies		Warranted EV/Sales matching with public companies		Obs	Peers selected by the underwriter as analyst		Obs	Peers selected by sell-side analysts	
Panel A. Valuation bias between minimum multiple of underwriter's peers and minimum multiple of alternative peers													
Val. bias	348	80.4***	(76.1***)	71.0***	(62.7***)	119.1***	(101.8***)	99	19.2***	(14.1***)	153	31.7***	(25.9***)
EV/Sales	184	105.7***	(109.9***)	99.2***	(94.6***)	156.3***	(146.8***)	34	24.1*	(17.7)	53	49.6***	(37.1***)
EV/EBITDA	170	77.8***	(75.4***)	66.0***	(65.1***)	85.2***	(74.3***)	71	15.1**	(11.0***)	80	25.5***	(22.8***)
EV/EBIT	117	71.1***	(60.9***)	57.8***	(51.0***)	97.0***	(86.8***)	18	12.8	(15.9)	14	43.7**	(46.8*)
P/E	265	68.8***	(70.3***)	54.1***	(42.5***)	109.1***	(100.1***)	64	25.8**	(17.1***)	84	22.7***	(21.1***)
P/CF	83	51.6***	(54.6***)	90.4***	(89.0***)	138.3***	(119.6***)	3	-43.4	(-20.8)	6	31.0	(25.8)
P/BV	97	95.7***	(92.5***)	74.5***	(76.2***)	150.4***	(155.4***)	1	7.1	(7.1)	7	46.3	(7.5)
Panel B. Valuation bias between maximum multiple of underwriter's peers and maximum multiple of alternative peers													
Val. bias	348	3.2	(0.0)	-1.6	(-8.5*)	-9.9**	(-13.1**)	99	13.4**	(15.2***)	153	8.5	(2.2)
EV/Sales	184	12.9	(0.0)	16.9	(10.7)	10.3	(8.7)	34	22.0	(6.3)	53	-3.7	(-16.6)
EV/EBITDA	170	7.1	(7.1)	-11.5	(-24.4*)	-17.7*	(-19.4**)	71	15.8**	(16.4***)	80	10.6	(-2.1)
EV/EBIT	117	-12.5	(-24.6*)	-7.7	(-21.0)	-22.2	(-27.1)	18	-8.7	(4.1)	14	-7.8	(-29.2)
P/E	265	-1.6	(-5.3)	-2.1	(-7.1)	-13.0*	(-11.1*)	64	12.2	(15.9*)	84	18.3**	(14.2**)
P/CF	83	-8.3	(23.9)	-17.9	(-29.7)	-38.8*	(-27.7)	3	-25.6	(-5.4)	6	20.6	(79.5)
P/BV	97	15.0	(6.6)	-3.5	(-7.5)	6.5	(-6.6)	1	52.2	(52.2)	7	-13.7	(10.9)
Panel C. Underwriter's peers with valuation multiples above the median of alternative peers (%)													
Overall	348	64.6***	(75.0***)	60.5***	(70.0***)	71.3***	(88.2***)	99	70.3***	(75.0***)	153	72.4***	(80.0***)
EV/Sales	184	67.3***	(80.0***)	66.6***	(80.0***)	76.0***	(100.0***)	34	69.3***	(75.0***)	53	75.5***	(87.5***)
EV/EBITDA	170	66.2***	(83.3***)	74.9***	(100.0***)	71.9***	(88.9***)	71	70.2***	(75.0***)	80	73.2***	(80.0***)
EV/EBIT	117	55.0	(62.5)	59.7**	(75.0**)	60.7**	(71.4**)	18	67.0**	(73.2**)	14	79.0**	(85.7**)
P/E	265	65.9***	(75.0***)	48.9	(50.0)	70.9***	(86.6***)	64	73.1***	(80.0***)	84	68.6***	(77.8***)
P/CF	83	55.6	(50.0)	58.4	(66.7)	66.1***	(83.8***)	3	42.5	(40.0)	6	91.7***	(87.5)
P/BV	97	68.8***	(90.0***)	58.1	(55.0*)	77.2***	(100.0***)	1	71.4	(71.4)	7	63.1	(66.7)

2.5.2 IPO premium

In this subsection, we empirically assess the persistence of a positive valuation bias after accounting for the deliberate discount that underwriters apply to their value estimates to set the POP. We refer to the IPO premium, a modified version of the valuation bias in which the numerator is the multiple implied by the POP of the IPO. Hypothesis 3 predicts that the valuation implied by the POP after accounting for the discount remains significantly higher than that of peers obtained from alternative selection criteria. Table 4 reports the results supporting this prediction. The multiples implied by the POP of the IPO are significantly higher compared to those of peers obtained from algorithmic methodologies, both for the average and median multiples. For the average multiple of the Thomson One Banker peers, the IPO premium averages 16.7% (19.8% in median) and increases to 38% (36.3%) if computed on the peers' median multiple. Propensity score matching yields similar findings, while the warranted EV/Sales matching methodology (which is less constrained by industry affiliation) provides even stronger evidence. Non-algorithmic criteria confirm the results obtained by algorithmic selections.

In summary, our empirical evidence on valuation bias and IPO premium is consistent with the related hypotheses developed in Section 2. Underwriters select comparable firms with a valuation that is significantly higher than that of comparable firms obtained by alternative selection criteria, consistent with Hypothesis 1. The valuation of peers selected by underwriters is higher because some peers with the poorest valuation multiples are excluded, as predicted by Hypothesis 2. Such positive valuation bias persists even after accounting for the deliberate price discount that underwriters apply to their value estimates when defining the valuation of the IPO firm, consistent with Hypothesis 3.

Table 4. IPO premium with respect to peers selected by alternative selection methodologies. The table reports average (median) values of IPO premium, computed as the percentage logarithm of the ratio between the issuer's multiples implied by the preliminary offer price and the corresponding multiples associated with alternative peers. In panel A (B), the denominator of the IPO premium is the average (median) multiple of alternative peers selected following the methodology in the header of the column. The logarithm of the ratio at the single-multiple level is also reported. 'Peers selected by underwriters' (column 0) are comparable firms published in the official prospectus. Alternative groups of peers are obtained from the same criteria defined in Table 2. Significance levels at 1% (***), 5% (**), and 10% (*) are based on the *t*-test and Wilcoxon signed-rank test for the difference from zero.

	Prospectus			Algorithmic selections						Non-algorithmic selections					
		(0)		(1)		(2)		(3)		(4)			(5)		
	Obs	Peers selected by underwriters		Peers proposed by Thomson One Banker		Propensity score matching with public companies		Warranted EV/Sales matching with public companies		Obs	Peers selected by the underwriter as analyst		Obs	Peers selected by sell-side analysts	
Panel A. IPO premium with respect to the mean multiple of alternative peers															
IPO premium	348	-5.4***	(-6.4**)	16.7***	(19.8***)	17.7***	(16.1***)	22.7***	(20.5***)	99	13.1***	(11.5***)	153	27.0***	25.1***
EV/Sales	184	-6.9	(-8.4*)	22.7***	(28.6***)	28.6***	(24.0***)	34.5***	(38.5***)	34	5.6	(-9.5)	53	26.6**	(12.4*)
EV/EBITDA	170	-3.6	(-3.7)	17.9**	(19.6**)	19.7***	(16.7***)	14.1*	(12.8*)	71	13.7**	(13.7**)	80	25.6***	(23.5***)
EV/EBIT	117	-13.9**	(-6.9*)	0.3	(-11.0)	12.1*	(16.1*)	3.1	(-13.5)	18	-5.9	(-1.5)	14	35.5**	(20.4**)
P/E	265	-1.2	(-6.5)	18.1***	(22.3***)	19.4***	(13.6***)	21.0***	(18.9***)	64	24.0***	(23.0***)	84	27.9***	(32.1***)
P/CF	83	-1.2	(-2.1)	11.5	(15.8)	12.7	(20.2)	30.7**	(27.6**)	3	-37.6	(-35.3)	6	68.0*	(75.7*)
P/BV	97	-9.7	(-4.7)	22.6**	(35.3***)	-0.8	(-5.9)	37.4***	(37.8***)	1	72.6	(72.6)	7	-12.4	(-0.5)
Panel B. IPO premium with respect to the median multiple of alternative peers															
IPO premium	348	2.2	(-0.8)	38.0***	(36.3***)	37.4***	(38.3***)	57.0***	(49.1***)	99	24.8***	(23.7***)	153	34.7***	(32.7***)
EV/Sales	184	1.5	(-3.2)	48.8***	(45.8***)	54.7***	(53.0***)	78.1***	(75.4***)	34	19.8	(7.0)	53	36.5***	(25.4*)
EV/EBITDA	170	5.6	(0.9)	35.6***	(34.0***)	43.5***	(43.1***)	41.8***	(36.4***)	71	21.7***	(20.0***)	80	31.2***	(26.6***)
EV/EBIT	117	-2.3	(-4.2)	21.2**	(9.3**)	29.2***	(25.1***)	30.7***	(13.7***)	18	6.8	(3.2)	14	41.6**	(27.5***)
P/E	265	3.3	(-4.3)	38.5***	(37.8***)	36.4***	(42.5***)	51.1***	(44.2***)	64	37.2***	(33.6***)	84	36.1***	(39.8***)
P/CF	83	9.5	(5.2)	36.3**	(36.2***)	30.0***	(37.8***)	83.7***	(78.6***)	3	-2.4	(8.8)	6	78.1*	(85.7*)
P/BV	97	-4.7	(1.5)	41.2***	(53.9***)	17.0	(19.4**)	69.6***	(73.3***)	1	82.5	(82.5)	7	-0.8	(7.5)

2.5.3 Determinants of valuation bias

Table 5 presents the results of our instrumental variables analyses, implemented as a 2SLS regression, showing estimates of the first- and second-stage models. In the first stage, the dependent variable is underwriter reputation, defined as the percentage market share of the lead underwriter measured by proceeds raised in Europe (London, Euronext, Frankfurt, and Milan) during 1995-2011 (Vismara, Paleari, and Ritter, 2012). In the second stage, the dependent variable is the median valuation bias across all methodologies for the selection of alternative peers. We compute the variance inflation factors for the independent variables, which indicate that collinearity is not a problem in our data[12]. In the first stage, we find that underwriter local concentration is negatively associated with underwriter reputation. In unreported tests, the first-stage F-statistic is statistically significant at the 1% level, and the partial R-squared measuring the correlation between the endogenous variable and the instrument is 24.3%, confirming the validity of our instrument.

Hypothesis 4 predicts that the underwriters' bias in the selection of peers is deterred by the presence of sophisticated investors. Consistently, the coefficient of the institutional offer variable is negative and significant across all model specifications of the second-stage regression. Hypothesis 5 states that more reputable underwriters are more biased in the selection of comparable firms due to their superior bargaining power. The coefficient of the instrumented underwriter reputation variable is positive and significant across all model specifications of the second-stage regression, confirming its positive causal impact on valuation bias.

Among the control variables, we find that the valuation bias is higher in larger offerings, where profits from fees are larger. Highly leveraged firms are associated with a less-pronounced valuation bias, possibly because of the monitoring role of debt-holders (Jensen, 1986). The high valuation ratios of firms that went public during the tech bubble of 1999-2000 made it convenient for underwriters to use them as comparables, resulting in an increased valuation bias. Among valuation and pricing indicators, we find that the IPO pricing methodology is influential for the underwriter's selection of peers, as the coefficient of the fixed price offer dummy is negative and

[12] The highest value of variance inflation factor is 3.7, with an average value of 1.8 across all variables. A detailed table of the variance inflation factors is available in Appendix D.

Table 5. 2SLS regression for determinants of valuation bias. The table reports estimates of the 2SLS model controlling for endogenous matching between issuer and underwriter. In the first stage, the dependent variable is underwriter reputation, defined as the percentage market share of the lead underwriter measured by proceeds raised in Europe (London, Euronext, Frankfurt, and Milan) during 1995-2011. In the second stage, the dependent variable is valuation bias across all alternative methodologies for selection of peers. Institutional offer: fraction of shares initially reserved for institutional investors over the total number of offered shares; underwriter reputation: instrumented variable; offer size: logarithm of the offer price multiplied by the number of offered shares, adjusted for inflation (2011 purchasing power); sales: logarithm of the firm's last fiscal year sales adjusted for inflation (2011 purchasing power); age: log of 1 plus firm age in years at the IPO; leverage: log of total debt over total assets; intangible assets: log of the portion of intangible over total assets; negative earnings: dummy equal to 1 in the case that the firm reported negative earnings in the last fiscal year before the IPO; tech bubble: dummy equal to 1 if the IPO took place in 1999-2000; pre-IPO market return: FTSE Euromid (FTSE MIB) index return over the 100 trading days before the IPO in Paris (Milan); DCF (DDM): dummy equal to 1 if the IPO is valued through Discounted Cash Flow (Dividend Discount Model); auction (fixed price): dummy equal to 1 if the IPO is priced using the auction (fixed price) mechanism; Prospectus Directive: dummy equal to 1 if the IPO took place after July 1, 2005, when the EU Directive became effective; UW local concentration: instrument for underwriter reputation, namely, the Herfindahl index of the amount of IPOs underwritten by the lead underwriter in each of the stock exchanges of London, Frankfurt, Euronext, and Milan, calculated over the sample period. All regressions include industry and stock exchange fixed effects. T-statistics in brackets are corrected using the Huber/White/sandwich estimator of variance.

	First stage: underwriter reputation				Second stage: valuation bias			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Institutional offer	0.01	0.00	0.01	0.00	-0.33***	-0.31**	-0.36***	-0.36***
	(0.21)	(0.11)	(0.21)	(0.01)	(-2.63)	(-2.37)	(-2.74)	(-2.72)
Underwriter reputation					0.82**	0.80**	0.78**	0.78**
					(2.13)	(2.06)	(2.04)	(2.04)
Offer size	-0.00	-0.00	-0.00	-0.01	0.07***	0.07***	0.06***	0.06***
	(-0.46)	(-0.27)	(-0.42)	(-0.86)	(3.31)	(3.15)	(2.85)	(2.90)
Sales	-0.55*	-0.57*	-0.59**	-0.69**	1.23	1.22	1.33	1.39
	(-1.89)	(-1.92)	(-1.97)	(-2.33)	(1.00)	(1.02)	(1.08)	(1.11)
Age	-0.01	-0.01	-0.01	-0.01	0.03	0.03	0.03	0.03
	(-0.74)	(-0.71)	(-0.71)	(-0.82)	(1.00)	(0.92)	(0.89)	(0.91)
Leverage	-0.01**	-0.01**	-0.01**	-0.01**	-0.08***	-0.08***	-0.07***	-0.07***
	(-2.27)	(-2.30)	(-2.23)	(-2.21)	(-3.13)	(-3.07)	(-2.84)	(-2.86)
Intangible assets	-0.00	-0.00	-0.00	-0.01	0.01	0.01	0.00	0.00
	(-0.14)	(-0.17)	(-0.16)	(-0.41)	(0.15)	(0.15)	(0.03)	(0.08)
Negative earnings	0.06	0.06	0.06	0.06	0.18	0.20	0.20	0.20
	(1.41)	(1.35)	(1.37)	(1.41)	(1.29)	(1.40)	(1.41)	(1.41)
Tech bubble	0.01	-0.01	-0.01	0.02	0.08	0.20**	0.25***	0.23***
	(0.71)	(-0.39)	(-0.18)	(0.69)	(1.12)	(2.44)	(3.05)	(2.58)
Pre-IPO market return	-0.01	0.01	0.01	-0.00	-0.14	-0.20	-0.21	-0.21
	(-0.18)	(0.09)	(0.13)	(-0.06)	(-0.47)	(-0.68)	(-0.77)	(-0.74)
DCF		-0.05*	-0.05*	-0.06**		0.20**	0.18**	0.19**
		(-1.87)	(-1.90)	(-2.31)		(2.21)	(2.11)	(2.14)
DDM		-0.02	-0.02	-0.02		-0.06	-0.05	-0.05
		(-0.62)	(-0.58)	(-0.70)		(-0.47)	(-0.43)	(-0.41)
Auction			-0.02	0.01			-0.18	-0.20*
			(-0.99)	(0.44)			(-1.62)	(-1.68)
Fixed price			-0.00	0.02			-0.26***	-0.27***
			(-0.10)	(1.01)			(-2.87)	(-2.96)
Prospectus Directive				0.06**				-0.04
				(2.53)				(-0.51)
UW local concentration	-0.44***	-0.44***	-0.44***	-0.44***				
	(-6.84)	(-6.82)	(-6.80)	(-6.92)				
Constant	2.61**	2.73**	2.82**	3.22***	-5.53	-5.53	-5.73	-5.97
	(2.25)	(2.29)	(2.35)	(2.70)	(-1.13)	(-1.17)	(-1.18)	(-1.20)
Observations	348	348	348	348	348	348	348	348
Adjusted R-squared	0.56	0.56	0.56	0.56	0.30	0.31	0.32	0.32

significant. Furthermore, the coefficient of the DCF dummy variable is positive and significant. Thus, when investment banks use the DCF as a complementary valuation method, valuation bias increases. Because the assumption of excessively high growth rates would undermine the credibility of the DCF, underwriters might tend to compensate such a constraint by using a set of peers characterized by higher valuations. We do not find any significant effect of the introduction of the Prospectus Directive on the underwriters' bias in the selection of comparable firms.

2.6 ROBUSTNESS CHECKS

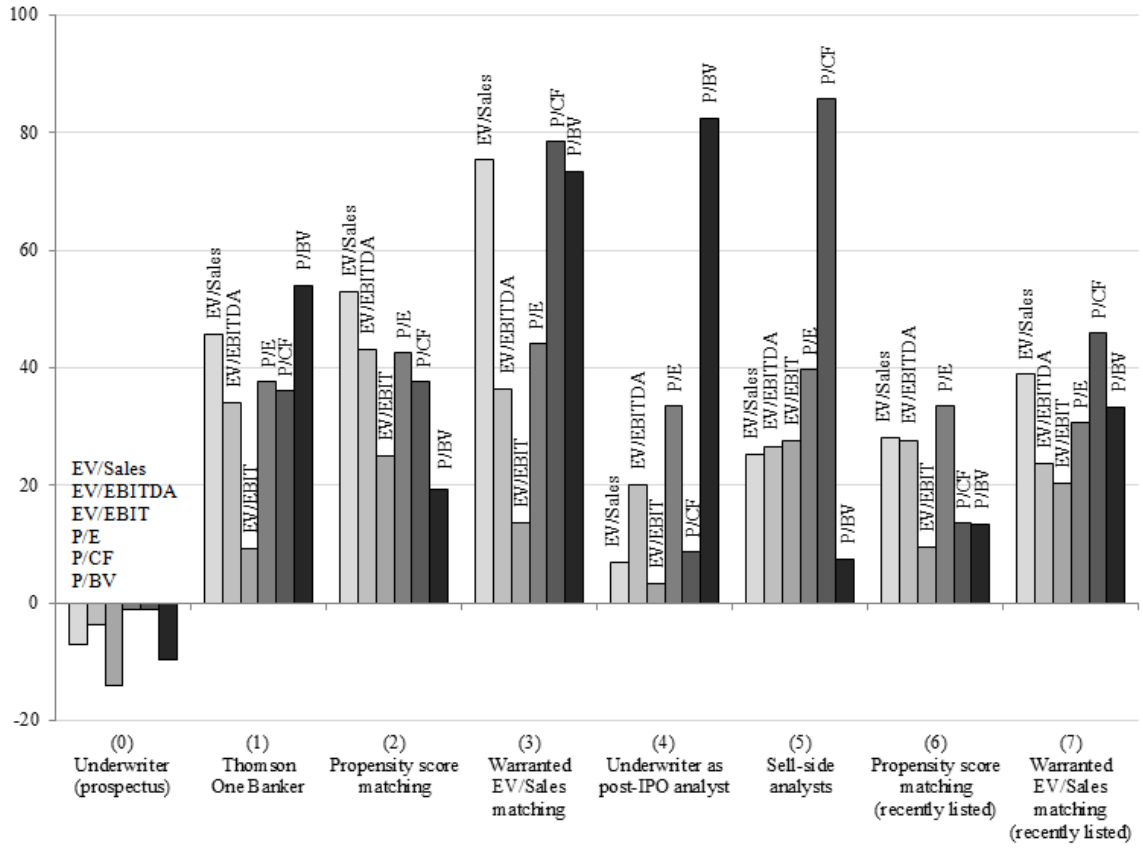
In this section, we perform several robustness checks to test possible alternative explanations of our results. First, we address the issue of the presence of growth opportunities embedded in IPO prices, which may explain the difference from the valuation of alternatively selected peers. Second, we control for the potential effect of using concurrent valuation methodologies other than the comparable peers approach. Third, we consider secondary market valuations of the IPO firm. Fourth, we account for the introduction of the Prospectus Directive by the European Commission in 2005. Finally, we repeat our analyses using different P/E definitions. We perform our robustness checks using the IPO premium because it is more conservative than valuation bias.

2.6.1 Growth opportunities in IPO valuations

IPO firms typically embed high growth opportunities and, consequently, obtain higher valuation ratios compared to seasoned firms. Thus, the difference in multiples between IPOs and comparable firms may be due to the present value of higher growth opportunities, rather than to an upwardly biased selection of peers. We address this issue by selecting comparable firms among a sample of newly listed firms. We repeat (6) the propensity score matching methodology and (7) the Warranted EV/Sales methodology by restricting the control sample to newly listed firms: that is, all firms available in Datastream that went public up to 5 years before the IPO date of the company under valuation.

Figure 3 summarizes the IPO premiums calculated on the median multiples of the different sets of peers, including the new selection criteria controlling for growth

Figure 2. IPO premium controlling for growth opportunities. The graph shows the median IPO premium, calculated as the logarithm of the ratio between the multiple implied by the preliminary offer price of the company going public and the median multiple of the alternative groups of peers (Table 4, panel B), except for peers selected by the underwriter (0), for which we take the IPO premium on the average multiple of alternative peers. Each bar shows the IPO premium calculated on the single multiple. Alternative groups of peers from (1) to (5) are obtained from the same criteria defined in Table 2. Alternative groups controlling for growth opportunities are: (6) nearest neighbors obtained from propensity score matching, and (7) nearest neighbors obtained from warranted EV/Sales matching (Bhojraj and Lee, 2002), with all equities alive in Datastream each year and listed by no more than 5 years.



opportunities. The zero line corresponds to a set of peers having the same median multiple as the IPO. As expected, we find that selecting alternative peers among newly listed companies decreases the magnitude of the IPO premium. However, the IPO premium remains positive (and significant, as documented by unreported tests), suggesting that growth opportunities are not sufficient to explain the difference in valuation between peers selected by IPO underwriters and from alternative procedures.

2.6.2 Concurrent valuation methods

The presence of concurrent valuation methodologies may affect the way in which underwriters value the company they are taking public. To address this concern, we check whether IPO premium persists by restricting the sample to the 102 IPOs in which the underwriter uses the comparables approach as the only valuation methodology. Panel A of Table 6 compares the results for the whole sample and the restricted sample. Overall, the evidence confirms that the valuation of the IPO firm remains significantly higher than that of peers obtained from alternative selection criteria regardless of the presence of concurrent valuation methods.

2.6.3 Primary vs. secondary market

Underwriters are often assumed to discount their value estimates deliberately when setting the POP (Rock, 1986). Both price revision, induced by canvassing investors' demand through the book-building process, and underpricing, incorporating the first market assessment, contribute to modify the initial valuation of the company going public. Results reported in panel B of Table 6 confirm that the IPO premium remains positive and significant across all of the different criteria for the selection of comparable firms even using the final offer price and the first-day market price.

2.6.4 Regulatory changes

The aims of the 2005 EU Prospectus Directive were to alleviate cross-country heterogeneity in European IPO prospectuses and ensure that investors have access to consistent and standardized information. Among the practical implications, the Directive recommends the disclosure of methods used by the underwriter in valuing the issuer's shares, together with an indication of the value estimates[13]. In panel C of Table

[13] The Directive resulted in an increase in the fraction of IPOs valued using multiples that published the names and valuations of the comparable firms used by the underwriter. Before the Directive,

6, we show that a positive and significant IPO premium exists before and after the regulatory change.

2.6.5 Price-to-earnings definitions

We check the robustness of our results against different specifications of the most widely used multiple, the P/E ratio, with the goal of controlling for contingent factors that may affect the firm's valuation, depending on how multiples are defined. We test whether our results persist by computing alternative multiple definitions for IPO firms and their peers selected by each alternative methodology. Thus far, we have used the trailing P/E ratio, in which the denominator is defined as the firm's last fiscal year earnings before the IPO. In this step, we calculate the IPO premium by considering the following alternative specifications: the (1) unlevered, (2) Shiller, and (3) forward P/E multiples.

The unlevered P/E ratio ensures comparability across companies with different leverages (Leibowitz, 2002). It is defined as follows:

$$\left(\frac{P}{E}\right)_{unlev} = \frac{Market\ Cap/(1-\frac{D}{D+E})}{Earnings + Interest\ Expense}$$

where *D* is total debt and *E* is the book value of equity. All measures refer to the firm's last fiscal year before the IPO, except for market capitalization that is computed at the POP. The Shiller P/E ratio is a long-term version of the P/E that alleviates the effects of the variability of earnings across years. It is computed as the ratio of the inflation-adjusted market value of the firm at the POP over the prior long-run trailing mean of inflation-adjusted earnings. Because our sample is composed of IPO firms that typically do not have a long backward operating history, we adopt a 3-year time horizon and restrict our sample to the 223 firms that have at least a 3-year pre-IPO track record. The forward P/E ratio is computed using consensus analyst forecast from I/B/E/S over the next year following the IPO, for both IPO firms and their peers. While this specification has the advantage of adopting a forward-looking measure of earnings, it may suffer from overoptimism (Rajan and Servaes, 1997) and herding (Trueman, 1994) in analyst forecasts.

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approximately 77% of IPOs in our sample made full disclosure of the comparable firms used; this fraction increased to 84% afterwards.

Panel D of Table 6 reports the IPO premium computed using different P/E definitions for IPO firms and their peers. The unlevered P/E ratio yields similar values of IPO premium to those previously obtained using the trailing P/E ratio, ranging from 18.9% to 31.9% on average. IPO premium is positive and statistically different from zero across all of the different matching methodologies. The Shiller P/E ratio produces even larger premiums. The backward average of earnings lowers indeed the denominator of the P/E ratio to a greater extent for IPO firms than for already listed firms. The forward P/E ratio yields lower IPO premiums, ranging from 10.7% to 18% on average. Because the growth rates assumed in analyst forecasts tend to be more optimistic for IPO firms than for seasoned firms, future earnings are relatively higher for IPO firms, thus lowering the P/E ratio to a greater extent. This situation results in a lower IPO premium when calculated using forward P/E, although it is statistically significant across all selection criteria. Overall, P/E ratios corrected for firm leverage, past profitability, and future growth prospects all confirm that the valuations of IPO firms are significantly higher than those of peers obtained from alternative selection criteria.

Table 6. Robustness checks. The table reports results of the robustness checks performed on the average (median) values of IPO premium, computed as the percentage logarithm of the ratio between the issuer's multiples implied by the preliminary offer price (POP) and corresponding multiples associated with alternative peers, as in Table 4. Alternative groups of peers are obtained from the same criteria defined in Table 2. In Panel A, IPO premium is computed on the median multiple of alternative peers in the denominator, on the whole sample and on the subsample of 102 IPOs valued using multiples as the only methodology. In Panel B, the numerator is the issuer's multiple implied by the POP, the final offer price, and the first day closing price, respectively. In Panel C, IPO premium is computed by splitting the sample before (197 IPOs) and after (151 IPOs) July 1, 2005, when the EU Prospectus Directive became effective. In Panel D, IPO premium is computed using different P/E definitions, both for the IPO firm and the peers obtained from alternative selection criteria, on the subsample of 265 IPO firms valued using the P/E ratio (Table 1, Panel B). P/E ratios are defined as follows: (1) trailing P/E is the traditional ratio; (2) unlevered P/E corrects for the effect of leverage; (3) Shiller P/E uses the previous 3-year trailing mean of inflation-adjusted earnings instead of last fiscal year earnings; (4) forward P/E uses consensus analyst forecast of earnings from I/B/E/S for the next year. Significance levels at 1% (***), 5% (**), and 10% (*) are based on the *t*-test and Wilcoxon signed-rank test for the difference from zero.

		Algorithmic selections						Non-algorithmic selections					
		(1)		(2)		(3)		(4)			(5)		
	Obs	Peers proposed by Thomson One Banker		Propensity score matching with public companies		Warranted EV/Sales matching with public companies		Obs	Peers selected by the underwriter as analyst		Obs	Peers selected by sell-side analysts	
Panel A. Concurrent valuation methods													
All sample	348	38.0***	(36.3***)	37.4***	(38.3***)	57.0***	(49.1***)	99	24.8***	(23.7***)	153	34.7***	(32.7***)
Multiples only	102	20.3***	(27.5***)	25.3***	(20.9***)	57.2***	(67.3***)	51	9.3	(2.9)	30	23.6**	(11.4*)
Panel B. Primary vs. secondary market													
Preliminary offer price (POP)	348	16.7***	(19.8***)	17.7***	(16.1***)	22.7***	(20.5***)	99	13.1***	(11.5***)	153	27.0***	(25.1***)
Offer price	348	12.3***	(14.9***)	14.8***	(12.8***)	18.6***	(14.2***)	99	6.6*	(4.9**)	153	22.2***	(19.6***)
First day market price	348	18.5***	(19.1***)	19.1***	(17.9***)	24.5***	(21.0***)	99	10.4**	(5.7***)	153	32.0**	(30.4***)
Panel C. Regulatory change													
Pre-Directive	197	13.2***	(18.5***)	8.2**	(7.3**)	23.6***	(25.7***)	44	1.3	(-0.1)	75	21.9***	(20.1***)
Post-Directive	151	21.6***	(20.8***)	30.2***	(24.8***)	21.4***	(13.1***)	55	24.4***	(22.1***)	78	33.5***	(30.2***)
Panel D. P/E definitions													
Trailing	265	18.1***	(22.3***)	19.4***	(13.6***)	21.0***	(18.9***)	64	24.0***	(23.0***)	84	27.9***	(32.1***)
Unlevered	265	18.9***	(23.3***)	20.0***	(14.4***)	31.9***	(33.4***)	64	25.5***	(25.3***)	84	29.0***	(33.2***)
Shiller	223	33.0***	(26.9***)	31.1***	(25.4***)	19.2***	(20.7***)	50	27.2***	(25.1***)	65	37.6***	(29.7***)
Forward	265	10.7**	(9.4***)	12.2*	(4.7**)	17.5***	(16.6***)	64	10.9*	(5.0*)	84	18.0***	(18.2***)

2.7 CONCLUSIONS

The comparables approach leaves IPO underwriters with responsibility and discretion in the selection of comparable firms. The way in which they make use of such discretion is the core of our investigation. Using a sample of 348 firms going public in France and Italy during 1999-2011, where valuation using multiples is largely adopted, we develop empirical evidence that underwriters perform a biased selection of comparable firms for valuing the firms they are taking public.

Peers published in IPO prospectuses show 13.5% to 36.9% higher valuation multiples than peers obtained from alternative algorithmic and non-algorithmic selection methodologies, such as the list of peers proposed by Thomson One Banker, obtained from propensity score-matching methods, or selected by sell-side analysts. This biased selection is pursued by underwriters by left-truncating the sample of potential peers (i.e. excluding peers with poor valuations). Even when underwriters apply a discount to their value estimates when defining the offer price, the valuation of the IPO firm remains significantly higher than that of alternatively selected peers. Our results persist if we compare peers published in the prospectus with those selected a few months later by the same bank when providing aftermarket analyst coverage to the same firm. The results are robust to the presence of growth opportunities embedded in IPO prices, the potential effect of concurrent valuation methodologies, secondary market valuations, regulatory changes, and different multiple definitions.

This is the first study to document empirically the existence of this valuation bias in the underwriters' selection of comparable firms. We argue that underwriters adopt such behavior to increase the valuation of the firm they take public and, at the same time, present the IPO as conservatively valued, especially compared to peers published in the prospectus. This approach allows underwriters to increase their immediate profit from fees, and permits issuers to raise larger amounts of capital. However, persistently overpricing IPOs entails some risks. We document that the presence of institutional investors, who have a superior ability to detect such opportunistic behavior, pushes underwriters to lessen the bias in the selection of peers. On the other hand, after controlling for endogeneity in matching between issuer and underwriter, we find that

the bias becomes more pronounced in presence of more reputable investment banks, arguably due to their higher bargaining power.

APPENDIX

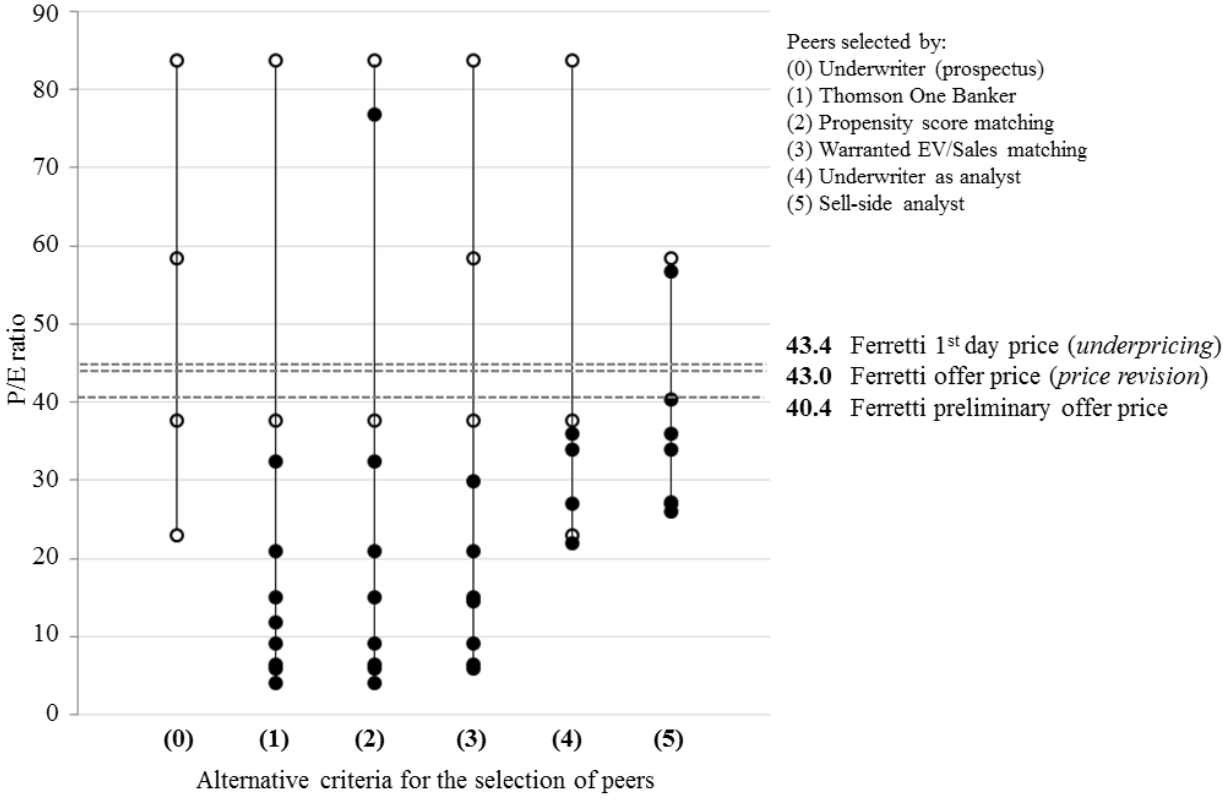
Appendix A. Descriptive statistics. The table reports descriptive statistics of the sample of 348 IPOs taking place in Paris and Milan from 1999 to 2011 valued using multiples. Panel A presents the firm characteristics, on average, in millions of euros, adjusted for inflation (2011 purchasing power). Enterprise value is market value plus total debt minus cash, where the market value is calculated at the offer price; market value is the offer price multiplied by the number of ordinary shares in issue; total assets is the sum of all firm assets; sales are annual revenues at the fiscal year end before IPO; EBITDA is earnings before interest expense, income taxes, depreciation and amortization; EBIT is earnings before interest expense and income taxes; earnings are income after all operating and non-operating income and expenses, reserves, taxes, minority interest and extraordinary items; cash flow is the sum of net income and non-cash charges or credits, minus changes in working capital; book value (pre-issue) is the book value of shareholders' equity before the IPO; book value (post-issue) accounts for the addition of equity through secondary shares, if any. Panel B presents the median values of valuation multiples at the IPO.

	Sample (348 IPOs)	Paris (229 IPOs)	Milan (119 IPOs)
Panel A. Firm characteristics (2011 €m)			
Enterprise value	1,020	809	1,426
Market value	796	564	1,263
Total assets	352	334	385
Sales	456	400	563
EBITDA	105	86	139
EBIT	60.9	47.3	87.1
Earnings	22.1	12.9	39.5
Cash Flow	96.7	81.4	121.7
Book value (pre-issue)	1812	132	277
Book value (post-issue)	272	216	379
Panel B. Valuation multiples at the IPO			
EV/Sales	1.5	1.5	1.6
EV/EBITDA	10.5	10.8	11.2
EV/EBIT	12.8	12.5	13.0
P/E	25.2	21.9	30.7
P/CF	15.1	15.0	16.0
P/BV pre-issue	6.8	6.9	5.9
P/BV post-issue	3.0	3.0	2.9

Appendix B. Peers of Ferretti selected by the underwriter and peers from alternative selection criteria. Ferretti went public on the Milan stock exchange on June 23rd, 2000 (ISIN: IT0001475091, primary SIC code: 3732). The underwriter Schroder Salomon Smith Barney valued the company using 4 peers and 4 multiples (EV/EBITDA, P/CF, P/E, and P/BV), as reported in the official prospectus (page 16). The alternative groups of peers are selected as described in Table 2. The post-IPO equity research report by Schroder Salomon Smith Barney was published on April 20th, 2001 (peers at page 3), while the first sell-side analyst report was published by Banca IMI on January 11th, 2002 (peers at page 4). Peers in bold are those published by the underwriter in the prospectus. Valuation Bias is the percentage logarithm of the ratio between the multiple associated with peers selected by the underwriter and the multiple associated with alternative peers, computed between the average, median, minimum and maximum multiple of the two groups. Above-median peers is the percentage of the underwriter's peers with valuation above the median valuation of alternatively selected peers. IPO premium is the percentage logarithm of the ratio between the issuer's multiple calculated on offer price and the median multiple associated with the alternative groups of peers. Ferretti's P/E ratio implied by the preliminary offer price is 40.4.

P/E of peers from algorithmic selections								P/E of peers from non-algorithmic selections			
(0) Peers selected by the underwriter		(1) Peers proposed by Thomson One Banker		(2) Propensity score matching with public companies		(3) Warranted EV/Sales matching with public companies		(4) Peers selected by the underwriter as analyst		(5) Peers selected by sell-side analysts	
Rodriguez Group	**83.8**	**Rodriguez Group**	**83.8**	**Rodriguez Group**	**83.8**	**Rodriguez Group**	**83.8**	**Rodriguez Group**	**83.8**	**Ducati**	**58.4**
Ducati	**58.4**	Ferretti	40.4	Neorion Holdings	76.8	**Ducati**	**58.4**	Ferretti	40.4	LVMH	56.8
Ferretti	40.4	**Bénéteau**	**37.6**	Ferretti	40.4	Ferretti	40.4	**Bénéteau**	**37.6**	Ferretti	40.4
Bénéteau	**37.6**	Fountain Powerboat	32.5	**Bénéteau**	**37.6**	**Bénéteau**	**37.6**	Gucci	35.9	Gucci	35.9
Porsche	**23.0**	Couach	21.0	Fountain Powerboat	32.5	Oceaneering Intl	29.9	Bulgari	34.0	Bulgari	34.0
		Conrad Industries	15.1	Couach	21.0	Couach	21.0	Tod'S	27.0	Hermès	27.2
		Austal	11.9	Conrad Industries	15.1	Conrad Industries	15.1	**Porsche**	**23.0**	Tod'S	27.0
		Marine Products	9.1	Marine Products	9.1	Rockwool Intl	14.5	Harley Davidson	22.0	Tiffany	26.0
		Cosalt	6.4	Cosalt	6.4	Marine Products	9.1				
		Grand Banks Yachts	5.9	Grand Banks Yachts	5.9	Cosalt	6.4				
		Shigi Shipbuilding	4.1	Shigi Shipbuilding	4.1	Grand Banks Yachts	5.9				
Average	50.7		22.7		29.2		28.2		37.6		37.9
Median	48.0		13.5		18.1		18.1		34.0		34.0
Min	23.0		4.1		4.1		5.9		22.0		26.0
Max	83.8		83.8		83.8		83.8		83.8		58.4
Valuation Bias											
between averages	-		80.2		55.1		58.8		29.9		29.1
between medians	-		126.9		97.8		97.8		34.5		34.5
between minima	-		172.5		172.5		136.1		4.4		-12.3
between maxima	-		0.0		0.0		0.0		0.0		36.1
Above-median peers (%)			100		100		100		75		75
IPO Premium											
on average	-22.7		57.5		32.4		36.1		7.1		6.4
on median	-17.2		109.6		80.6		80.6		17.2		17.2

Appendix C. Multiples of peers of Ferretti selected by the underwriter vs. peers obtained from alternative selections. The graph shows the distribution of the P/E ratios of the peers of Ferretti. The X-axis reports the groups obtained from the different criteria for the selection of peers, while the Y-axis shows the P/E values. Each dot corresponds to the P/E of one of the peers, with the white dots referring to the peers published by the underwriter in the IPO prospectus. The three grey dashed horizontal lines refer to the P/E ratios of Ferretti, implied by the preliminary offer price, the offer price, and the 1st day closing price respectively. The first vertical line shows the valuation distribution of peers selected by the underwriters, as reported in the IPO prospectus (0). The alternative groups of peers are selected as described in Table 2. The detailed lists of peers are provided in Appendix B.



Appendix D. Variance inflation factors for the independent variables of the regression in Table 5. The table reports variance inflation factor coefficients for each of the independent variables included in the 2SLS regression on valuation bias (Table 5).

Variable	VIF
Offer size	3.7
Tech bubble	3.4
Sales	2.9
Prospectus Directive	2.8
DCF	2.7
Milan SE	2.5
Auction	2.1
Consumer goods dummy	1.9
Underwriter reputation	1.9
Healthcare dummy	1.8
Leverage	1.6
Fixed price	1.6
Telecommunications dummy	1.5
Negative earnings	1.4
Financials dummy	1.4
Consumer services dummy	1.4
DDM	1.4
Intangible assets	1.3
Age	1.3
Institutional offer	1.3
Technology dummy	1.3
Pre-IPO market return	1.2
Industrials dummy	1.1
Basic materials dummy	1.1
Utilities dummy	1.1
Mean VIF	1.8

CHAPTER THREE.

Are IPO underwriters paid for the services they provide?

3.1 INTRODUCTION

The level of competition in the industry of IPO underwriting has been under discussion since Chen and Ritter (2000) pointed out an unusual clustering of gross spreads at seven percent among almost all moderate-sized IPOs in the US. They argue that an implicit form of collusion (strategic pricing) has been adopted. Eleven years later, Liu and Ritter (2011) address the inconsistency of perfect competitive models and study the US underwriting industry as a series of local oligopolies. The principal sources of market power they identify are quality, which involves the reputation of the underwriters, industry expertise, and the ancillary services bundled with underwriting.

Chen and Ritter (2000) and Liu and Ritter (2011) deal with IPOs in the United States. Europe presents a different story. First, underwriting fees are significantly lower (e.g., Ljungqvist, Jenkinson, and Wilhelm, 2003). Abrahamson et al. (2011) document a three percentage points gap between US and European gross spreads, which is barely justified by the higher costs of taking a company public (Torstila, 2003) or by the greater litigation exposure to which US underwriters are subject (Lowry and Shu, 2002). They point at the different nature of competition as the most plausible motivation: strategic pricing occurs in the US but not in Europe. Second, European fees do not cluster. Torstila (2001b) documents substantial variation both across and within European countries. While the clustering phenomenon prevents to shed light on which factors drive the underwriter's remuneration in the US, the variability of European gross spreads makes Europe a privileged setting for such investigation.

This paper relates the fees paid to IPO underwriters (gross spread) to the nature and quality of the services they provide. Some services are granted in every IPO (e.g., due diligence, roadshows, book building, and placement), while others, such as price stabilization and liquidity support, are optional. The quality of the 'standard' services required in every IPO is related to several factors, such as the characteristics of the firm going public, the risk associated with the offering, and the reputation of the underwriter.

The provision of ancillary services is instead specific to the offering. *Ceteris paribus*, investment banks should charge higher fees if they offer ancillary services. There are in particular two services that are crucial for the success of an IPO (Ellis, Michaely, and O'Hara, 2000): price stabilization and liquidity support. We test whether they drive up the underwriter's remuneration.

We model gross spread as a function of three dimensions: (1) firm and offer characteristics, (2) underwriter characteristics, and (3) the provision of ancillary services. The nature of the company going public is expected to affect the level of fees. For instance, larger firms may be expected to pay less than small firms, as do privatizations and ECOs (Torstila, 2001b). In the second category, the reputation of the underwriter is a proxy for the quality of its services and a source of bargaining power that raises fees (Fang, 2005). Thus, we control for the ranking and internationality of the underwriter. The third category takes into account the level of service provided within the listing process. This last aspect represents the main novelty of the paper, in that our model investigates whether a formal commitment by underwriters to provide ancillary services allows them to charge higher fees.

Official prospectus declarations disclose whether underwriters are 'available' to stabilize the price and/or improve liquidity during the first month of trading[14]. However, given that a legally binding contract could be too costly to define and to enforce (Lewellen, 2006), they do not specify the commitment to when they have to intervene, and to what extent. As a consequence, since aftermarket trading is on average profitable for underwriters (Ellis, Michaely, and O'Hara, 2000), they may have an incentive to intervene also when not needed. Vice versa, they may be reluctant to stabilize the price or to support liquidity when it is too costly. We therefore investigate whether underwriters are aligned with the issuer's interest when supplying ancillary services.

The empirical setting of our paper is Italy, where we can access unique data provided by the Italian stock exchange (Borsa Italiana), including detailed information on the fees charged by underwriters as well as on their services[15]. Results reveal that underwriters

[14] A firm that goes public is required to publish a prospectus. This requirement is based on the governing regulations of the stock exchange where the firm is to be listed.

[15] Investigating the Italian underwriting market can be instructive. First, its institutional setting is similar to most continental European countries, but significantly different from the US market (Abrahamson, Jenkinson, and Jones, 2011). In the US, IPO allocation policies are discretionary for both retail and institutional investors (Ljungqvist and Wilhelm, 2003), while in Europe shares cannot be discretionarily

are paid more for their availability to stabilize stock price, providing issuers with the opportunity to pay lower fees by accepting the risk of no aftermarket support.

Conversely, liquidity support does not increase the gross spread. Firm and offer characteristics are also important, due to economies of scale in larger issues and the premium charged by reputable banks. Concerning the actual provision of the services, only half of the IPOs that require price stabilization are then stabilized. These offerings exhibit poor aftermarket performance, therefore underwriters seem to act properly by stabilizing those IPOs that really need it. The nationality and reputation of the underwriter are also important drivers of the stabilization decision. Liquidity support is instead carried out in 90% of the cases in which the underwriter was asked to provide it if necessary. In this case, it is less clear what drives the underwriter's intervention, raising concerns about the alignment with the issuer's interests.

The remainder of the paper is organized as follows. Section 2 provides a review of the literature on competition in the underwriting industry and gross spread determinants. Section 3 describes the IPO underwriting industry in Italy, and Section 4 the research design. Results are reported and commented in Section 5. Section 6 concludes the article.

3.2 LITERATURE REVIEW

In the US, issuers and underwriters widely adopt the 'seven percent solution' regardless of offer size and underwriting costs (Chen and Ritter, 2000). Moreover, underwriters who persistently underprice IPOs experience superior market share growth, instead of being penalized for leaving money on the table (Hoberg, 2007). This empirical evidence of spread clustering and 'underwriter persistence' is inconsistent with most of the asymmetric information-based models that attempt to explain IPO equilibrium, such as the winner's curse (Rock, 1986), signaling (Allen and Faulhaber, 1989) and litigation (Beatty, 1993). Liu and Ritter (2011) argue that the underwriting

allocated to retail investors (Jenkinson and Jones, 2004). Second, in the Italian market offers the opportunity to study the going public decision outside the Anglo-Saxon financial system (Pagano, Panetta, and Zingales, 1998). Both the UK and the US have well-developed equity markets, and a related industry of financial intermediation centered on providing equity (La Porta, Lopez-De-Silanes, Shleifer, and Vishny, 1997). Our analysis sheds light on financial intermediation of IPOs in a bank-centered system.

market in the US is best represented as a series of local oligopolies, where the quality of ancillary services determines market power and underwriters exercise this power through underpricing rather than by charging higher fees. Hence, in equilibrium, neither underpricing nor spread is competitive.

Chen and Ritter's (2000) original implicit collusion hypothesis is challenged by an opposite line of research. Hansen (2001) claims that seven percent is simply the efficient contract that best suits the IPO market, whose low concentration and weak entry barriers are inconsistent with the adoption of collusive practices. Torstila (2003) documents that clustering also occurs outside the US, though less pervasively, and need not originate in collusive behavior. Yeoman (2001) emphasizes that spreads are negotiated at the beginning of the IPO process, when the expected outcome is still very uncertain. Since issuer and underwriter cannot identify the optimal spread, they tend to promote the seven percent solution to drop contracting costs.

The issuer's and the underwriter's characteristics are widely recognized as important determinants of the cross-sectional variation in the level of fees. For instance, fees decrease with offer size due to substantial economies of scale (Ritter, 1987; Lee, Lochhead, Ritter, and Zhao, 1996). Underwriters receive a lower remuneration also in privatizations (Torstila, 2001b), and in venture-backed IPOs (Francis and Hasan, 2001). On the underwriter's side, reputation is crucial. Reputable banks charge a premium because they are able to obtain a higher price for the issuer (Chemmanur and Fulghieri, 1994) and because of their certifying role (Booth and Smith, 1986). In particular, US banks operating in European markets are more costly because of their superior expertise in case the IPO has to be marketed in the US (Torstila, 2001b).

Despite the growing interest in explaining the underwriters' remuneration, however, no existing study asks whether ancillary services affect the gross spread[16]. The underwriters' conduct after the issue, when price stabilization and liquidity support services are provided, remains opaque (Aggarwal, 2000). Ellis et al. (2000) demonstrate that underwriters take substantial inventory positions when stabilizing stock price, and both stabilization and liquidity provision are intrinsically profitable activities. Boreiko and Lombardo (2011b) find that IPOs affected by a higher degree of informational

[16] The only partial exception is Torstila (2001a), whose prediction that stabilization costs are anticipated by the level of fees finds, however, no empirical support.

asymmetries, those taking place during bear markets, and those affiliated with less reputable underwriters are more likely to be stabilized.

3.3 IPO UNDERWRITING IN ITALY

This paper focuses on the IPO market in Italy, for which we have data on the entire population of IPOs in the period 1999-2008[17]. The IPO process in Italy is briefly outlined in Table 1.

Table 1. The roles of the underwriting syndicate in Italy. List of activities provided by an underwriting syndicate through the IPO process. The 'in charge to' column defines who, among the syndicate members, is in charge of providing the service.

Service	Description	In charge to
Panel A: pre-listing activities		
Syndicate coordination	Coordination of the underwriting syndicate activities	Lead Underwriter
Due diligence	Valuation of going public company as potential investment	Lead Underwriter, Sponsor
Pre-IPO marketing	Roadshow, meetings between top management and institutional investors	Lead Underwriter
Book building	Gathering information on institutional demand	Lead Underwriter, Specialist
Pricing	Definition of the offer price	Lead Underwriter
Placement	Distribution of shares among investors	Lead Underwriter, Sponsor
Panel B: post-listing activities		
Underwriting	Subscription of unsold shares, if any	Lead Underwriter
Price stabilization	Purchase of shares in the aftermarket	Lead Underwriter
Liquidity support	Posting of bid and ask proposals in the aftermarket	Specialist
Reporting	Publication of reports and disclosure of price sensitive information	Sponsor, Specialist

The pre-listing phase includes 'standard' services: the typical marketing, pricing and placement activities mandatory in all IPOs. The underwriter's mandate does not end with the beginning of trading, since it often guarantees the subscription of all or part of the unsold shares, if any. Moreover, the lead underwriter and the specialist are involved

[17] Data on underwriter services in the aftermarket are provided by Borsa Italiana only until 2008. In Italy, Issuers can choose among three public markets managed by Borsa Italiana: the MTA (*Mercato Telematico Azionario*), which is the main market; the *Expandi*, dedicated to small companies (the minimum capitalization is one million euros); or the *Nuovo Mercato*, for young firms in high-tech industries.

in providing two aftermarket services, i.e. price stabilization and liquidity support[18]. Price stabilization consists in purchasing shares in the aftermarket in order to prevent price drops, and is provided by the underwriter as soon as the stock price goes below a certain threshold (typically, the offer price). Liquidity support is performed by the specialist, that posts bid and ask proposals in order to facilitate trading activity by avoiding excessively wide bid-ask spread. Both these services are supplied during the first 30 days by means of direct trading activity. The main difference is that stabilization is performed in reaction to price downturns, while liquidity support is provided when the bid-ask spread becomes too wide[19].

Allocation devices such as overallotment, naked short position, and greenshoe option are crucial for both the decision and the extent of price stabilization. The overallotment option is an agreement between issuer and underwriter that allows the underwriter to sell additional shares up to a maximum of 15% of the offered volume, by borrowing them from existing shareholders. Overallotment can either be covered by giving back the corresponding amount of money (greenshoe) or shares (stabilization) to the lenders, or by a combination of the two. The greenshoe option allows underwriters to leave the additional shares on the market and pay them back at the offer price, regardless of current market valuation. Conversely, price stabilization occurs when the underwriter repurchases shares in the aftermarket, and gives them back to the lenders.

The greenshoe option can be exercised up to 30 days from the beginning of trading activity. Although it is not mutually exclusive with price stabilization, the key determinant of the choice between the two is aftermarket stock price. If the IPO is traded above the offer price, buying shares at the current market valuation (i.e. stabilizing) would be more costly than exercising the greenshoe option. Vice versa, if the IPO is traded below the offer price, paying back the shares at the offer price (i.e. greenshoe) would cause a loss. Therefore, stabilization is typically associated with bad

[18] In Italian IPOs, the underwriting syndicate is typically composed of three members: the lead underwriter (or 'global coordinator'); the sponsor, who is in charge of complying with disclosure and transparency rules; and the specialist, who provides liquidity in the aftermarket. In about one-third of our sample, the lead underwriter and the specialist are the same bank. We have data on the gross spread paid to the underwriting syndicate, but no information is available about its division among the different members of the syndicate. The gross spread is the commission that comprehends all the services provided by the underwriting syndicate. The roles and services provided by the underwriting syndicate in Italy, as described in this paper, are similar to France and Germany, as reported in Goergen et al. (2009).

[19] There is no threshold set by regulatory authorities that triggers liquidity support. The specialist and the issuer arrange the terms of this service discretionarily.

performing IPOs. Underwriters may also take an initial short position even in excess of 15% of the offering, known as 'naked short'. In this case, the underwriter knows *ex-ante* that he will have to engage in price stabilization.

3.4 RESEARCH DESIGN

3.4.1 Data and methodology

We collect information on the characteristics of firms, offers, and underwriting syndicates directly from IPO prospectuses. Information regarding price stabilization and liquidity support is provided by Borsa Italiana through the MarketConnect database. In particular, we access the amounts of shares bought and sold by underwriters both for stabilization and liquidity support purposes, throughout the first month of trading. This information allows us to identify which IPOs are price-stabilized and/or liquidity-supported by underwriters, and to what extent[20].

We use three different models. First, we run a cross-sectional OLS regression to investigate the influence of ancillary services on the gross spread. Second, we focus on price stabilization. To correct for potential self-selection bias, we employ a two-stage Heckman procedure that controls for unobservable factors that may drive both the provision and the intensity of this service. For instance, underwriters may anticipate the extent to which an IPO needs to be stabilized, and therefore avoid intervening if the provision of this service would be too costly. Then, the first stage models the underwriter's decision to stabilize the aftermarket price of the IPO firm by using a probit regression, and estimates the sample selection term (Mill's lambda). The dependent variable is the price stabilization dummy, identifying IPOs that are stabilized. The second stage models the intensity of the underwriter's intervention by using an OLS regression, corrected for selectivity bias. The dependent variable is the quantity of shares purchased during the provision of this service, scaled by the first month turnover. Third, we investigate the provision of the liquidity support service by addressing an analogous selection issue. However, since liquidity support declaration is not substantiated in only 6 cases, the estimation of Heckman's first step would become

[20] Stabilization data are disclosed in a report transmitted to Borsa Italiana by the underwriter at the end of the first trading month, and is available for all IPOs. Liquidity support is identified by a flag on trades accomplished to this purpose, although we have no information for 40 of the 87 offerings in which the liquidity support service was declared.

ineffective. We therefore employ a Tobit model treating the dependent variable as censored at zero in absence of this service.

3.4.2 Variables

Table 2 summarizes the definitions and theoretical justifications of the variables included in the gross spread regression. We consider variables in three categories: (1) firm and offer characteristics, (2) underwriter characteristics, and (3) the provision of ancillary services.

In the first group, we employ firm age at the IPO as a proxy for maturity, while size controls for economies of scale. We control for privatizations, where underwriters tend to receive a lower remuneration due to the bargaining power of national governments (Torstila, 2001b), and venture capital-backed IPOs, where agency issues may become more pronounced, especially in the European context (Bessler and Kurth, 2007). We also include relative issue size, dilution ratio, and institutional allocation. Since underwriting IPOs in hot periods may require lower effort by investment banks, with potential reduction in fees, we add the return of the *FTSE Italia MIB* index 100 days before the listing date (pre-IPO market return), and the number of IPOs in the previous twelve months (market momentum)[21].

The second set of determinants is related to the underwriter. Reputation is proxied by the underwriter's market share (in terms of capital raised) in the Italian market during the sample period[22]. However, this measure alone would penalize foreign investment banks benefiting from a high reputational capital but taking public only a small number of companies in the Italian market. Therefore, we add a dummy for IPOs underwritten by non-Italian banks. The size of the underwriting syndicate is also included, because large syndicates allow to share IPO risk (Torstila, 2001b).

[21] Underwriters care about firm valuation at the IPO, since gross spread is in percentage of offering proceeds. First day market price is also important, due to reputational effects and the commitment to engage in price stabilization if it falls below a certain threshold level. Chemmanur and Krishnan (2012) show that high-reputation underwriters are able to exercise their market power by increasing the heterogeneity in investor beliefs, leading to both higher IPO valuation and deeper underpricing, compared to low-reputation underwriters. However, these evidences stem from the US context, where underwriters cannot fully exercise their market power through gross spread due to clustering at 7% (Chen and Ritter, 2000). This assumption does not hold in European markets, where fees show substantial variability. Therefore, in line with previous European studies (e.g., Torstila, 2001b), we do not address in this paper the role of underpricing as an indirect source of revenues of underwriters.

[22] We also define underwriter reputation in terms of number of IPOs managed instead of amount of capital raised, finding similar results. These models are not reported in the paper.

Table 2. Variable definitions

Name	Definition	Theoretical background
FIRM AND OFFER		
Firm age	Log of 1 plus firm age (in years) at the IPO	Younger companies are characterized by higher uncertainty
Size	Log of IPO proceeds adjusted for inflation, expressed in 2008 Euros	Presence of economies of scale on gross spread
Relative issue size	Number of shares offered over pre-IPO outstanding shares	
Dilution ratio	Number of newly issued shares over pre-IPO outstanding shares	Newly issued shares increase underwriter's valuation uncertainty (Yeoman, 2001)
Institutional allocation	Fraction of shares reserved to institutional investors by prospectus	The participation of well-informed investors is relevant for the success of the IPO
Pre-IPO market return	*FTSE Italia MIB* index return over 100 days prior the IPO	Market returns capture investment opportunities, investor sentiment and other unknown dynamics (Lowry, 2003)
Market momentum	Number of IPOs in the Italian market during the 12 months before listing	Favorable market sentiment makes trading activity more profitable for underwriters (Ellis, Michaely, and O'Hara, 2000)
Price revision	Percentage difference between the offer price and the midpoint of the preliminary price range	Price revision should impound public and private information on investor demand gathered in the bookbuilding process (Benveniste and Spindt, 1989)
Claw back to retail	Fraction of shares shifted from institutional to retail investors after the initial allocation, as percentage of total number of offered shares	Balance of cold demand of informed institutional investors with hot demand of non-informed retail investors
Underpricing	Difference between first day closing price and offer price, divided by offer price	Underpricing is a proxy for the success of an IPO
Greenshoe exercised	Dummy equal to 1 in case the greenshoe option was exercised	Exercising the greenshoe option is a substitute for price stabilization
UNDERWRITER		
Foreign underwriter	Dummy for non-Italian lead underwriters	US banks underwriting European IPOs are more costly (Torstila, 2001b)
Underwriter reputation	Amount of capital raised by the underwriter over the total capital raised in the sample (scaled to 1 = national leader Mediobanca)	Reputable banks charge higher fees and provide higher quality services (Fang, 2005)
Syndicate size	Number of members of the underwriting syndicate	Syndicate size is important for the IPO risk sharing (Torstila, 2001b)
ANCILLARY SERVICES (explanatory)		
Stabilization not required	Dummy equal to 1 in case the issuer does not require ex-ante the price stabilization service	
Liquidity support not required	Dummy equal to 1 in case the issuer does not require ex-ante the liquidity support service	

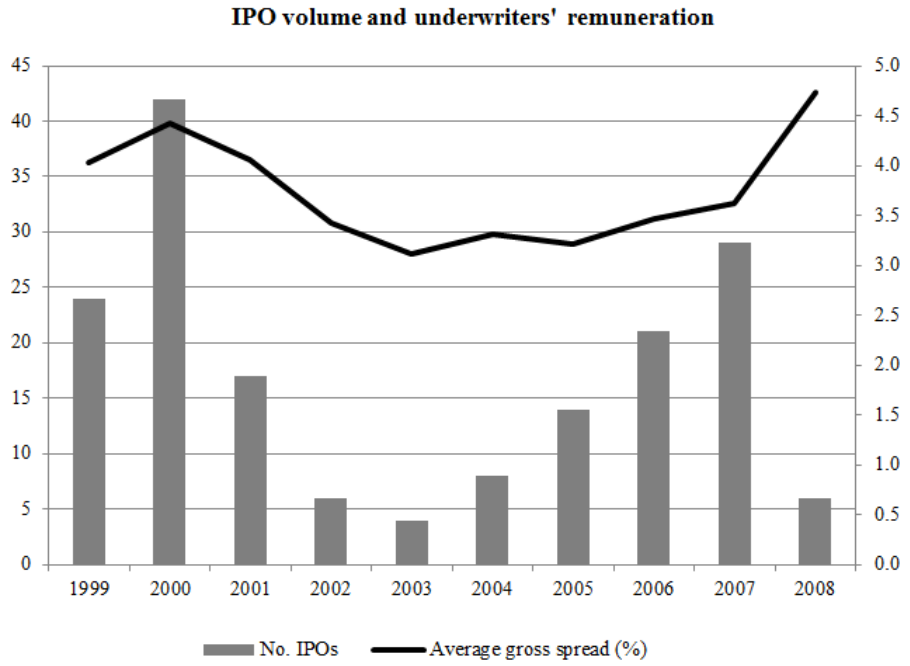
Stabilization performed	Dummy equal to 1 in case the underwriter stabilizes aftermarket stock price	
Liquidity support performed	Dummy equal to 1 in case the specialist supports aftermarket liquidity	
Overallotment	Dummy equal to 1 in case the underwriter allocates more shares than made available by the issuer	Control for short covering in the decision to provide aftermarket support
Naked short	Dummy equal to 1 in case the underwriter overallocates more than 15% of the offer volume	Control for short covering in the decision to provide aftermarket support
Overallotment volume	Amount of shares over-allocated, as percentage of offer volume	Control for short covering in the intensity of aftermarket support
Greenshoe volume	Fraction of greenshoe actually exercised (0-15% of offer volume)	Control for short covering in the intensity of aftermarket support
Naked short volume	Fraction of over-allocated shares exceeding the 15% threshold	Control for short covering in the intensity of aftermarket support
CONTROL DUMMIES		
Industries (ICB 1-digit); IPO years; privatizations/ECOs (Torstila 2001b); markets and segments (Star, Expandi, Nuovo Mercato); private placings (Beatty and Ritter, 1986); VC-backing (Megginson and Weiss, 1991; Bessler and Kurth, 2007).		

Finally, the third group contains our two explanatory variables, i.e. two dummies identifying IPOs that did not require price stabilization and liquidity support *ex-ante*. The aim is to test whether issuers have the possibility to pay lower fees by relieving the underwriters of such duties.

3.4.3 Sample

The sample consists of 171 IPOs occurring in Italy in the period 1999-2008. Figure 1 documents a similar pattern followed by IPO volume and underwriters' remuneration across the sample years. In hot periods, such as the tech bubble of the late 1990s and the 2006-2007 IPO run-up, underwriters are on average paid more. The increased demand for underwriting services from the large number of companies going public lessens the competition among underwriters, that are able to charge higher fees. Therefore, the average gross spread spans from 3.1% in 2003 (4 IPOs) to 4.4% in 2000 (42 IPOs). The only exception is represented by year 2008, when the average gross spread rises up to 4.7% despite the near-halt in IPO activity.

Figure 1. IPO volume and underwriters' remuneration. The graph shows the annual number of IPOs taking place in Italy from 1999 to 2008, and the annual average underwriters' remuneration through gross spread, expressed in percentage of IPO proceeds. The number of IPOs corresponds to the grey bars (right Y-axis), while gross spread is represented by the black line (right Y-axis).



The median gross spread in Italy is 4%, as reported in Table 3. Two important factors affect its level. The first one is economies of scale. Within the Blue Chip segment, where the average size of IPOs is 1.5 billion euros, the median spread is only 2.7%. The second one is uncertainty. The highest fees are charged in the *Nuovo Mercato*, where young (the median age is 8 years at the IPO) and riskier firms typically go public. Here the median spread for underwriters is 4.70%. Higher exchange listing standards are indeed proven to screen out companies that are less prepared to go public (Johan, 2010), that in turn may opt for second-tier, less regulated markets (Vismara, Paleari, and Ritter, 2012). IPOs of the *Nuovo Mercato* show the most favorable market momentum (32 offerings in the previous twelve months), the highest dilution ratio (32.2%) and the deepest underpricing (21.7%), on average[23]. The Blue Chip segment is characterized by the highest level of underwriter reputation (39.8% on average) and the strongest presence of foreign banks (38.9%). These banks underwrite the 23% of the IPOs of the sample, and are totally absent from the *Expandi* market. The overallotment and the exercise of the greenshoe option are quite common practices, occurring in approximately 60% of the IPOs. Conversely, underwriters assume a naked short position only in 4.7% of the cases. Approximately half of the IPOs are actually stabilized. The 171 IPOs of the sample are underwritten by 31 different investment banks, as reported in Table 4. Italian banks underwrite approximately three-quarters of the IPOs (Panel A of Table 4). Mediobanca is the national leader, with the largest amount of capital raised (24 €m, nearly half of the sample), while Intesa Sanpaolo underwrites the largest number of deals (48 IPOs, 28% of the sample). Among foreign banks, five of the top six underwriters are based in the US. Foreign banks tend to be involved in larger syndicates, with an average membership of 2.6, while Italian banks are more willing to operate in small groups or even alone. Contrary to their domestic behavior and to the evidence found by Torstila (2001b), US banks are among the cheapest underwriters when operating in Italy. Their average fees range from 2.05% (Goldman) to 4.11% (Citigroup). However, they underwrite only the largest offers.

[23] These evidences are driven by the fact that most of the IPOs of the *Nuovo Mercato* took place during the tech bubble period. The average underpricing of the Standard segment is inflated by the 532.6% underpricing of Finmatica, gone public on the main market in November 24, 1999, and then transferred to the newly launched *Nuovo Mercato* in October 16, 2000.

Table 3. Descriptive statistics. Average and median values (in brackets) of the sample of 171 Italian IPOs from 1999 to 2008. *Gross spread* is the underwriter's remuneration, in percentage of IPO proceeds. *Firm age* is the age in years of the company at the IPO; *issue size* is the amount of proceeds in 2008 Euros; *relative issue size* is the fraction of offered shares as percentage of pre-IPO outstanding shares; *dilution ratio* is the percentage of newly issued shares as percentage of pre-IPO outstanding shares; *institutional allocation* is the fraction of shares reserved to institutional investors by prospectus; *pre-IPO market return* is the FTSE Italia MIB index return over 100 days prior the IPO; *market momentum* is the number of IPOs in Italy in the 12 months before the listing; *price revision* is the percentage difference between offer price and midpoint of the preliminary price range; *claw-back to retail* is the number of shares shifted from institutional to retail investors, as percentage of the offer volume; *underpricing* is the difference between first day closing price and offer price, divided by offer price; *underwriter reputation* is the fraction of capital raised in the sample, scaled at 1 for the national leader Mediobanca; *syndicate size* is the number of members of the underwriting syndicate; *foreign underwriter* is the percentage of IPOs underwritten by a non-Italian bank; o*verallotment* is the percentage of IPOs in which the underwriter sells shares in excess of the offered volume; *greenshoe exercised* is the percentage of IPOs in which the greenshoe option is exercised; *naked short position* is the percentage of IPOs in which the underwriter overallocates more than 15% of the offering; *stabilization performed* are the IPOs stabilized in the aftermarket; *liquidity performed* are the IPOs that are actually liquidity-supported. Data on actual liquidity support are available for 46 of 87 IPOs for which a specialist was designated (29 of 32 IPOs in the Star segment).
[a] percentage of firms

	ALL SAMPLE		MTA (101 IPOs)						EXPANDI		N.MERCATO	
	(171 IPOs)		BLUE CHIP(18)		STANDARD(46)		STAR(37)		(29 IPOs)		(41 IPOs)	
Gross spread (%)	3.92	(4.00)	2.82	(2.70)	3.69	(3.70)	3.52	(3.50)	3.96	(3.90)	4.75	(4.70)
Firm age (years)	32.1	(19.0)	41.1	(32.0)	49.9	(26.0)	35.8	(32.0)	27.3	(20.0)	9.8	(8.0)
Issue size (€m)	303.0	(95.2)	1,704.2	(443.0)	220.0	(98.5)	127.0	(117.0)	33.6	(22.6)	131.3	(53.5)
Relative issue size (%)	101.7	(38.8)	37.6	(38.7)	265.2	(38.3)	49.3	(45.2)	41.3	(37.8)	37.7	(31.0)
Dilution ratio (%)	26.5	(25.5)	12.3	(7.1)	24.9	(25.0)	25.5	(25.7)	30.8	(30.0)	32.2	(28.3)
Institutional allocation (%)	74.9	(75.0)	70.5	(74.5)	70.9	(75.0)	77.9	(75.0)	86.4	(86.4)	70.5	(70.0)
Pre-IPO market return (%)	0.9	(1.6)	0.7	(2.9)	-0.3	(-0.6)	3.0	(3.4)	0.6	(3.3)	0.7	(-2.0)
Market momentum (no. IPOs)	23.7	(23.0)	20.5	(18.0)	23.5	(22.0)	19.8	(20.0)	19.1	(21.0)	32.1	(33.0)
Price revision (%)	28.8	(35.1)	33.2	(34.1)	38.9	(50.0)	22.4	(26.8)	33.7	(31.7)	18.4	(46.9)
Claw-back to retail (%)	5.5	(1.0)	9.0	(4.3)	6.4	(3.2)	4.3	(0.9)	4.2	(0.0)	4.8	(0.9)
Underpricing (%)	12.4	(3.5)	3.2	(2.1)	17.0	(2.5)	3.2	(1.0)	9.4	(5.8)	21.7	(4.2)
Underwriter reputation (%)	22.3	(6.0)	39.8	(11.5)	21.2	(8.0)	29.8	(12.0)	14.7	(2.0)	14.3	(3.0)
Syndicate size (no.)	2.1	(2.0)	2.3	(2.0)	2	(2.0)	2.1	(2.0)	1.7	(2.0)	2.3	(2.0)
Foreign underwriter [a]	23.0		38.9		23.9		29.7		0.0		24.4	
Overallotment [a]	62.6		88.9		58.7		67.6		72.4		43.9	
Greenshoe exercised[a]	61.4		88.9		50		72.9		79.3		39.0	
Naked short position [a]	4.7		0.0		2.2		0.0		10.3		9.8	
Stabilization performed [a]	55.7		66.7		61		51.4		34.5		65.9	
Liquidity support performed [a]	89.1		0.0		0.0		93.1		92.9		n.a.	

Table 4. Descriptive statistics of IPO underwriters. The sample of 171 IPOs is underwritten by 33 different lead underwriters. The table reports for each of them the number of IPOs underwritten and the capital raised adjusted for inflation (expressed in 2008 Euros). Reputation is measured by a ranking, calculated as the fraction of capital raised in the sample, scaled at 1 for the national leader Mediobanca. Bank names may be different from what reported in prospectus due to M&As. Banca Commerciale Italiana merged with Banca Intesa in 2001 to form IntesaBci, which in turn merged with Banca Imi in 2006 becoming Intesa Sanpaolo. Capitalia merged with Unicredito Italiano in 2007 to form Unicredit.

Lead underwriter	Capital raised (€m)	No. IPOs	% IPOs	No.IPOs by market			Average syndicate size (no.)	Reputation (ranking)	Average gross spread (%)
				MTA	Expandi	NM			
Panel A. Italian banks									
Mediobanca	24,434	26	15.2	20	3	3	2.1	1.000	3.85
Intesa Sanpaolo	7,140	48	28.1	27	4	17	1.8	0.292	4.11
Banca Monte Dei Paschi Di Siena	2,460	1	0.6	1	0	0	2.0	0.101	1.95
Intermonte Securities Sim	2,247	5	2.9	1	2	2	2.6	0.092	4.05
Unicredit	1,735	9	5.3	7	1	1	2.0	0.071	3.58
Banca Leonardo	825	4	2.3	1	0	3	3.0	0.034	4.13
Abaxbank	446	10	5.8	4	6	0	1.5	0.018	3.73
Bnl	265	2	1.2	1	0	1	2.5	0.011	4.73
Euromobiliare Sim	179	3	1.8	0	2	1	1.0	0.007	4.17
Banca Akros	182	3	1.8	0	2	1	2.0	0.007	4.42
Centrobanca	126	4	2.3	3	1	0	3.0	0.005	3.60
Unipol Merchant	96	3	1.8	0	3	0	1.0	0.004	4.42
Interbanca	70	3	1.8	1	1	1	2.3	0.003	4.40
Banca Finnat	54	2	1.2	0	1	1	3.0	0.002	4.00
Banca Nazionale dell'Agricoltura	46	1	0.6	1	0	0	3.0	0.002	5.50
Rasfin Sim	37	3	1.8	0	3	0	2.3	0.002	4.05
Meliorbanca	42	1	0.6	0	0	1	2.0	0.002	4.40
Banca Aletti	34	2	1.2	1	0	1	1.0	0.001	3.90
Banca Intermobiliare Inv. e Gest.	28	1	0.6	1	0	0	1.0	0.001	4.50
Total/average Italian banks	*40,446*	*131*	*77*	*69*	*29*	*33*	*2.1*	*0.087*	*4.08*
Panel B. Foreign banks									
JPMorgan Chase (US)	2,970	8	4.7	5	0	3	2.4	0.122	3.27
Goldman Sachs Intl. (US)	2,699	2	1.2	2	0	0	2.5	0.110	2.05
Merrill Lynch (US)	2,515	9	5.3	9	0	0	2.2	0.103	3.15
Lehman Brothers (US)	833	2	1.2	2	0	0	2.0	0.034	2.63
Deutsche Bank (DE)	737	5	2.9	5	0	0	2.2	0.030	4.45
Citigroup (US)	537	4	2.3	3	0	1	2.5	0.022	4.11
Credit Suisse First Boston (CH)	357	4	2.3	2	0	2	2.0	0.015	4.25
Abn Amro (NL)	317	1	0.6	1	0	0	4.0	0.013	3.70
Dresdner Kleinwort W. (UK)	183	1	0.6	1	0	0	3.0	0.007	2.90
Commerzbank (DE)	126	1	0.6	1	0	0	3.0	0.005	4.50
ING Barings (NL)	80	2	1.2	0	0	2	3.0	0.003	4.75
Societe Generale (FR)	56	1	0.6	1	0	0	2.0	0.002	5.50
Total/average foreign banks	*11,412*	*40*	*23*	*32*	*0*	*8*	*2.6*	*0.039*	*3.77*
Total/average (whole sample)	*51,858*	*171*	*100*	*101*	*29*	*41*	*2.3*	*0.068*	*3.96*

3.5 RESULTS

3.5.1 Gross spread determinants

Table 5 reports the results of cross-sectional regressions on gross spread[24]. Underwriters that take companies public during the tech bubble charge a fee premium due to the higher risk associated with these offerings, mainly conducted by small firms with no established track records and uncertain growth prospects. Predictably, firm and offer characteristics affect the level of underwriters' remuneration. According to Torstila (2001b), there are at least three explanations for the negative impact of size. First, IPOs have fixed costs, such as prospectus preparation, marketing and consulting, which become less significant as offerings grow larger. Second, the size of the IPO is inversely related to risk, in that smaller companies are typically subject to higher uncertainty. Third, large IPOs are more sought after by investment banks, so competition may result in lower fees. In less diluted offerings, suggesting an exit rather than a growth strategy of the firm going public, and in presence of lower institutional participation, signaling weak interest by well-informed investors, underwriters charge higher fees.

Prestigious banks benefit from a significantly positive fee premium. Increased bargaining power and the issuers' perception that these banks are able to provide higher quality services are both plausible explanations. As for our explanatory variables, we find that issuers that do not require *ex-ante* the stabilization service pay lower fees. If a firm goes public bearing the risk of no aftermarket support, then it can save on the fee paid to the investment bank. This instead is not the case for the liquidity support service.

[24] As the Breusch-Pagan test detects the presence of heteroskedasticity, we use White's heteroskedasticity-consistent standard errors. Variance inflation factors for the independent variables are reported in Appendix A.

Table 5. Determinants of gross spread. Sample of 171 Italian IPOs from 1999 to 2008. The dependent variable is *gross spread*, the underwriter's remuneration in percentage of IPO proceeds. Control dummies (coefficients not reported for brevity): industries, years, privatizations, ECOs, private placings, markets, VC-backing. Independent variables: *tech bubble* is a dummy equal to 1 in case the IPO took place in 1999-2000; *firm age* is log of 1 plus firm age in years at the IPO; *issue size* is the log of IPO proceeds expressed in 2008 Euros; *relative issue size* is the no. of shares offered in percentage of pre-IPO outstanding shares; *dilution ratio* is the fraction of newly issued shares as percentage of pre-IPO outstanding shares; *institutional allocation* is the fraction of shares reserved to institutional investors by prospectus; *pre-IPO market return* is the return of the FTSE Italia MIB Index over 100 days prior the IPO; *market momentum* is the number of IPOs in Italy in the 12 months before listing; *foreign underwriter* is equal to 1 in case of non-Italian underwriter; *underwriter reputation* is the fraction of capital raised by each underwriter in our sample of IPOs (scaled at 1 for the national leader Mediobanca); *syndicate size* is the no. of members in the underwriting syndicate; *stabilization not required* is a dummy equal to 1 in case price stabilization is not required ex-ante by the issuer; *liquidity support not required* is a dummy equal to 1 in case liquidity support is not required ex-ante by the issuer. Coefficients and t-statistics (in brackets) are reported. T-statistics are computed using Huber/White/Sandwich heteroskedasticity-consistent standard errors.

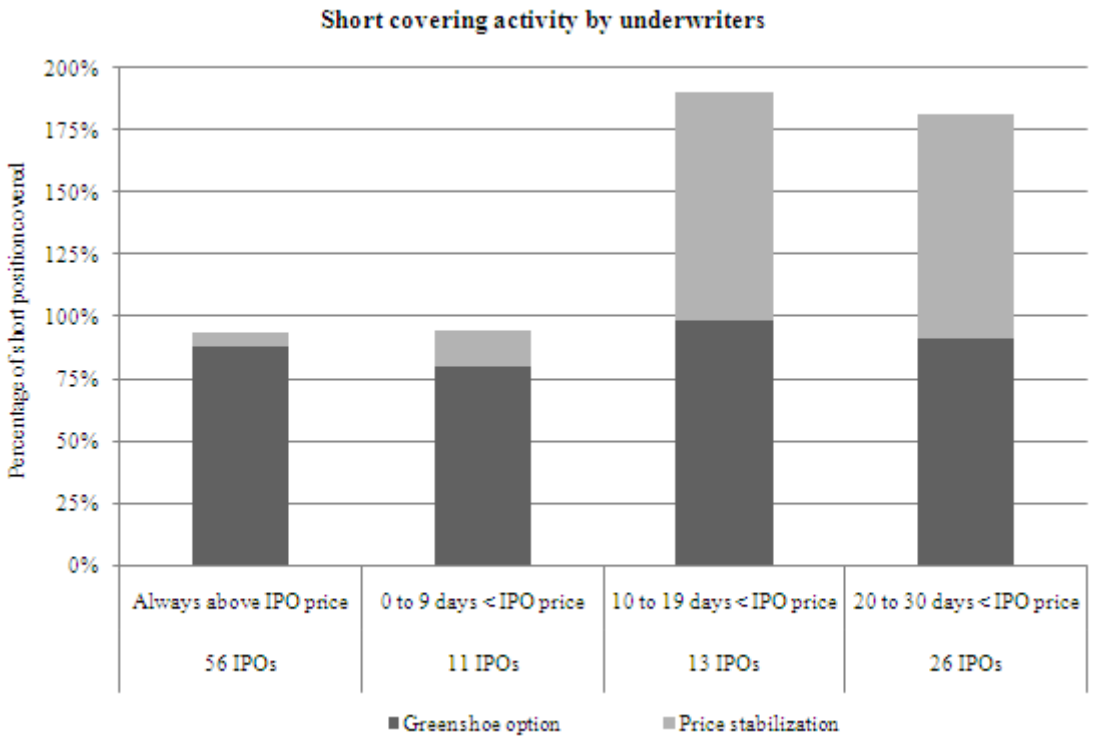
	(1)	(2)	(3)
Constant	-8.64	-8.83	-11.87
	(-0.77)	(-0.79)	(-0.99)
Tech bubble	0.10***	0.12***	0.11***
	(2.80)	(2.82)	(2.83)
Firm age	-0.00	-0.00	-0.00
	(-0.26)	(-0.27)	(-0.28)
Issue size	-0.14***	-0.16***	-0.17***
	(-4.63)	(-4.72)	(-4.70)
Relative issue size	0.22***	0.20***	0.19***
	(2.78)	(3.38)	(4.12)
Dilution ratio	-0.02**	-0.02**	-0.02**
	(-2.29)	(-2.28)	(-2.23)
Institutional allocation	-0.23**	-0.23**	-0.24**
	(-2.04)	(-2.24)	(-2.17)
Pre-IPO market return	-0.21	-0.19	-0.15
	(-0.97)	(-0.93)	(-0.75)
Market momentum	-0.65	-0.61	-0.55
	(-1.22)	(-1.12)	(-0.93)
Foreign underwriter		0.02	0.02
		(0.70)	(0.65)
Underwriter reputation		0.10***	0.11***
		(2.80)	(2.87)
Syndicate size		0.01	0.00
		(0.52)	(0.14)
Stabilization not required			-0.10**
			(-2.27)
Liquidity support not required			0.01
			(0.41)
Observations	171	171	171
Adjusted R-squared	0.55	0.56	0.57

3.5.2 Underwriter's behavior in the aftermarket

We now examine the underwriters' conduct in providing price stabilization and liquidity support. Figure 2 offers a picture of how underwriters cover the initial short

position, undertaken in 62.6% of the IPOs. The graph refers to the end of the first month of trading, and shows the average fraction covered by exercising the greenshoe option, and the average fraction covered by stabilizing the IPO, both expressed in percentage of the initial short position (i.e., 100% corresponds to the sum of overallotment and naked short, if any). IPOs are categorized in four groups, according to the number of days within the first month in which the IPO is traded below the offer price.

Figure 2. Short covering activity by underwriters. The graph shows how underwriters have covered their initial short position at the end of the first month of trading. Dark grey is the average fraction covered by greenshoe option, light grey is the average fraction covered by price stabilization. Y-axis reports the short position undertaken by underwriters at the IPO, where 100% is the sum of overallotment and naked short, if any. Categories on the x-axis refer to the number of days (during the first 30 days of trading) in which the official daily price of the stock was below the offer price.



The largest fraction of short position is covered using the greenshoe option, which is exercised at a nearly constant rate, regardless of price trends. This is not particularly surprising if we consider that underwriters earn fees in percentage of all the shares issued. Price stabilization is more intense in bad performing offerings, confirming that aftermarket performance drives its provision. However, some stabilization activity occurs even when the stock price keeps persistently higher than the offer price.

Stabilizing well performing offerings is costly for underwriters, and raises some questions about their behavior in the provision of aftermarket services.

We try to unveil what drives the supply of the price stabilization service. To help discern if the intensity of the (observed) stabilization is due to a self-selection bias, we use a Heckman procedure to control for the possible endogeneity between the intensity of the support and the decision to supply it. For instance, underwriters may anticipate how much an IPO needs to be stabilized, and therefore avoid intervening if the provision of this service would be too costly. Therefore, we use a two-step Heckman selection model to correct for unobservable factors that may drive both the decision and the extent to which underwriters stabilize IPOs.

Within the Heckman's first stage, we also need to address an endogeneity issue. The underwriter's decision to stabilize is indeed caused by poor stock performance after the IPO. However, aftermarket performance is endogenous, because it is in turn influenced by the underwriter's intervention. Therefore, we adopt an instrumental variable approach by employing a set of instruments for aftermarket performance[25]. Specifically, we instrument the 1-month buy-and-hold abnormal return of the IPO using pre-IPO market return, market momentum, underpricing and claw back clauses to retail investors[26]. Among the independent variables, we include gross spread in order to investigate whether the level of fees, arranged *ex-ante* by issuer and underwriter, is able to anticipate whether the prospectus declaration will be substantiated or not in the aftermarket. Overallotment, naked short, and greenshoe dummies control for short covering. The results are shown in Table 6.

[25] Endogeneity is detected using the Hausman (1978) test. The first step of the instrumental variable approach testifies that the selected variables are valid instruments for 1-month buy-and-hold abnormal return, and are uncorrelated with the second stage regression (i.e. the probit regression on stabilization dummy) residuals. We also check excludability of instruments through Hansen's J test. First-stage results of the IV approach are available upon request. Instruments are defined in Table 2.

[26] Claw-back clauses allow underwriters to shift shares from one investor category to another, in order to manage different levels of oversubscription. Boreiko and Lombardo (2011a) find that underwriters in Italy use claw back clauses as a risk-management device in IPOs with weak institutional demand at the expense of retail investors. These offerings show significantly lower levels of initial underpricing.

Table 6. Heckman selection model on stabilization activity. Sample of 167 Italian IPOs from 1999 to 2008 in which the underwriter declared to stabilize stock price if needed. Coefficients and statistics (in brackets) are reported. The dependent variables are: in step 1, stabilization dummy, equal to 1 if the underwriter stabilizes stock price; in step 2, stabilization intensity, i.e. the number of traded shares to stabilize stock price during the first month, scaled by first month turnover. Control dummies (coefficients not reported for brevity): industries, years, privatizations, ECOs, private placings, markets, VC-backing. Independent variables: *firm age*, *issue size*, *relative issue size*, *dilution ratio*, *gross spread*, *institutional allocation*, *foreign underwriter*, *underwriter reputation*, *syndicate size* are as defined in Table 5. *Price revision* is the percentage difference between offer price and midpoint of the preliminary price range; *1-month BHAR* is the instrumented variable for 1-month buy-and-hold abnormal return, obtained using *pre-IPO market return* (return of the FTSE Italia MIB Index over 100 days prior the IPO), *market momentum* (no. of IPOs in Italy in the 12 months before listing), *underpricing* (difference between first day closing price and offer price, divided by offer price) and *claw back to retail* (fraction of shares shifted from institutional to retail investors after the initial allocation, as percentage of total number of offered shares) as instruments. *Overallotment* is a dummy equal to 1 in case of the underwriter sells shares in excess of the offered volume; *greenshoe* is a dummy equal to 1 in case the greenshoe option is exercised; *naked short* is a dummy equal to 1 in case the underwriter overallocates more than 15% of the offering; *overallotment volume* are overallocated shares in percentage of offer volume; *greenshoe volume* is the fraction of greenshoe exercised (0-15% of offer volume); *naked short volume* is the amount of naked short in percentage of offer volume.

	Step 1. Stabilization decision	Step 2. Stabilization intensity
Firm age		0.03
		(1.31)
Issue size		0.06
		(1.29)
Relative issue size		-0.08
		(-0.50)
Dilution ratio		0.25
		(1.52)
Gross spread	-0.24	
	(-1.47)	
Institutional allocation	-1.33	
	(-1.06)	
Price revision	-3.35***	
	(-3.64)	
1-month BHAR	-1.91***	
	(-2.79)	
Foreign underwriter	-0.97***	
	(-2.93)	
Underwriter reputation	-0.82**	
	(-2.00)	
Syndicate size	0.20	
	(1.23)	
Overallotment dummy	-0.08	
	(-0.14)	
Greenshoe dummy	-0.77	
	(-1.44)	
Naked short dummy	0.92	
	(1.50)	
Overallotment volume		-0.50
		(-1.50)
Greenshoe volume		-0.81**
		(-2.01)
Naked short volume		1.42
		(0.67)
Constant	10.9***	-0.31
	(3.36)	(-0.81)
Mills ratio (λ)		-0.05
		(-0.73)
Observations	167	
Censored	74	
Wald Chi-square	47.3	

Underwriters do seem to support bad performing IPOs. The coefficient of the instrumented variable for the first month buy-and-hold abnormal return is negative and significant, confirming that the provision of this service is triggered by poor aftermarket performance. Additionally, IPOs that experience a downward price revision are more likely to be stabilized. Curiously, foreign and more reputable underwriters are less prone to provide this service. This may be explained by the endogeneity of matching between issuer and underwriter (Fang, 2005): prestigious banks have stricter standards, so they take public only high-quality firms which are less likely to underperform, and therefore less likely to need price support.

Gross spread is found to have no predictive power on the provision of this service, as its influence on the underwriter's decision is not significant. Overallotment, greenshoe option, and naked short dummies are also not significant, suggesting that underwriters still act with a certain degree of discretion beyond the pure short covering activity. Evidence from the second stage suggests that neither offer size nor the extent of the short position are influential on the intensity of stabilization, measured as the volume of shares purchased to stabilize, scaled by the first month turnover. Instead, the negative coefficient of the fraction of exercised greenshoe confirms its substitutability for price stabilization. The coefficient of the sample selection term (Mill's ratio) is not significant.

Table 7 reports the results of the Tobit model on the provision of liquidity support. Similarly to the price stabilization analysis, the driver of the provision of this service, i.e. the aftermarket bid-ask spread, is endogenously determined by the underwriter's intervention. Again, we address this issue by adopting an instrumental variable approach. Following previous studies on aftermarket liquidity (e.g., Zheng and Li, 2008), we instrument the first month bid-ask spread, defined as the average of the daily ask minus bid prices divided by the midpoint of the bid and ask prices, by using pre-IPO market volatility, relative issue size and foreign underwriter dummy[27].

We find that the instrumented bid-ask spread does not drive the provision of this service. This may reveal a potential misalignment of incentives between the issuer and

[27] Pre-IPO market volatility is calculated as the standard deviation of daily returns over 100 trading days prior to the IPO date; relative issue size and foreign underwriter dummy are defined in Table 2. The instruments of the daily bid-ask spread were subject to the same tests as those performed in the price stabilization analysis (see footnote 10).

Table 7. Tobit regression on liquidity support. Sample of 46 Italian IPOs from 1999 to 2008 in which the underwriter declared to provide liquidity support, and for which we have available data on aftermarket provision. Coefficients and t-statistics (in brackets) are reported. Dependent variable is liquidity support intensity, i.e. the number of traded shares to support liquidity as percentage of first month turnover, censored at zero in non-supported IPOs. *Daily bid-ask spread:* instrumented variable for the average of the daily bid-ask spread (calculated as difference between the daily closing bid and ask prices divided by the midpoint of the bid and ask prices) over the first month of trading, obtained using *pre-IPO market volatility*, *relative issue size*, and *foreign underwriter dummy* as instruments; *gross spread:* underwriter's remuneration in percentage of IPO proceeds*; firm age:* log of 1 plus firm age (in years) at the IPO; *issue size:* log of IPO proceeds adjusted for inflation*; dilution ratio:* no. of newly issued shares over pre-IPO outstanding shares; *institutional allocation:* fraction of shares reserved to institutional investors by prospectus; *pre-IPO market return:* FTSE Italia MIB index return over 100 days prior the IPO*; market momentum:* no. of IPOs in the Italian market during the 12 months before listing; *price revision:* percentage difference between the offer price and the midpoint of the preliminary price range*; claw back to retail investors*: fraction of shares shifted from institutional to retail investors after the initial allocation, as percentage of total number of offered shares*; underpricing*: difference between first day closing price and offer price, divided by offer price*; greenshoe volume*: fraction of greenshoe actually exercised (0-15% of offer volume)*; underwriter reputation:* amount of capital raised by the underwriter over the total capital raised in the sample (1=Mediobanca); *syndicate size:* no. of members of the underwriting syndicate; *stabilization performed*: dummy equal to 1 if the underwriter stabilizes the IPO in the aftermarket. Coefficients and t-statistics computed using Huber/White/Sandwich heteroskedasticity-consistent standard errors (in brackets) are reported.

	Liquidity support intensity
Daily bid-ask spread	0.01
	(0.93)
Gross spread	0.00
	(0.12)
Firm age	0.00
	(0.28)
Issue size	-0.02**
	(-2.35)
Dilution ratio	0.01***
	(5.74)
Institutional allocation	-0.07*
	(-1.65)
Pre-IPO market return	-0.06
	(-1.25)
Market momentum	-0.19
	(-0.90)
Price revision	0.02
	(0.61)
Claw back to retail	-0.04
	(-1.64)
Underpricing	-0.15**
	(-2.19)
Greenshoe volume	0.29**
	(2.29)
Underwriter reputation	-0.01
	(-1.00)
Syndicate size	0.00
	(0.02)
Stabilization performed	0.00
	(0.32)
Constant	1.34
	(1.05)
Observations	46
Left-censored obs	10
Wald Chi-squared	743.7

the underwriter. The main determinants of the underwriter's intervention are instead offer size, dilution, underpricing, and the fraction of exercised greenshoe. Specifically, smaller IPOs experiencing a higher dilution are more intensely supported in terms of liquidity. Highly diluted offerings, often conducted by small companies going public to establish their equity, are characterized by a substantial degree of uncertainty, thereby increasing the likelihood of liquidity shortages. IPOs with poor first day returns and with a large fraction of exercised greenshoe also tend to be supported. While IPOs with low underpricing may suffer from weak demand, calling for liquidity support, it is less clear why IPOs with a successful overallocation of shares should be more subject to the underwriter's intervention. As in the case of price stabilization, the coefficient of gross spread is not significant, documenting that the level of fees does not anticipate whether the service will be carried out or not.

3.6 CONCLUSIONS

This paper investigates the relationship between the gross spread paid to IPO underwriters and the level of service they provide, in a sample of 171 Italian IPOs that took place between 1999 and 2008. While extensive research in the last decade has highlighted the clustering of gross spreads in US IPOs, less effort has been spent in investigating the variability of European fees. In particular, the presence of ancillary services and their impact on fees is still unexplored. We consider both the *ex-ante* formal commitment and the *ex-post* aftermarket supply of two crucial services for the success of an IPO, i.e. price stabilization and liquidity support. First, we document that companies going public can reduce the gross spread paid to their underwriters by *ex-ante* relieving them of the price stabilization duty. If issuers are willing to accept the risk of no aftermarket support, they can save on fees. Conversely, liquidity support does not increase the gross spread.

Second, we observe that underwriters adopt different behaviors in the actual provision of the two services. While only half of the IPOs requiring price stabilization are then actually supported, almost all liquidity declarations are fulfilled in the aftermarket. We investigate what drives the underwriter's decision in order to find an explanation for such different patterns. In general, underwriters do seem to stabilize IPOs that really need it, since bad performing offerings experiencing downward price

revisions are more likely to be price-supported. Thus, underwriters seem to act according to the issuer's interest. On the other hand, such an alignment of incentives is not as clear in the provision of the liquidity support service.

APPENDIX

Appendix A. Variance inflation factors for the regressors in Table 5. The table reports the variance inflation factor coefficients for each of the independent variables included in the regression on gross spread (Table 5).

Variable	VIF	1/VIF
Liquidity support not declared	3.60	0.28
Tech bubble	3.52	0.28
Institutional allocation	2.73	0.37
Issue size	2.65	0.38
Market momentum	1.94	0.52
Pre-IPO market return	1.88	0.53
Stabilization not declared	1.86	0.54
Foreign underwriter	1.84	0.54
Underwriter reputation	1.75	0.57
Firm age	1.67	0.60
Relative issue size	1.64	0.61
Syndicate size	1.49	0.67
Dilution ratio	1.32	0.76
Mean VIF	2.15	0.51

CHAPTER FOUR.

Two-stage exits: an empirical analysis of the dynamic choice between IPOs and acquisitions by European private firms

4.1 INTRODUCTION

The choice between IPOs and acquisitions as exit mechanisms for private firms has recently received considerable attention, both among academics and practitioners. Part of the reason for the above interest is due to the fact that, in recent years, a private firm has been much more likely to be acquired than to go public: see, e.g., Gao, Ritter, and Zhu (2013) who show the significant decline in the number of IPOs in the US over the last decade. Existing empirical analyses of IPOs versus acquisitions treat private firms' exit decision as a one-time choice between the two (Brau, Francis, and Kohers, 2003; Poulsen and Stegemoller, 2008; Chemmanur, He, He, and Nandy, 2012). However, in reality, a significant proportion of firms (roughly 15% both in the US and Europe) first go public and are then acquired within three years of their IPO. If firms making their initial exit choice between IPOs and acquisitions factor in the above possibility of choosing to be acquired subsequent to an IPO, this may modify their initial trade-off between the various factors driving their decision. In other words, the choice between IPOs and acquisitions may be a dynamic choice rather than a one-time decision. The objective of this paper is to empirically analyze the above dynamic choice between IPOs and acquisitions for the first time in the literature.

The single-stage choice between IPOs and acquisitions has been analyzed in the theoretical model of Bayar and Chemmanur (2011). In their setting, an entrepreneur, with private information about the viability of his firm's business model against product market competitors (and therefore about its future cash flows) makes his firm's exit choice between IPOs and acquisitions by either selling (a fraction) of his equity in the IPO market or to a potential acquirer. A crucial factor driving the above choice in their setting is that, while a stand-alone firm has to fend for itself after going public, an acquirer is able to provide considerable support to the firm, thus increasing its chances

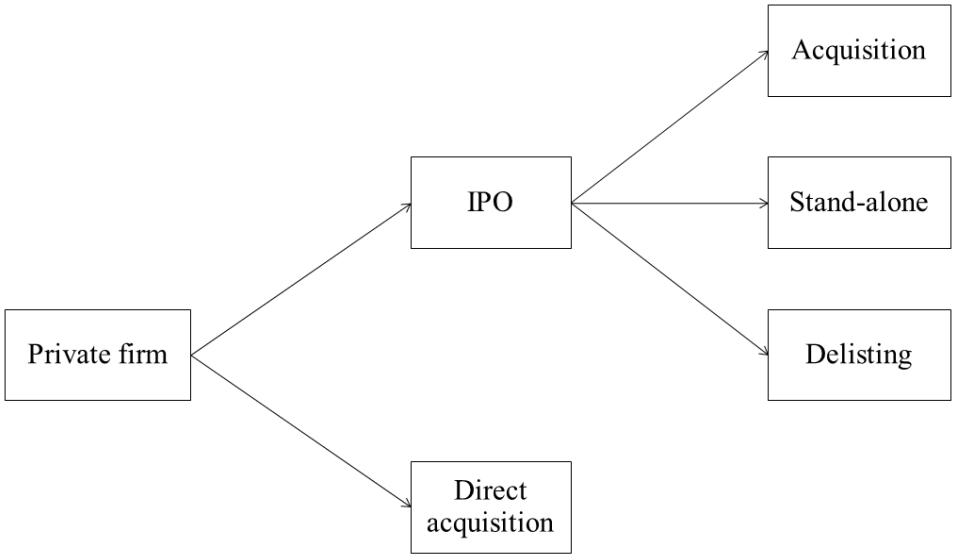
of succeeding and establishing itself in the product market. Two other factors affecting the IPO versus acquisition decision in their setting are the valuation premium less viable firms going public are able to receive in the IPO market (versus being acquired) by pooling with more viable firms, and the fact that the entrepreneur will be able to retain control of his firm in the event of an IPO (and enjoy the benefits arising from control) whereas he will lose such control in the event his firm is acquired. Bayar and Chemmanur (2011) predict that, in equilibrium, a larger fraction of the more viable firms will go public while a similar fraction of the less viable firms will be acquired.

Consider now the situation where an entrepreneur making his firm's exit choice in a setting similar to that analyzed by Bayar and Chemmanur (2011) accounts for the possibility of a two-stage exit: i.e., of first going public and being acquired shortly thereafter. In this case, the entrepreneur's initial trade-off will be affected by the benefits and costs of first going public and being acquired shortly thereafter (say, within three years). One important benefit of first going public and then being acquired is that, by successfully going through the due diligence process associated with an IPO, the firm may be able to reduce the asymmetric information faced by potential acquirers, thus enabling it to obtain higher valuations in a post-IPO acquisition, compared to the valuation it can obtain in a one-stage (direct) acquisition as a private firm. A second important benefit of such a two-stage exit is that the firm may be able to invest the external capital raised in the IPO in its growth opportunities and thus obtain higher valuations in an eventual post-IPO acquisition, compared to the scenario where it is acquired as a private firm, in which case its valuation may be lower due to the inability to fully implement its growth opportunities because of the financial constraints faced as private firm. On the other hand, there may also be several costs of a two-stage exit compared to a direct acquisition. The first important cost may arise from the product market: the support a potential acquirer can provide to the firm against product market competition will be reduced if the acquisition is delayed, since the firm will be competing as a stand-alone firm in the interval between its IPO and subsequent acquisition. The second important cost may arise from the financial market: if the firm's IPO is not a significant success, and its post-IPO performance in the financial market is not satisfying (e.g., in terms of post-IPO stock returns or stock market liquidity), this

may convey a negative signal to potential acquirers, resulting in an inability to be acquired, and even resulting in delisting from the stock market.

In our empirical analysis, we attempt to assess these and other benefits and costs of a two-stage exit over a direct acquisition, which, in turns, will allow us to draw implications for a firm's dynamic choice between IPOs and acquisitions. Figure 1 depicts the four possible scenarios faced by a private firm upon making its exit decision.

Figure 1. Scenarios faced by a private firm at its exit decision



Our empirical analysis is composed of two parts. In the first part, we compare firms that are directly acquired as private firms versus those that first go public and are acquired subsequently (within three years), and we address two important research questions. First, what are the characteristics of firms that choose to be acquired directly as private firms versus first go public and be subsequently acquired? Second, what is the valuation premium, if any, obtained by firms that go through a two-stage exit versus those directly acquired? The answer to the second research question will shed light on the benefits of a two-stage exit that we discussed above. In the second part of our empirical analysis, we compare the three possible scenarios prevailing for a firm that goes public: remain a stand-alone firm; be acquired subsequent to the IPO (within three years); be delisted. Again, we address two important research questions in this part of the paper. First, what are the characteristics of firms that go through each of the above three scenarios? Second, we compare firm valuations across each of the above three

scenarios, and in turn compare them to the valuations obtained by private firms in a direct acquisition.

We conduct our empirical analysis using a sample of European firms that in the period 1995-2012 were either directly acquired as private firms; went public (had an IPO) and remained independent, were acquired, or were delisted within three years. We obtain data from several databases, such as EurIPO, including information on European IPOs; Thomson One Banker, including information on M&A deals, to identify firms that were directly acquired as private and firms that were acquired within three years of the IPO; and Amadeus, used to integrate financial data for private firms.

The results of our empirical analysis can be summarized as follows. In the first part of our analysis, we find that firms that suffer greater information asymmetry and more severe financial constraints are more likely to choose a two-stage exit rather than a direct acquisition. This indicates that firms that have more to gain from a two-stage exit choose this exit mechanism compared to a direct acquisition. Consistent with this, our propensity score matching analysis of the two groups of firms shows that firms that first went public and are subsequently acquired enjoy a significant valuation premium over those that are directly acquired. Even after accounting for the direct costs of going public, this valuation premium comes to around 77%.

Our findings from the second part of our empirical analysis are as follows. Our comparison of the financial market characteristics of firms that are acquired subsequent to an IPO, remain stand-alone, or are delisted after IPO indicates that the first group of firms (two-stage exit) is characterized by the most successful IPOs (as measured by oversubscription), and highest post-IPO liquidity. In contrast, the third group of (delisted) firms has the least successful IPOs, lowest post-IPO liquidity, and lowest post-IPO stock returns. The second group of (stand-alone) firms has IPO oversubscription and post-IPO liquidity in between the first and third group of firms above, while their post-IPO stock returns are similar to the two-stage exit group of firms. Our comparison of the product market characteristics of the above three groups of firms shows that the first group (two-stage exit) has the largest growth options, while the third group of (delisted) firms has the smallest growth options, with the second group (stand-alone) being in-between the other two in magnitude. On the other hand, the first group of (two-stage) firms is characterized by the smallest control benefits,

with the other two (stand-alone and delisted) groups having larger control benefits, insignificantly different from each other.

Our analysis across the four possible scenarios faced by a private firm upon exit shows that the highest valuations are given to firms that are acquired subsequent to IPO; firms delisted after IPO and those that are directly acquired obtained the lowest valuations; stand-alone IPO firms receive valuations in-between. The above results indicate that firms having viable business models undertaking two-stage exits obtain significant benefits from such mechanisms over direct acquisitions. However, our analysis also shows that firms with less viable business models taking such a two-stage exit decision may face significant costs, since these firms may have less successful IPOs and poorer subsequent financial market performance, leading to delisting and low valuations.

The idea of going public to facilitate subsequent M&A activity as target is not new. Zingales (1995) suggests that firms benefit from an increased bargaining power vis-à-vis potential acquirers after conducting an IPO. Reuer and Shen (2004) and Ragozzino and Reuer (2007) highlight the role of information asymmetry between the firm and its buyers as a crucial determinant of the decision to go public before selling out. A few studies investigate whether companies undertaking two-stage exits earn a greater payoff than that obtained by those being directly acquired as private. Brau, Sutton, and Hatch (2010) document that firms acquired after going public sell at around 20% higher valuation. Mantecon and Thistle (2011) report a 174.7% higher return for two-stage firms compared to private firms filing for an IPO but eventually selling out before going public.

The contribution made by this paper is two-fold. The primary contribution is in offering new insights on a private firm's exit decision, which has been traditionally modeled as a dichotomous, one-time choice between IPO and acquisition. By accounting for the possibility to be acquired after the IPO, we are the first to take a dynamic perspective and to draw implications on a firm's initial exit trade-off. In particular, we show that not only traditional information asymmetry-based explanations matter, but also financial and product market considerations do play a role in a two-stage perspective. Further, we document a significant valuation premium for two-stage exits over direct acquisitions, and we are the first to explain its drivers. A secondary

contribution of this paper is to shed further light on the relation between IPO and M&A markets, which so far has received considerable attention only in a growth perspective, i.e. the way in which IPOs facilitate subsequent M&A activity as acquirer (e.g., Celikyurt, Sevilir, and Shivdasani, 2010; Hovakimian and Hutton, 2010). The interaction of these two corporate events from a divestiture point of view has been far less explored, although anecdotal evidence suggests that a significant fraction of firms that go public are acquired shortly thereafter.

The remainder of the paper is organized as follows. Section 2 describes the underlying theoretical setting and formulates the testable hypotheses of the paper. Section 3 describes data, sample selection procedures, and variables. Section 4 presents the empirical tests of our analysis and the results. Section 5 concludes.

4.2 THEORY AND HYPOTHESES

In this section, we formulate the hypotheses tested in the paper. The theoretical framework adopted is that of Bayar and Chemmanur (2011), where an entrepreneur wants to diversify his equity holdings in the firm and exit (at least partially), while simultaneously issuing new equity to raise capital for the firm. In this setting, entrepreneurs have two options: taking the company public (IPO), or selling it to another firm. In the first case, they can sell some of their equity holdings in the firm and raise new capital to fund growth projects, while continuing to manage the firm after going public. In case of an acquisition, they typically divest their entire equity holdings in the firm, thereby transferring control to the acquirer. One crucial factor driving this choice is product market competition. Entrepreneurs have private information about the viability of their firm's business model against competitors, and about its future cash flows. Therefore, while firms with more viable business models are better able to fend for themselves against product market competition, less viable firms may need the support of an acquirer in order to increase their probability of success in the product market.

Besides product market competition, there are further important factors that affect an entrepreneur's IPO vs. acquisition trade-off, as modeled by Bayar and Chemmanur (2011). First, atomistic investors in an IPO, mainly relying on publicly available information, may be at an informational disadvantage with respect to firm insiders,

while the industry expertise of potential acquirers may increase their ability to assess the true value of the firm. This pushes less viable firms to pool in the IPO market with higher quality firms in order to get higher valuations, rather than to be correctly valued by an incumbent. Second, acquirers typically benefit from larger bargaining power than public market investors, allowing them to extract the firm's net present value from insiders. Third, entrepreneurs may derive personal benefits from managing the firm, and these private benefits of control are likely to be lost in case of an acquisition, after which the target firm's entrepreneur usually leaves the company.

4.2.1 Two-stage exit versus direct acquisition

Going public and being acquired shortly thereafter may allow the firm to sell at a better valuation than that otherwise obtained as private target. IPOs bring three substantial benefits to firms looking for an acquirer: they reduce information asymmetry faced by potential buyers (Reuer and Shen, 2004), increase liquidity by listing the firm's shares on a public stock exchange (Officer, 2007), and provide an infusion of fresh equity capital to be invested in value-adding projects, so that the company can be sold at its optimal stage (Poulsen and Stegemoller, 2008). On the other hand, two-stage exit is a risky decision. First, going public is a costly process (Ritter, 1987). Second, the firm may not succeed in finding an acquirer after the IPO. From a financial market point of view, going public may turn out to be an unsuccessful decision if the firm is not able to develop liquid trading, or is affected by unfavorable market conditions. This would convey a negative signal, and increase the likelihood of being delisted. In terms of product market competition, delaying the sellout forces the firm to remain independent for a longer period, which may endanger its survival if the business model is not viable enough to sustain competitive pressure.

4.2.1.1 Private firms' exit decision

Accounting for the possibility to go public and be acquired shortly thereafter generates a number of implications that alter a private firm's initial trade-off between IPO and acquisition. In this subsection, we address our first research question, i.e.: what are the characteristics of firms that choose a two-stage exit instead of a direct acquisition when still private? The two-stage exit decision should be taken by firms whose expected gain in valuation brought by the IPO exceeds the expected cost arising

from going through the listing process and delaying the sellout. We consider four dimensions influencing a private firm's choice: (1) the degree of information asymmetry between insiders and outsiders, (2) the firm's level of financial constraints, (3) financial market conditions, and (4) the characteristics of the product market in which the firm operates.

First, it is widely documented that information asymmetry between two counterparts involved in a transaction leads to increased costs or even failure in accomplishing such transaction, due to the rise of adverse selection issues (Akerlof, 1970). In the market for corporate control, this inefficiency may force high-quality targets to sell at a lower valuation as a compensation for the acquirer's risk-taking. IPOs can effectively alleviate information asymmetry along several dimensions, such as increasing the visibility of the target firm, providing signaling opportunities about its quality, and reducing uncertainty about its valuation. Information production associated with marketing efforts and disclosure requirements, such as the roadshow process and the release of an official prospectus, allows the company to present itself to the investment community and to attract media attention (Reuer and Shen, 2004). This lowers search costs faced by potential buyers, thereby increasing their willingness to pay for the target. Enhanced visibility also allows the target to enter the feasible set of more potential buyers, stimulating competition on bids. Auction theory argues that the presence of competing bidders makes higher selling prices achievable (Walkling and Edmister, 1985).

The going public process also acts as screening device (Ellingsen and Rydqvist, 1997). Companies able to successfully complete an IPO convey a credible signal about their quality. The ability to fulfill listing requirements, bear IPO costs, and find an underwriter raise the profile of the company, that benefits from a stronger bargaining position vis-à-vis potential acquirers (Pagano, Panetta, and Zingales, 1998). Investment banks can certify the quality of affiliated firms, due to the incentive to preserve their reputation as repeated players in the IPO market (e.g., Beatty and Ritter, 1986). Therefore, successfully conducting an IPO increases the perceived quality of the firm in the eyes of potential acquirers, enhancing its valuation when subsequently targeted.

The establishment of a publicly observable market value is another way through which IPOs effectively reduce information asymmetry between firm insiders and outsiders. The acquirer's costs of valuing a potential target represent another crucial

inefficiency in the M&A market. These costs become more pronounced in case of young firms with limited track records, or in presence of high asset intangibility, with deal negotiations being lengthier and buyers responding by offering lower bids (Coff, 1999). By placing a price on the target firm's shares, the IPO removes valuation challenges for potential acquirers and increases the target's likelihood of receiving an attractive bid. Based on these arguments, we expect that firms affected by greater information asymmetry between insiders and outsiders have a stronger incentive to go public before selling out, in order to increase their future valuation by enhancing firm visibility, signaling their quality, and reducing uncertainty about their market value. Therefore, we formulate the following hypothesis:

H1.1 Private firms affected by greater information asymmetry are more likely to choose two-stage exits over direct acquisitions

The second dimension we consider in the trade-off between two-stage exit and direct acquisition is the private firm's level of financial constraints. Private firms suffer from limited access to external financing, which reduces their set of investment opportunities (Boyle and Guthrie, 2003). The inability to fully realize growth opportunities may lead to a suboptimal valuation of the firm if sold when still private. Going public alleviates this problem by infusing capital that can be invested in positive NPV projects and contribute to enhance firm valuation. Raising capital through IPO also allows firms to avoid funding competition associated with the direct acquisition option. While a newly listed firm can decide independently how to allocate offering proceeds, the investment opportunities of a firm that is directly acquired as private have to compete for the availability of resources within the merged firm's internal capital market (Stein, 1997). This suggests that direct acquisitions may not release the firm's financial constraints straight away, as in the case of the IPO. Based on these arguments, we formulate the following hypothesis:

H1.2 Private firms affected by more severe financial constraints are more likely to choose two-stage exits over direct acquisitions

The attractiveness of two-stage exits over direct acquisitions should increase when financial market conditions are favorable, as corporate insiders may take advantage by

timing IPOs to periods when stock prices are high. Ritter and Welch (2002) point out that market conditions are crucial in a firm's decision to go public. Lucas and McDonald (1990) show that firms tend to delay equity offerings if they are undervalued by the market, while they issue equity immediately in case of overvaluation. Going public under favorable market conditions not only allows the firm to receive a higher valuation, but also to raise a larger amount of capital that can be used to fund growth prospects. On the other hand, going public in periods of severe market risk should raise the expected costs of a two-stage exit by increasing the likelihood of an unsuccessful IPO. This would convey a negative signal about the quality of the firm and might result in the inability to find an acquirer. Additionally, the introduction of regulatory changes induced by the US Sarbanes-Oxley Act (thereafter, SOX) among European countries may have increased the expected costs associated with a two-stage exit decision[28]. Consistently, Bova, Minutti-Meza, Nichardson, and Vyas (2013) document that SOX influenced a private firm's exit decision by increasing the preference for being acquired relative to going public. Based on these arguments, we formulate the following hypothesis on the impact of financial market conditions on a private firm's two-stage vs. direct acquisition trade-off:

H1.3 Private firms making their exit decision during more favorable financial market conditions and before the introduction of SOX-equivalent regulatory changes are more likely to choose two-stage exits over direct acquisitions

The product market competition theory of Bayar and Chemmanur (2011) generates a number of implications on a private firm's two-stage vs. direct acquisition decision. Specifically, the viability of the firm against competitors and the characteristics of the product market in which the firm operates can influence this trade-off. First, firms that are more viable against product market competition are more likely to go public before selling out, while less viable firms are more likely to choose direct acquisitions.

[28] The introduction of the Sarbanes-Oxley Act in 2002 by US authorities served as a paradigm that influenced analogous regulatory changes in Europe. In the same year, the Report of the High Level Group of Company Law Experts on a Modern Regulatory Framework for Company Law in Europe, issued by the European Commission, recommended corporate governance practices that are similar to the SOX provisions (see http://ec.europa.eu/internal_market/company/docs/modern/report_en.pdf). SOX imposed additional compliance costs on publicly traded firms that, as a percentage of revenue, have been especially onerous for small firms. Iliev (2010) documents a post-SOX reduction in the market value of small firms.

Delaying the sellout and remaining independent exposes the firm to competitive threats for a longer period of time, increasing the risk associated with the two-stage exit choice if the firm is not fully able to fend for itself against competitors. At the same time, less viable firms may need support by an incumbent as soon as possible, due to their inability to survive in the product market. Second, managers are reluctant to choose a direct acquisition if they enjoy substantial private benefits from controlling the company. In industries characterized by greater private benefits of control, the likelihood of choosing a two-stage exit is therefore higher, because these benefits would be retained by the existing management after the IPO, while they would be lost to the incumbent in case of acquisition. Third, the likelihood of IPOs relative to acquisitions is smaller in more concentrated industries characterized by the presence of a dominant player. The benefits arising from product market support by a dominant firm are indeed greater than those provided by smaller incumbents in less concentrated industries. This increases the attractiveness of the direct acquisition alternative. Based on these arguments, we formulate the following hypothesis:

H1.4 Private firms more viable against product market competition, operating in industries characterized by larger private benefits of control and lower concentration, are more likely to choose two-stage exits over direct acquisitions

4.2.1.2 Valuation premium of two-stage exits

In this subsection, we address our second research question and investigate whether a valuation premium exists for two-stage exits over direct acquisitions. We define three theoretical motivations that justify the existence of a valuation premium for two-stage firms, namely (1) reduced information asymmetry, (2) superior liquidity, and (3) the possibility to sell the company at the optimal stage. Since these benefits are realized exclusively by going public, we expect that firms able to complete a two-stage exit sell at a better valuation than that otherwise obtained as private targets. Brau, Sutton, and Hatch (2010) show that firms acquired after going public sell at a considerable premium compared to firms who decide to sell when still private. Mantecon and Thistle (2011) confirm this result by documenting a valuation premium for two-stage firms over private firms acquired after withdrawing an IPO. Consistently, we formulate the

following hypothesis on the valuation of two-stage exits compared to direct acquisitions:

H2 Firms that choose to go public before selling out are acquired at a premium compared to similar private firms

Although IPOs can be perceived as a signal of firm quality per se (Stoughton, Wong, and Zechner, 2001), we expect valuation premium to vary based on the extent to which each single firm benefits from going public. Alternatively stated, valuation premium will be larger for firms able to exploit in a more effective way the value-enhancing sources associated with the IPO. These should be firms that, among others, are able to (1) reduce information asymmetry to a greater extent, (2) develop greater liquidity, and (3) invest more capital after the IPO. First, as already discussed, IPOs allow to reduce information asymmetry by increasing firm visibility, providing signaling opportunities, and reducing valuation uncertainty. However, a large, established company may receive a lower marginal benefit in terms of visibility from going public, being already well-known by outsiders even as a private firm; or, assuming the pre-IPO degree of information asymmetry being equal, two firms may experience different visibility gains if one receives coverage by ten analysts after the IPO, and the other by only two analysts. Similarly, companies affiliated with top underwriters are able to send more credible signals about their quality (Carter and Manaster, 1990). Firms that are harder to value as private, such as knowledge-intensive firms, remove a larger fraction of uncertainty about their valuation from placing a price on their shares.

Second, liquidity is treated by firms as a valuable resource, as documented by the liquidity discount affecting the valuation of unlisted firms (Officer, 2007). Thus, besides this discount, we expect firms that exhibit greater aftermarket liquidity to benefit from a larger valuation premium. Third, IPOs allow to raise fresh capital that can be invested to enhance firm value and sell the company at its optimal stage. We therefore argue that two-stage firms that are able to invest more after the IPO should benefit from a larger valuation premium, due to the fact that they are pursuing growth opportunities to a greater extent. Based on these arguments, we formulate the following hypotheses on the motivations that drive the magnitude of the valuation premium across two-stage firms:

H2.1 Valuation premium is larger for firms able to reduce information asymmetry to a greater extent by going public

H2.2 Valuation premium is larger for more liquid firms

H2.3 Valuation premium is larger for firms able to pursue more investments thanks to the IPO

4.2.2 Post-IPO scenarios

In this subsection, we address our third research question related to the three possible scenarios faced by a firm once it goes public, i.e.: what are the characteristics of firms that go through each of the three scenarios, i.e. (1) acquisition, (2) stand-alone firm, and (3) delisting? Two-stage exits entail several risks, such as prolonged exposure to product market competition, the risk of delisting if the firm is not successful in the financial market, or the inability to find an acquirer after going public. We hypothesize that the firm's success in both financial and product markets is crucial in shaping its post-IPO outcome. Concerning the financial market dimension, we expect firms conducting more successful IPOs to be more likely to draw the attention of potential acquirers. By signaling their superior quality, these firms increase their attractiveness as targets and face an enlarged pool of potential buyers, thereby increasing the likelihood of completing a two-stage exit. De and Jindra (2012) document that newly listed firms whose stock performance is better, reflecting their post-IPO success, are more likely to attract acquirers. On the other hand, firms for which the IPO turns out to be an unsuccessful strategy should be less likely to survive on the financial market. Therefore, we formulate the following hypothesis on the influence of a firm's financial market success on its post-IPO outcome:

H3.1 Newly listed firms that are more successful in the financial market are more likely to be acquired, while firms that are less successful are more likely to be delisted

Concerning product market characteristics, we formulate our hypotheses by relying on the above mentioned product market competition theory of Bayar and Chemmanur (2011). First, firms with less viable business models should be less likely to fend for themselves against product market competition, thereby facing a higher risk of failure. Second, firms operating in industries characterized by greater private benefits of control

should be more reluctant to become acquisition targets, because their managers would lose such benefits to the bidder. Third, firms operating in more concentrated industries should be more likely to be acquired due to the beneficial support of large, established incumbents. An opposite line of reasoning on industry concentration is suggested by Jain and Kini (1999) who use a sample of US IPOs during 1977-1990 and find that concentration reduces the probability of being acquired after the listing. They posit that in concentrated industries incumbents tend to avoid price-cutting or other aggressive and expensive practices to gain market share, thereby leaving to entrants the possibility to tap profitable market niches. However, since our setting is based on the assumptions of the product market competition theory of Bayar and Chemmanur (2011), we hypothesize a positive effect of concentration on the probability to be acquired. Based on these arguments, we formulate the following hypotheses concerning the relation between product market characteristics and a firm's post-IPO scenario:

H3.2 Newly listed firms with more viable business models are less likely to be delisted; firms operating in industries characterized by greater private benefits of control are less likely to be acquired; and firms operating in more concentrated industries are more likely to be acquired

Finally, the fourth research question of the paper focuses on the payoffs associated with each of the scenarios in which a private firm's exit path may end. The aim is to compare the valuations recognized to firms that go public and are acquired, remain stand-alone, or are delisted, and in turn compare them with the valuations of directly acquired firms. By doing so, we are able to quantify the valuation gain associated with a two-stage exit in case it is successfully completed. On the other hand, we can also assess the costs borne by the firm (in terms of valuation) if the two-stage exit fails and the firm ends up being delisted. Finally, we can investigate whether for firms who have failed to complete a two-stage exit it would have been better off to be acquired when still private, rather than to undertake the two-stage attempt. Given the explorative nature of this research question, we do not formulate any explicit hypothesis.

4.3 DATA, SAMPLE AND VARIABLES

4.3.1 Data and sample selection

The data used in this study are drawn from several databases. In the first part of our analysis, we compare firms that are directly acquired as private versus those that first go public and are acquired within three years of the IPO. The sample of direct acquisitions of private firms is obtained from Thomson One Banker database. We require that the firm is based in Europe, that it was targeted in an M&A in the period 1995-2012, and that the deal valuation is available in Thomson One Banker. Since a fraction of private firms does not have adequate financial data in the Thomson One Banker database, we complete the information about these firms with the Amadeus database. Thus, our sample of direct acquisitions comprises 4,573 private firms acquired during the period 1995-2012. The population of European IPOs is from the EurIPO database29, providing offer- and firm-level data for each firm going public in the stock exchanges of the four largest European economies (London, Euronext30, Frankfurt and Milan stock exchanges). To keep track of the first three years of life as listed firm, we consider firms going public not later than 2009, resulting in a sample of 3,755 observations31. We identify firms that are acquired within three years of the IPO by matching the EurIPO database with the M&A deals included in Thomson One Banker. Thus, our two-stage sample is composed of 577 firms going public in Europe during 1995-2009 and acquired within three years of the IPO.

In the second part of our analysis, we compare three possible scenarios faced by a firm after going public: being acquired; remaining a stand-alone firm; being delisted (within three years). Firms acquired within three years of the IPO form the above mentioned two-stage sample. The stand-alone sample, obtained from EurIPO and cross-checked with Thomson One Banker, is composed of 3,038 firms that went public in Europe during 1995-2009 and did not complete any M&A deals as target within three years of the IPO. The delisted sample, obtained from EurIPO and cross-checked with Datastream, is composed of 140 firms that went public in Europe during 1995-2009 and

[29] See Vismara, Paleari, and Ritter (2012) for a description of the database (www.euripo.it).

[30] We use the French Paris Bourse until the creation of Euronext with the merger of the four stock exchanges of Belgium, France, the Netherlands and Portugal, where the first listing took place on January 27, 2005. Afterwards, we consider Euronext in its entirety.

[31] To ensure comparability between the two samples, in some of our empirical analyses we will restrict the direct acquisitions sample to 4,270 firms acquired in the period 1995-2009.

were delisted from the stock market (for reasons other than acquisition) within three years of the IPO. To sum up, Table 1 presents the annual distribution of the population of European IPOs, from which we draw the two-stage, the stand-alone, and the delisted samples, and the direct acquisitions sample composed of firms acquired as private. Of the 3,755 firms going public during 1995-2009, 577 (15.4%) are acquired within three years, 3,038 (80.9%) are still alive as independent firms at the three-year IPO anniversary, and 140 (3.7%) are delisted from the stock market during the first three years of life as a public company.

Table 1. Yearly distribution of direct acquisitions, two-stage, stand-alone, and delisted firms. This table presents the yearly distribution of the sample of the four possible exit scenarios faced by a private firm: (1) two-stage are firms going public in Europe during 1995-2009 and acquired within three years of the IPO; (2) stand-alone are firms going public in Europe during 1995-2009 and still alive as independent firms three years after the IPO; (3) delisted are firms going public in Europe during 1995-2009 and delisted from the stock market within three years of the IPO; (4) direct acquisitions are firms based in Europe and acquired as private during the period 1995-2012. Data are from EurIPO and Thomson One Banker databases.

	IPO firms				Private firms
	No. IPOs	Two-stage	Stand-alone	Delisted	Direct acquisitions
1995	87	21	65	1	277
1996	230	37	186	7	263
1997	219	33	175	11	245
1998	275	47	223	5	329
1999	373	54	309	10	361
2000	572	87	454	31	410
2001	191	21	165	5	293
2002	120	11	104	5	184
2003	89	7	78	4	180
2004	309	42	241	26	281
2005	429	72	342	15	330
2006	421	68	346	7	371
2007	353	63	289	1	395
2008	60	9	49	2	263
2009	27	5	12	10	88
2010-2012	-	-	-	-	303
Total	3,755	577	3,038	140	4,573

4.3.2 Information asymmetry, financial constraints, financial market and product market variables

In this subsection, we discuss the construction and measurement of the various firm-specific and industry-specific test variables and control variables that we use in our univariate and multivariate econometric analyses. When comparing the characteristics of firms that opt for a direct acquisition with those undertaking a two-stage exit, we

proxy for the degree of information asymmetry between the firm and other market participants by defining a high-tech dummy variable similar to Loughran and Ritter (2004). This variable is equal to 1 for firms with three-digit SIC codes 357, 366, 367, 372, 381, 382, and 384. In the analysis of the drivers of the valuation premium associated with two-stage firms, we take advantage from the superior data availability of listed firms by using several proxies for information asymmetry. First, we include a main market dummy, equal to 1 for firms going public on the main, regulated market of each stock exchange (Vismara, Paleari, and Ritter, 2012). Second, we obtain from I/B/E/S the number of analysts' EPS forecasts for the IPO fiscal year end, scaled by annual sales, to proxy for firm visibility, similar to Chemmanur, He, and Nandy (2010). Third, we include a top underwriter dummy identifying firms going public with a prestigious underwriter, i.e. with an updated Carter and Manaster (1990) rank, available on Jay Ritter's website, of 8 or more. This proxies for the reduction in information asymmetry thanks to the signaling effect of underwriter reputation. Fourth, we measure the extent to which a firm reduces valuation uncertainty by using pre-IPO asset intangibility, defined as the ratio of intangible assets over total assets at the last fiscal year before IPO, similar to Poulsen and Stegemoller (2008).

Financial constraints are proxied following Hadlock and Pierce (2010), who document that firm size and age are the only two relatively exogenous predictors, allowing for a non-linear relation between firm size and the degree of financial constraints[32]. Therefore, we include firm size, defined as the log of last fiscal year sales (inflation-adjusted), size squared, and age in years at the IPO.

Financial market-related measures are defined as follows. We control for market momentum by measuring the return of the FTSE Euromid index over the 100 days prior to the relevant date (acquisition date, for direct acquisitions of private firms, and IPO date, for two-stage firms), and for the riskiness of the investment environment by computing market volatility as the standard deviation of daily returns of the FTSE Euromid index over the 100 days prior to the relevant date (Bodnaruk, Kandel, Massa,

[32] Hadlock and Pierce (2010) discuss previous studies on financial constraints, such as Kaplan and Zingales (1997) and Whited and Wu (2006). They argue that not all components of KZ index, which is derived from 49 firms and 719 firm-years, have the predicted signs in their larger sample of 356 firms and 1,848 firm-years. They find that the relation between constraints and firm size and age is essentially flat for very large and old firms. However, they uncover a quadratic relation between size and constraints and a linear relation between age and constraints for smaller and younger firms.

and Simonov, 2008). We also control for regulatory changes that may increase the costs of going public, and define a dummy equal to 1 if the exit decision occurs after the issuer's country of incorporation adopted a SOX-equivalent corporate governance code during our sample period[33]. In the analysis of the three post-IPO scenarios (two-stage, stand-alone, delisted), we use three proxies for a firm's success on the financial market. First, IPO oversubscription, defined as the ratio between the number of shares demanded by investors and the number of shares allocated at the IPO; second, aftermarket liquidity, computed as the average ratio of the daily bid-ask spread divided by the midpoint of bid and ask prices, from 1 month after the IPO to the minimum between 13 months after the IPO and 2 months before the event (acquisition or delisting); third, excess return, i.e. the firm's annualized stock return for the 3-year period after the IPO or up to 2 months before the event date, minus the FTSE Euromid index return over the same period (Field and Karpoff, 2002).

Finally, we use four industry-specific product market measures. First, we define the market share of the firm (Chemmanur, He, and Nandy, 2010) as the firm's market share in terms of sales at the three-digit SIC level. Second, we measure the cross-sectional variation in private benefits of control across different industries by constructing the same variable used by Bayar and Chemmanur (2012), inspired by Rajan and Wulf (2006) who empirically analyze perk consumption by firm executives. Thus, we define a private benefits dummy equal to 1 for firms operating in oil & gas production (SIC code 13), chemicals and allied products (SIC code 28), petroleum refining (SIC code 29), and transportation equipment (SIC code 37) industries[34]. Third, to determine if there is a dominant player in a firm's industry, we define a big player dummy variable which is equal to 1 if there is a firm with a market share more than 30%[35] in the same three-digit SIC industry (Bayar and Chemmanur, 2012). Fourth, similar to Brau, Francis, and Kohers (2003), we include the Herfindahl index in order to measure

[33] For instance: the German Corporate Governance Code was introduced on February 26th, 2002; in the UK, the Combined Code was passed on July 23rd, 2003; in France, the Law on Financial Securities was introduced on August 1st, 2003; in Italy, the Legislative Decree no. 310/2004 was introduced on January 1st, 2004.

[34] These industries are the top five in CEO perk consumption and have a CEO-Divisional Manager differential in the perk consumption score greater than 1, according to Rajan and Wulf (2006). The CEO-Divisional Manager differential in perk consumption measures the extent to which a CEO values his or her perks as a unique privilege.

[35] As a robustness check, we set the threshold market share to be a big player to be 20% and 40%, with results qualitatively unchanged.

industry concentration, calculated by summing up the squares of the market share in sales of all public and private European firms covered by Amadeus within a particular industry (at the three-digit SIC level)[36]. These variables are measured at the last fiscal year end before the event date, i.e. acquisition or IPO in the analysis of the direct acquisition versus two-stage exit choice, and IPO in the analysis of the three post-IPO scenarios.

4.4 EMPIRICAL TESTS AND RESULTS

In this section, we present the empirical results of our univariate and multivariate tests. We first focus on a private firm's trade-off between being directly acquired as a private firm and going public before being acquired. Then, we provide evidence about the three possible scenarios prevailing for a firm that goes public (being acquired, remaining stand-alone, and being delisted). In both cases, we shed light on the determinants of the exit choice at a firm- and industry-level, and on the payoffs associated with the different strategies.

4.4.1 Two-stage exit versus direct acquisition

4.4.1.1 Private firms' exit decision

In this subsection, we outline the differences between firms that go public and are subsequently acquired and firms that are directly acquired as private. Then, we investigate the determinants of a private firm's choice between two-stage exit and direct acquisition in a multivariate setting. Table 2 reports the means and medians of our key test variables as well as the results of the two-sample t-tests for the difference in means and Wilcoxon-Mann-Whitney tests for evaluating the significance of the difference in medians between the two-stage and the direct acquisitions samples.

Hypothesis H1.1 predicts that firms facing higher information asymmetry would benefit more from going public, thereby increasing their propensity to undertake a two-stage exit instead of a direct acquisition. Although the average fraction of high-tech firms among two-stage exits is slightly higher than that of direct acquisitions (5.9% vs.

[36] Since the number of firms covered by Amadeus in the first years of our sample is poor, for the period 1995-1998 we hold industry variables constant using the 1999 values.

Table 2. Summary statistics and univariate tests on the characteristics of direct acquisition vs. two-stage firms. This table presents summary statistics and univariate tests for firms that went public and were acquired within three years of the IPO (two-stage), and firms that were directly acquired as private (direct acquisitions). Two-stage are the 577 firms going public in Europe during 1995-2009 and acquired within three years of the IPO. Direct acquisitions are 4,270 private firms based in Europe and acquired during the period 1995-2009. All variables are measured at the IPO for two-stage firms, and at the acquisition for direct acquisition firms. *High-tech* is a dummy variable equal to 1 if the firm has a three-digit SIC code of 357, 366, 367, 372, 381, 382, 384; *Sales* is last fiscal year sales; *Age* is firm age in years; *Market momentum* is the return of the FTSE Euromid index over the 100 days prior to IPO/acquisition; *Market volatility* is the standard deviation of the FTSE Euromid index daily returns over the 100 days prior to IPO/acquisition; *EU SOX-equivalent* is equal to 1 for IPOs/acquisitions taking place from the second quarter of 2002 onwards, when the first SOX-like regulatory change was implemented in Europe; *Market share* is the value of a firm's market share in terms of total sales in its three-digit SIC industry; *Private benefits* is a dummy equal to 1 if a private firm's industry is both one of the top five CEO perk consumption industries of Rajan and Wulf (2006) and one of those industries in which the CEO-Divisional Manager differential in the Rajan-Wulf perk consumption score is greater than 1, i.e. industries with two-digit SIC codes of 13 (oil & gas production), 28 (chemicals and allied products), 29 (oil refining), and 37 (transportation equipment); *Big player* is a dummy equal to 1 if another company in the firm's industry (three-digit SIC level) has a market share of more than 30%; *Herfindahl index* is the value of Herfindahl Index at the three digit SIC level; *Sales growth* is the firm's average annual change in sales from year -3 to -1 or from year -2 to -1 depending on data availability, available for 4,332 firms (408 two-stage and 3,924 direct acquisitions). All monetary values are in real terms. The last column reports the tests of difference in means (t-test) and medians (Wilcoxon-Mann-Whitney test) between the sample of two-stage firms and direct acquisitions. ***, **, and * indicate significance at the 1, 5, and 10 percent levels respectively.

			Two-stage exits		Direct acquisitions		Test on difference	
Hypothesis		Variable	*average*	*median*	*average*	*median*	*average*	*median*
H1.1	Information asymmetry	High-tech firm (%)	5.9	0.0	4.6	0.0	1.3	0.0
H1.2	Financial constraints	Sales (€m)	135.7	20.7	61.8	11.3	73.9***	9.6***
		Age (years)	14	6	30	26	-16***	-20***
H1.3	Financial market	Market momentum (%)	4.6	4.4	2.2	3.2	2.4***	1.2***
		Market volatility (%)	79.9	74	92.8	80.7	-12.9***	-6.7***
		EU SOX-equivalent (%)	46.1	0.0	51.8	100.0	-5.7**	-100.0**
H1.4	Product market	Market share (%)	0.9	0.1	0.4	0.0	0.5***	0.1***
		Private benefits (%)	8.5	0.0	4.7	0.0	3.8***	0.0***
		Big player (%)	9.3	0.0	15.9	0.0	-6.6***	-0.0***
		Herfindahl index (%)	7.3	5.0	7.3	5.3	0.0	-0.3
		Sales growth (%)	9.0	1.0	4.5	0.2	4.5***	0.8***

4.6%), which is consistent with H1.1, we find no significant difference at a univariate level. Partly inconsistent with the financial constraints hypothesis, two-stage firms are on average significantly larger in sales than those being directly acquired (€128.0m vs. €61.8m), arguable due to the typically smaller size of private firms. The values of firm age are instead consistent, with two-stage firms being younger, both in means and medians, than directly acquired firms (14 vs. 30 years, on average).

Hypothesis H1.3 argues that market conditions influence the two-stage vs. direct acquisition trade-off. Consistently, we find that two-stage exits take place at a higher frequency during periods of better stock market performance (4.6% vs. 2.2%), lower

stock market volatility (79.9% vs. 92.8%), and lower costs of going public. Hypothesis H1.4 predicts that firms with a smaller market share, operating in industries with limited private benefits of control, and with a high degree of concentration are more exposed to product market competition and therefore less likely to delay the acquisition. Consistent with this prediction, two-stage firms have a larger market share (0.9% vs. 0.4%). Moreover, two-stage exits are more common in industries characterized by greater private benefits of control (8.5% vs. 4.7%), and lower concentration, as the presence of a big player is associated with a lower (9.3% vs. 15.9%). Finally, two-stage firms experience a greater growth in sales compared to direct acquisitions.

Table 3 reports the maximum likelihood estimates of the cross-sectional determinants of a private firm's choice between IPO and subsequent acquisition (two-stage) and acquisition as private (direct acquisition), in a multivariate logit regression framework. One potential concern about the empirical analysis of the choice between two-stage exit and direct acquisition is about endogeneity in the exit decision. Going public may not be a real option for many small private companies, with the observable characteristics of two-stage firms being affected by the fact that only high-quality firms are admitted to the stock market and are able to bear listing costs. Therefore, we run the regression on the full sample and on the subsample of firms for which going public may be a real option, i.e. with last fiscal year sales of at least €20m[37]. Additionally, we correct for self-selection due to firm quality by including sales growth, which is commonly used as a measure of the viability of the firm's business model (Bayar and Chemmanur, 2012)[38]. We employ our two proxies for industry concentration, i.e. big player dummy and Herfindahl index, separately. The dependent variable is a dummy equal to 1 in case the firm goes public and is subsequently acquired (two-stage), and 0 otherwise.

The coefficients from the full sample estimation reveal that, consistent with H1.1, firms operating in high-tech industries are more likely to undertake a two-stage exit,

[37] As a robustness check, we set the annual sales threshold to €10m and €30m, with results qualitatively unchanged.

[38] Sales growth is computed as the average annual change in sales over the three years or two years before the IPO/acquisition, depending on data availability. 169 out of 577 firms of the two-stage sample, and 346 out of 4,270 firms of the direct acquisition sample (1995-2009) have less than two fiscal years of financial data prior to the IPO/acquisition, therefore we conduct our multivariate analyses both on the whole sample without sales growth, and on the restricted sample with available sales growth.

Table 3. Determinants of the direct acquisition versus two-stage exit method. This table presents the cross-sectional logistic regression on the decision to be acquired as private firm (direct acquisition) versus first go public and be acquired within three years of the IPO (two-stage). The sample is made of two-stage firms (577 firms) and direct acquisitions (4,270 firms) during 1995-2009. Models (5) to (8) are restricted to 1,817 firms with more than €20m (inflation-adjusted) in annual sales. The dependent variable is a dummy equal to 1 for two-stage firms, and 0 for direct acquisitions. All variables are measured at the IPO for two-stage firms, and at the acquisition for direct acquisition firms. *High-tech* is a dummy equal to 1 if the firm has a three-digit SIC code of 357, 366, 367, 372, 381, 382, 384; *Ln(Sales)* is the log of last fiscal year sales and $Ln^2(Sales)$ is the squared term; *Ln(Age)* is the log of one plus firm age in years; *Market momentum* is the return of the FTSE Euromid index over the 100 days prior to IPO/acquisition; *Market volatility* is the standard deviation of the FTSE Euromid index daily returns over the 100 days prior to IPO/acquisition; *EU SOX-equivalent* is equal to 1 for IPOs/acquisitions taking place from the second quarter of 2002 onwards, when the first SOX-like regulatory change was implemented in Europe; *Market share* is the value of a firm's market share in terms of total sales in its three-digit SIC industry; *Private benefits* is a dummy equal to 1 if a private firm's industry is both one of the top five CEO perk consumption industries of Rajan andWulf (2006) and one of those industries in which the CEO-Divisional Manager differential in the Rajan-Wulf perk consumption score is greater than 1, i.e. industries with two-digit SIC codes of 13 (oil & gas production), 28 (chemicals and allied products), 29 (oil refining), and 37 (transportation equipment); *Big player* is a dummy equal to 1 if another company in the firm's industry (three-digit SIC level) has a market share of more than 30%; *Herfindahl index* is the value of Herfindahl Index at the three digit SIC level; *Sales growth* is the firm's average annual change in sales from year -3 to -1 or from year -2 to -1 depending on data availability, available for 4,332 firms (408 two-stage and 3,924 direct acquisitions). Heteroskedasticity corrected clustered robust t-statistics are in brackets. ***, **, and * represent statistical significance at the 1, 5, and 10 percent levels, respectively.

			All sample				Sales > €20m			
Hypothesis		Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
H1.1	Information asymmetry	High-tech firm	0.83***	0.85***	0.62**	0.64**	0.84**	0.87**	0.17	0.19
			(2.94)	(3.02)	(2.22)	(2.26)	(2.47)	(2.55)	(0.43)	(0.49)
H1.2	Financial constraints	Ln(Sales)	-1.55***	-1.58***	-0.98***	-1.05***	0.55	0.51	0.36	0.34
			(-9.11)	(-9.16)	(-3.27)	(-3.51)	(0.62)	(0.58)	(0.33)	(0.32)
		Ln^2(Sales)	0.05***	0.05***	0.04***	0.04***	-0.01	-0.01	-0.00	-0.00
			(9.46)	(9.54)	(4.03)	(4.27)	(-0.31)	(-0.27)	(-0.04)	(-0.03)
		Ln(Age)	-2.87***	-2.87***	-2.77***	-2.77***	-1.82***	-1.82***	-3.11***	-3.10***
			(-15.34)	(-15.30)	(-10.89)	(-10.89)	(-8.28)	(-8.21)	(-6.91)	(-6.87)
H1.3	Financial market	Market momentum	1.54***	1.49***	1.58**	1.54**	1.99***	1.97***	2.41***	2.42***
			(2.79)	(2.68)	(2.56)	(2.48)	(2.72)	(2.70)	(2.88)	(2.88)
		Market volatility	-0.57***	-0.63***	-0.69***	-0.74***	-0.43**	-0.46**	-0.40	-0.42*
			(-3.34)	(-3.70)	(-3.51)	(-3.82)	(-2.09)	(-2.22)	(-1.57)	(-1.67)
		EU SOX-equivalent	-0.08	-0.16	-0.14	-0.21	-0.30**	-0.35**	-0.46***	-0.51***
			(-0.72)	(-1.36)	(-1.15)	(-1.59)	(-2.03)	(-2.31)	(-2.93)	(-3.07)
H1.4	Product market	Market share	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.02
			(0.71)	(0.87)	(0.50)	(0.66)	(0.81)	(1.10)	(0.61)	(0.83)
		Private benefits	1.00***	1.03***	1.03***	1.05***	0.21	0.26	0.16	0.19
			(3.94)	(4.02)	(4.07)	(4.09)	(0.60)	(0.74)	(0.42)	(0.48)
		Big player	-0.45**		-0.40**		-0.33		-0.29	
			(-2.47)		(-2.14)		(-1.36)		(-1.18)	
		Herfindahl index		-2.40**		-2.14*		-2.24*		-1.85
				(-2.29)		(-1.89)		(-1.69)		(-1.62)
Control variables		Sales growth			0.50***	0.49***			0.64***	0.63***
					(4.06)	(3.97)			(3.87)	(3.83)
		Constant	20.13***	20.64***	14.68***	15.55***	-2.39	-1.74	4.12	4.39
			(14.55)	(14.50)	(5.39)	(5.68)	(-0.27)	(-0.20)	(0.38)	(0.41)
Observations			4,847	4,847	4,332	4,332	1,817	1,817	1,618	1,618
Pseudo R-squared			0.35	0.35	0.27	0.27	0.17	0.17	0.24	0.24

documenting that this type of firms has greater incentive to raise their profile and enhance transparency by going through the IPO process. The significance of this coefficient is lower among larger firms (models 5-8), for which information asymmetry concerns may be mitigated by their size. Similarly, the coefficients of the linear and squared terms of firm size provide support to the financial constraints hypothesis (H1.2) only in the full sample estimation. Since financial constraints are more severe for smaller firms, but fall sharply as firms start to grow, the likelihood of two-stage exit over direct acquisition decreases at a quadratic rate with firm size. This suggests that financial constraints decrease remarkably as the firm reaches a certain size threshold, resulting in a non-significant effect among larger firms. Younger firms are more likely to opt for a two-stage exit, consistent with H1.2.

Hypothesis H1.3 predicts that favorable market circumstances increase the attractiveness of the two-stage exit decision. Consistent with such prediction, the propensity to undertake a two-stage exit increases during periods of high stock market returns and low volatility. On the other hand, the implementation of SOX-equivalent regulatory changes in Europe is negatively related to a private firm's likelihood to go public before being acquired, discouraged by the increased compliance costs of going and staying public.

Hypothesis H1.4 concerns the relationship between product market characteristics and the propensity to undertake a two-stage exit. The coefficient of the private benefits dummy is positive and significant, supporting the prediction that firms operating in industries characterized by large private benefits of control are more reluctant to lose such benefits by selling the firm immediately. The coefficient is not significant among large firms, suggesting that private benefits of control matter most for small firms. The presence of a dominant player in the firm's industry is negatively and significantly related to the probability of choosing a two-stage exit over a direct acquisition. Predictably, the coefficient is not significant for larger firms, as the benefits from receiving product market support by a large incumbent exist mainly for small firms. The impact of industry concentration on the two-stage exit decision is robust to the use of the Herfindahl index as alternative measure. Finally, firms with larger previous sales growth are more likely to choose two-stage exits, across all model specifications. These firms are more likely to have a viable business model that allows them to fend for

themselves against product market competition. Therefore, the risk of delaying the acquisition by going public and remaining independent for a longer period is relatively lower.

In summary, the results of our multivariate logit analysis in Table 3 show that the empirical evidence on the choice of two-stage exit versus direct acquisition is broadly consistent with the testable hypotheses we developed in Section 2. After controlling for potential sources of endogeneity, such as self-selection and firm quality, we find that a firm's degree of information asymmetry and financial constraints have a significant impact on its exit choice between two-stage and direct acquisition. Specifically, firms affected more severely by information asymmetry and financial constraints show a stronger incentive to go public before being acquired in order to alleviate such effects. We also document that overall market conditions, product market characteristics and private benefits of control influence a private firm's trade-off between two-stage exit and direct acquisition.

4.4.1.2 Valuation premium of two-stage exits

In this subsection, we quantify the benefits of the two-stage exit in terms of better valuation recognized to firms that are acquired after going public with respect to firms directly acquired as private, and explain its cross-sectional determinants. We investigate the existence of a valuation premium by comparing the deal value to sales multiple at which the newly listed and the private target firms are acquired. The deal value to sales multiple is defined as the ratio between the deal value, i.e. the monetary value of consideration paid by the acquirer (excluding fees and expenses), and the target's last fiscal year sales before the deal[39]. The two-stage sample is restricted to 540 observations because the terms of the acquisition, including the price paid by the acquirer, were not disclosed for 37 out of the 577 firms.

Although Panel A of Table 4 documents a statistically higher valuation for two-stage firms, with an average deal value to sales of 11.7 versus 4.1, we need to mitigate the issue of selection on observables in the comparison with private firms, especially by accounting for firm quality. The valuation gap may arise from the fact that only higher

[39] There are other valuation measures commonly used in literature, such as Deal Value/EBITDA, Deal Value/Book Value of Equity, or Tobin's Q. For many private firms, however, EBITDA and book value of equity are negative, therefore we use Deal Value/Sales multiple to avoid estimation bias, coherent with Bayar and Chemmanur (2012).

quality firms are admitted to the stock market, rather than from the choice of the exit mechanism. Therefore, we perform a propensity score matching procedure using the nearest neighbor criterion (Dehejia and Wahba, 2002)[40]. First, we estimate each firm's propensity to choose a two-stage exit by using the above mentioned logistic regression (see Table 3); second, we match each two-stage firm with the direct acquisition firm having the closest propensity score. Then, we test whether two-stage firms are acquired at a premium with respect to their peers directly acquired as private, by defining the valuation premium similar to Bayar and Chemmanur (2012):

$$\text{Valuation premium} = \log\left(\frac{M_{two-stage}}{M_{direct\ acquisition}}\right)$$

where $M_{\text{two-stage}}$ is the deal value to sales ratio of the acquisition of the two-stage firm, net of direct IPO costs[41], and $M_{\text{direct sellout}}$ is the same ratio associated with the acquisition of the comparable firm choosing a direct acquisition, picked by the propensity score matching methodology.

Panel B of Table 4 shows the results on the valuation premium obtained after applying the propensity score matching methodology. The incidence of direct and indirect costs borne by two-stage firms to achieve the public status is reported in Panel C of Table 4. Since underpricing cannot be merely considered a cost for the issuer, we will refer to valuation premium as net of direct listing costs, without accounting for the first day return[42]. Therefore, two-stage firms benefit from an average valuation premium of 77% (73.4% in median), net of direct IPO costs, with respect to a comparable firm acquired when still private.

[40] We also impose the common support condition by dropping observations of the direct acquisition sample whose propensity score is higher (lower) than the maximum (minimum) score associated with the two-stage sample.

[41] We take the monetary value of the direct costs borne by the company during the IPO process (auditing, legal, printing, exchange listing, and investment banking fees) as reported in prospectus, and subtract them from the deal value of the subsequent acquisition. The numerator of the valuation premium is then defined as follows: (deal value – IPO costs) / last fiscal year sales.

[42] Although traditional information asymmetry-based theories look at underpricing as a cost for the issuer, Loughran and Ritter (2004) discuss an issuer's objective function that explains why companies would hire an underwriter that is expected to leave more money on the table than necessary. Hoberg (2007) documents that high underpricing underwriters gain larger market shares than low underpricing underwriters. Liu and Ritter (2011) document that underpricing is a form by which issuers indirectly remunerate underwriters in exchange for high-quality ancillary services bundled with underwriting.

Table 4. Valuation premium of two-stage versus matched direct acquisitions. This table presents the valuation of two-stage firms and direct acquisitions and the valuation premium of two-stage firms over direct acquisitions, gross and net of the direct and indirect IPO costs. The sample is made of two-stage firms (577 firms) and direct acquisitions (4,573 firms) occurred during 1995-2012. Panel A shows the deal value to sales ratio, defined as the monetary value of consideration paid by the acquirer, excluding fees and expenses, divided by the target's last fiscal year sales before the deal, at which the two group of firms are acquired. Tests are on the difference in mean (t-test) and median (Wilcoxon-Mann-Whitney test) between the two samples. In Panel B, the sample is made of two-stage firms for which we measure direct listing costs (including auditing, legal, printing, exchange listing, and investment banking fees) and indirect costs measured as IPO underpricing, defined as the difference between the first day closing price and the offer price. Both are expressed in percentage of the capital raised at the IPO. Panel C shows the valuation premium, defined as the logarithm of the ratio between the deal value to sales of the two-stage firm and the deal value to sales of the comparable private firm choosing a direct acquisition, found using propensity score matching. The two-stage sample is reduced to 540 due to undisclosed terms of the acquisition for 37 firms. Net valuation premiums are obtained by subtracting the monetary value of direct and indirect costs from the monetary value of consideration paid by the acquirer of the two-stage firm. Tests are on the difference in means (t-test) and medians (Wilcoxon-Mann-Whitney test) between the two-stage and direct acquisitions samples. ***, **, and * represent statistical significance at the 1, 5, and 10 percent levels, respectively (in unreported tests, all variables in Panel B and C are statistically different from zero at 1 percent level).

Panel A. Deal value to sales ratio	*average*	*median*
Two-stage firms	11.7	1.9
Direct acquisitions	4.1	1.0
Test on difference	7.6***	0.9***
Panel B. Costs of going public		
Direct listing costs (%)	8.8	8.2
Indirect costs (underpricing) (%)	21.4	6.8
Panel C. Valuation premium (propensity score matching)		
Gross valuation premium (%)	85.9	82.0
Valuation premium net of listing costs (%)	77.0	73.4
Valuation premium net of listing costs and underpricing (%)	57.3	55.7

Not all private firms benefit from the IPO process to the same extent. For instance, we expect the valuation premium to vary across firms, according to their ability to reduce information asymmetry, develop aftermarket liquidity and exploit new investment opportunities. Therefore, we shed light on the determinants of such valuation premium both at a univariate and multivariate level. Table 5 presents the results of the univariate tests. Hypothesis H2.1 predicts that firms able to reduce information asymmetry to a greater extent thanks to the IPO benefit from a larger valuation premium. Consistently, we find that firms with above-median valuation premium are significantly smaller (€93.6m vs. €178m in annual sales) and younger (12 vs. 16 years). Smaller and younger private firms, more severely affected by information asymmetry, receive a larger benefit from going through the due diligence and roadshow processes. Similarly, we find that the fraction of IPO firms affiliated with a top underwriter is significantly larger among firms benefiting from a higher valuation premium (23.3% vs. 15.9%). Hypothesis H2.2, predicting that firms developing higher

liquidity in the aftermarket benefit from a larger valuation premium, does not find support at a univariate level. Consistent with hypothesis H2.3, firms with higher valuation premium are associated with a significantly higher capital expenditure growth after the IPO[43].

Table 5. Summary statistics and univariate tests on the drivers of the two-stage valuation premium. This table presents summary statistics and univariate tests of the characteristics of the 540 two-stage firms (with valuation as target disclosed) divided into two groups, i.e. with below- and above-median valuation premium. Valuation premium is defined as the logarithm of the ratio between the deal value to sales of the two-stage firm, net of the direct costs of going public, and the deal value to sales of the comparable private firm choosing a direct acquisition, found using propensity score matching. *Main market* is a dummy equal to 1 for firms going public on main (regulated) markets; *Sales* are at the last fiscal year before IPO; *Age* is firm age in years; *VC backing* is a dummy equal to 1 for venture capital-backed IPOs; *Analysts' forecasts* is the number of the firm's EPS forecasts available in I/B/E/S for the IPO fiscal year end; *Top underwriter* is a dummy equal to 1 in case the IPO is underwritten by a bank with an updated Carter-Manaster rank of 8 or more (from Jay Ritter's website); *Asset intangibility* is the ratio of intangible assets over total assets at the IPO; *Daily bid-ask spread* is the average ratio of the bid-ask spread divided by the midpoint of the bid and ask prices, using the daily closing bid and ask prices from 1 month after the IPO to the minimum between 13 months after the IPO and 2 months before the acquisition date (from Datastream); *Capex growth* is the firm's change in capital expenditure from fiscal year t-1 to fiscal year t+1 (with t = IPO year), scaled by the average level of total assets. The last column reports the tests of difference in means (t-test) and medians (Wilcoxon-Mann-Whitney test) between the two groups. ***, **, and * indicate significance at the 1, 5, and 10 percent levels respectively.

			Val. premium above median		Val. premium below median		Test on difference	
Hypothesis		Variable	*average*	*median*	*average*	*median*	*average*	*median*
H2.1	Information	Main market (%)	34.4	0.0	35.2	0.0	-0.8	0.0
	Asymmetry	Sales (€m)	93.6	8.8	178.0	42.6	-84.4***	-33.8**
		Age (years)	12	5	16	7	-4**	-2***
		VC backing (%)	34.1	0.0	29.6	0.0	4.5	0.0
	Visibility	Analysts' forecasts (no.)	17	8	15	7	2	1**
	Signaling	Top underwriter (%)	23.3	0.0	15.9	0.0	7.4**	0.0**
	Val. uncertainty	Asset intangibility (%)	12.5	2.1	16.2	4.8	-3.7*	-2.7*
H2.2	Liquidity	Daily Bid-Ask spread (%)	4.2	2.9	4.1	2.8	0.1	0.1
H2.3	Optimal stage	Capex growth (%)	50.5	8.7	16.7	2.3	33.8***	6.4***

A fundamental issue in the analysis of the determinants of the valuation premium in a multivariate setting is that not all firms going public are subsequently acquired because of an intentional two-stage exit choice. For instance, newly listed firms may decide to be acquired due to going public turning out to be an unsuccessful strategy, or after receiving an unexpectedly favorable bid. The intentionality of the firm in pursuing a two-stage exit is therefore unobservable, causing sample selection problems. To correct for this, we employ a two-step Heckman (1979) procedure that accounts for the

[43] Capital expenditure is defined as the firm's change in capital expenditure from fiscal year t-1 to fiscal year t+1 (with t = IPO year), scaled by the average level of total assets. It is not available for 119 firms acquired within the first year of their IPO.

presence of unobservable factors that simultaneously affect both the probability of the treatment selection (in this case, being acquired after the IPO) and the treatment outcome (valuation premium). The estimation is composed of two steps. First, a logistic regression on the sample of all European IPOs taking place during 1995-2009 models the probability of being acquired within three years (i.e., completing a two-stage exit), and determines the inverse Mills ratios for each observation. Second, an OLS regression estimates the drivers of the valuation premium of the 540 two-stage firms, by including the inverse Mills ratio among the regressors, in order to capture unobservable factors influencing both the likelihood of being acquired and the valuation at the time of acquisition. Table 6 presents the results of the second stage regression.[44] Model (1) is estimated on the full sample, and model (2) on the restricted sample of firms acquired later than one year from the IPO, for which capital expenditure growth is available.

Consistent with the prediction of H2.1, the coefficient of the main market dummy is positive and significant in both model specifications. The increased level of transparency and the higher disclosure requirements of main markets effectively mitigate the amount of information asymmetry between the firm and the market. Coherently, smaller firms, characterized by a higher level of pre-IPO information asymmetry, benefit more from going public, as documented by the negative and significant coefficient of the sales variable. Firm age and VC-backing do not exert any significant influence on valuation premium. The coefficient of the number of analysts' forecasts, positive and significant, confirms that greater analyst coverage raises the valuation premium. The presence of top underwriters is perceived as a credible signal that raises the profile of the firm, as shown by the result of the top underwriter dummy variable. On the other hand, the reduction in valuation uncertainty is not beneficial, as highly intangible firms do not benefit more than others from the IPO placing a price on them. Therefore, the larger benefits in terms of valuation premium due to the reduction of information asymmetry are associated with smaller IPO firms, firms listing on main markets, with greater analyst coverage and affiliated with reputable underwriters.

[44] We do not discuss here in detail the first step as it is not the main focus of this part of our analysis. The model used in the first step is the same we employ in subsection 4.2.1 in a multinomial setting (see Table 8), simplified to a logistic regression where the dependent variable is equal to 1 in case the IPO firm is acquired within three years, 0 otherwise.

Table 6. Determinants of the valuation premium of two-stage versus direct acquisition. This table presents the second step (cross-sectional OLS regression) of the Heckman selection procedure of the information asymmetry, liquidity, and optimal stage effects on the valuation premium of two-stage firms over direct acquisitions. The dependent variable is valuation premium, defined as the logarithm of the ratio between the deal value to sales of the two-stage firm, net of the direct costs of going public, and the deal value to sales of the comparable private firm choosing a direct acquisition, found using propensity score matching. Model (1) reports the estimates on the full sample of 540 two-stage firms with valuation as target disclosed; model (2) includes capex growth, which is not available for 119 firms acquired within one year of the IPO. *Main market* is a dummy equal to 1 for firms going public on main (regulated) markets; *Ln(Sales)* is the log of last fiscal year sales before IPO; *Ln(Age)* is the log of one plus firm age in years; *VC backing* is a dummy equal to 1 for venture capital-backed IPOs; *Analysts' forecasts* is the number of the firm's EPS forecasts in I/B/E/S for the IPO fiscal year end, scaled by last fiscal year sales; *Top underwriter* is a dummy equal to 1 in case the IPO is underwritten by a bank with an updated Carter-Manaster rank of 8 or more (from Jay Ritter's website); *Asset intangibility* is the ratio of intangible assets over total assets at the IPO; *Daily bid-ask spread* is the average ratio of the bid-ask spread divided by the midpoint of the bid and ask prices, using the daily closing bid and ask prices from 1 month after the IPO to the minimum between 13 months after the IPO and 2 months before the acquisition date (from Datastream); *Capex growth* is the firm's change in capital expenditure from fiscal year t-1 to fiscal year t+1 (with t = IPO year), scaled by the average level of total assets. All monetary values are in real terms. Heteroskedasticity corrected clustered robust t-statistics are in brackets. ***, **, and * represent statistical significance at the 1, 5, and 10 percent levels, respectively.

Hypothesis		Variable	(1)	(2)
H2.1	Information asymmetry	Main market	0.61***	0.66***
			(2.79)	(2.70)
		Ln(Sales)	-0.40***	-0.41***
			(-9.28)	(-8.39)
		Ln(Age)	-0.07	-0.03
			(-0.92)	(-0.40)
		VC backing	0.04	-0.10
			(0.22)	(-0.44)
	Visibility	Analysts' forecasts	0.25***	0.22**
			(3.47)	(2.54)
	Signaling	Top underwriter	0.50**	0.65**
			(2.09)	(2.38)
	Val. uncertainty	Asset intangibility	0.09	0.32
			(0.22)	(0.74)
H2.2	Liquidity	Daily bid-ask spread	-4.24**	-3.18*
			(-2.35)	(-1.72)
H2.3	Optimal stage	Capex growth		0.37***
				(4.19)
		Constant	7.26***	7.27***
			(9.74)	(9.02)
		Mills ratio (λ)	-0.50**	-0.38*
			(-2.06)	(-1.93)
Observations			540	421
Wald Chi-squared			146.6	138.2

The liquidity hypothesis (H2.2) is supported by the negative and significant coefficient of the daily bid-ask spread in both model specifications. Firms developing superior aftermarket liquidity (i.e., narrower bid-ask spread) are acquired at a larger premium. Consistent with the optimal stage hypothesis (H2.3), firms investing more after the IPO benefit from a larger valuation premium, as revealed by the positive and

statistically significant coefficient of the capital expenditure growth variable in column (2). The IPO effectively opens new investment possibilities that, if pursued, lead to a better valuation of the firm when subsequently targeted. The Mills ratio is negative and significant, indicating that there are indeed unobservable factors, such as the intentionality to go public in order to be acquired, that affect both the newly listed firm's propensity to be acquired and its subsequent valuation as target. Overall, our results provide support to each of our three hypotheses about the determinants of valuation premium.

In summary, our propensity score matching analysis documents that firms that go public and are subsequently acquired enjoy a significant valuation premium at the time of acquisition over their private peers that are directly acquired. Even after subtracting the direct costs borne by the firm to go public, the valuation premium amounts to 77% on average. It is larger for firms benefiting more from the reduction of information asymmetry associated with the IPO process, i.e. smaller and younger firms, listing on main markets, with greater analyst coverage and affiliated with top underwriters; for firms developing superior liquidity in the aftermarket; and for firms that invest more after raising capital at the IPO.

4.4.2 Post-IPO scenarios

4.4.2.1 The probability of being acquired, remaining stand-alone, being delisted

In this subsection, we empirically investigate the three possible scenarios faced by a newly listed firm at its three-year IPO anniversary: (1) being acquired, (2) remaining stand-alone, and (3) being delisted. Table 7 presents the summary statistics and univariate comparisons of financial market, product market, and firm characteristics of 3,755 firms going public in Europe during 1995-2009. 577 of them are acquired (two-stage), 3,038 remain stand-alone, and 140 are delisted within three years of the IPO.

Hypothesis 3.1 states that firms that are more successful in the financial market become more attractive targets, while firms for which going public turns out to be an unsuccessful strategy are more likely to get delisted. All our proxies for financial market success are consistent with this prediction. First, two-stage firms exhibit a higher level of IPO oversubscription on average (8.4 times the offer size), while IPOs of firms that are subsequently delisted from the stock market are less oversubscribed (4.9 times).

Table 7. Summary statistics and univariate tests on the characteristics of two-stage vs. stand-alone vs. delisted firms. This table presents summary statistics and univariate tests of the characteristics of the firms associated with the three post-IPO scenarios: (1) two-stage are firms going public in Europe during 1995-2009 and acquired within three years of the IPO; (2) stand-alone are firms going public in Europe during 1995-2009 and still alive as independent firms three years after the IPO; (3) delisted are firms going public in Europe during 1995-2009 and delisted from the stock market within three years of the IPO. *IPO oversubscription* is the ratio between the number of shares demanded and the number of shares allocated at the IPO; *Bid-Ask spread* is the average ratio of daily bid-ask spread divided by the midpoint of bid and ask prices, from 1 month after the IPO to the minimum between 13 months after IPO and 2 months before the acquisition/delisting; *Excess return* is the firm's buy-and-hold stock return for the 3-year period after the IPO or up to 2 months before the event date, minus the Euromid index buy-and-hold return over the same period; *Market share* is the value of a firm's market share in terms of total sales in its three-digit SIC industry; *Private benefits* is a dummy equal to 1 if a private firm's industry is both one of the top five CEO perk consumption industries of Rajan and Wulf (2006) and one of those industries in which the CEO-Divisional Manager differential in the Rajan-Wulf perk consumption score is greater than 1, i.e. industries with two-digit SIC codes of 13 (oil & gas production), 28 (chemicals and allied products), 29 (oil refining), and 37 (transportation equipment); *Big player* is a dummy equal to 1 if another company in the firm's industry (three-digit SIC level) has a market share of more than 30%; *Herfindahl index* is the value of Herfindahl Index at the three digit SIC level; *Growth opportunities* is the growth opportunities fraction of the firms' market-to-book ratio, measured as ln(V/B), where V=intrinsic value, B=book value of equity; *Misvaluation* is the misvaluation fraction of the firm's market-to-book ratio, measured as ln(M/V), where M=market value, V=intrinsic value of equity; *Sales* are at last fiscal year before the IPO; *Age* is firm age in years; *Leverage* is the ratio of last fiscal year total debt to total assets; *VC backing* is a dummy equal to 1 for venture capital-backed IPOs. The last columns report the tests of difference in means (t-test) and medians (Wilcoxon-Mann-Whitney test) between the two-stage sample and the stand-alone and delisted sample, respectively. ***, **, and * indicate significance at the 1, 5, and 10 percent levels respectively.

		Two-stage (577)		Stand-alone (3,038)		Delisted (140)		Difference Two-stage-Stand-alone		Difference Two-stage-Delisted	
Hypothesis	Variable	*average*	*median*	*average*	*median*	*average*	*median*	*average*	*median*	*average*	*median*
H3.1 Financial	IPO oversubscription	8.4	4.6	6.9	3.7	4.9	2.6	1.5***	0.9***	3.5***	2.0***
market	Bid-Ask spread (%)	4.2	2.9	6.7	3.5	12.1	8.0	-2.5***	-0.6***	-7.9***	-5.1***
	Excess return (%)	-12.3	-16.4	-17.5	-18.6	-39.7	-46.1	5.2***	2.2***	27.4***	29.7***
H3.2 Product	Market share (%)	0.9	0.1	2.2	0.2	1.5	0.2	-1.3***	-0.1	-0.6*	-0.1
market	Private benefits (%)	8.5	0.0	13.4	0.0	14.8	0.0	-4.9***	-0.0***	-6.3***	-0.0***
	Big player (%)	9.3	0.0	13.7	0.0	7.0	0.0	-4.4***	-0.0***	2.3	0.0
	Herfindahl index (%)	7.3	5.0	8.4	6.5	6.9	6.5	-1.1***	-1.5***	0.4	-1.5
	Growth opportunities Ln(V/B)	0.4	0.4	0.3	0.3	0.2	0.1	0.1***	0.1***	0.2***	0.3***
Control	Misvaluation Ln(M/V)	0.4	0.1	1.1	0.9	1.1	1.0	-0.7***	-0.8***	-0.7***	-0.9***
variables	Sales (€m)	135.7	20.7	337.0	13.9	197.0	5.7	-201.3	6.8***	-61.3	15.0***
	Age (years)	14	6	13	6	7	3	1	0	7***	3***
	Leverage (%)	29.8	20.1	21.4	11.3	21.6	11.0	8.4***	8.8***	8.2***	9.1***
	VC backing (%)	31.9	0.0	38.1	0.0	39.9	0.0	-6.2***	-0.0***	-8.0*	-0.0*

Second, firms that are acquired develop a higher level of aftermarket liquidity (4.2% average bid-ask spread), while delisted firms suffer from scarce liquidity and show a significantly larger bid-ask spread (12.1 on average). Third, better stock returns, computed on an annualized basis in excess of the FTSE Euromid index return, are associated with firms that are acquired within three years of the IPO (-12.3% on average), while stocks of firms that end up being delisted tend to perform worse (-39.7%). In all the three cases, stand-alone firms exhibit values that are between the two other groups.

Hypothesis H3.2 refers to the product market characteristics at an industry level. First, consistent with the prediction that firms with smaller market share are less likely to survive independently, we find the highest value of market share among stand-alone firms (2.2% on average). Second, the two-stage group has the lowest presence of firms operating in industries with large private benefits of control (8.5%), consistent with our prediction that firms that enjoy greater private benefits of control are more reluctant to be acquired. The delisted sample shows the largest fraction of firms operating in these industries (14.8%), suggesting a potentially detrimental effect of private benefits on a firm's success. Third, 9.3% of firms that are acquired shortly after the IPO belong to an industry where there is a dominant player, whereas this fraction decreases to 7% among delisted firms. The highest mean value of the Herfindahl index is instead associated with stand-alone firms (8.4%). Finally, acquired firms embed the largest growth opportunities (with an average logarithm of the V/B ratio of 0.4), while firms that end up being delisted have the least (0.2), consistent with our prediction that firms with a more viable business model are more likely to either be acquired or remain stand-alone, while firms with a less viable business model face a higher risk of delisting.

Table 8 presents the multinomial logit estimates of the three scenarios faced by a firm after going public. The dependent variable is categorical and takes three values: 0 if the firm is delisted from the stock market (for reasons other than acquisition) within three years of the IPO; 1 if the firm is alive and independent at its three-year IPO anniversary; and 2 if the firm gets acquired within three years. Since the stand-alone case is the base outcome, the reported coefficients represent the effects that the explanatory variables exert on the likelihood of being acquired or delisted relative to remaining stand-alone.

All the firm specific financial market variables are significant determinants of a firm's likelihood of being acquired or delisted. Consistent with hypothesis H3.1, firms that conduct less successful IPOs, develop scarce liquidity, and exhibit poor stock returns are more likely to be delisted within three years of the IPO. On the contrary, highly oversubscribed IPOs and high aftermarket liquidity both increase the likelihood of becoming acquisition target. Among product market variables, larger market share decreases the likelihood of becoming acquisition target. Consistent with the prediction of hypothesis H3.2, firms operating in industries with lower private benefits of control are more likely to be acquired, since their managers are not concerned about losing such benefits after the acquisition. At the same time, firms with more viable business models, as proxied by the growth opportunities component of their market-to-book ratio, are more likely to be acquired due to their increased attractiveness in the eye of potential buyers. Firms with scarce growth options face instead a higher risk of delisting.

The extent to which a firm is misvalued by the stock market is a crucial determinant of its post-IPO acquisition likelihood. Specifically, the more overvalued is the firm, the lower is the probability of being targeted, due to overpayment by potential acquirers. Firms that go public at a later stage in life are more likely to remain stand-alone, while younger firms, that may suffer more from product market competition, tend to either be delisted or to be acquired in an attempt to receive support from another firm. We also find that highly leveraged firms are more likely to be acquired, while the presence of a venture capitalist reduces the likelihood of becoming an acquisition target.

In summary, our regression results in Table 8 are generally consistent with our financial and product market hypotheses. We find that firms with high IPO oversubscription and superior aftermarket liquidity are more likely to be acquired, while low IPO oversubscription, scarce liquidity and poor stock returns increase the risk of delisting. Coherently, we find that firms embedding greater growth opportunities are more likely to attract potential acquirers, while firms with less viable business models tend to be delisted. At an industry level, firms operating in sectors with lower private benefits of control are more likely to be acquired. The overvaluation of the firm by the financial market, firm age and the presence of venture capitalists also reduce the likelihood of being acquired, while leverage increases it.

Table 8. Determinants of post-IPO scenarios: two-stage vs. stand-alone vs. delisted firm. This table presents the multinomial logistic regression of the financial market and product market effects on an IPO firm's likelihood to end in one of these three scenarios: (1) two-stage, i.e. being acquired within three years of the IPO; (2) stand-alone, i.e. being still alive as independent firms three years after the IPO; (3) delisted, i.e. being delisted from the stock market within three years of the IPO. The dependent variable is a categorical variable identifying two-stage, stand-alone, and delisted firms (stand-alone is the default case). *IPO oversubscription* is the ratio between the number of shares demanded and the number of shares allocated at the IPO; *Bid-Ask spread* is the average ratio of daily bid-ask spread divided by the midpoint of bid and ask prices, from 1 month after the IPO to the minimum between 13 months after IPO and 2 months before the acquisition/delisting; *Excess return* is the firm's buy-and-hold stock return for the 3-year period after the IPO or up to 2 months before the event date, minus the Euromid index buy-and-hold return over the same period; *Market share* is the value of a firm's market share in terms of total sales in its three-digit SIC industry; *Private benefits* is a dummy equal to 1 if a private firm's industry is both one of the top five CEO perk consumption industries of Rajan and Wulf (2006) and one of those industries in which the CEO-Divisional Manager differential in the Rajan-Wulf perk consumption score is greater than 1, i.e. industries with two-digit SIC codes of 13 (oil & gas production), 28 (chemicals and allied products), 29 (oil refining), and 37 (transportation equipment); *Big player* is a dummy equal to 1 if another company in the firm's industry (three-digit SIC level) has a market share of more than 30%; *Herfindahl index* is the value of Herfindahl Index at the three digit SIC level; *Growth opportunities* is the growth opportunities fraction of the firms' market-to-book ratio; *Misvaluation* is the misvaluation fraction of the firm's market-to-book ratio; *Sales* are at the last fiscal year before IPO; *Age* is firm age in years; *Leverage* is the ratio of last fiscal year total debt to total assets; *VC backing* is a dummy equal to 1 for venture capital-backed IPOs. Heteroskedasticity corrected clustered robust t-statistics are in brackets. ***, **, and * represent statistical significance at the 1, 5, and 10 percent levels, respectively.

			(1)		(2)	
Hypothesis		Variable	Delisted	Two-stage	Delisted	Two-stage
H3.1	Financial market	IPO oversubscription	-0.08**	0.02***	-0.08**	0.02***
			(-2.03)	(2.70)	(-2.05)	(2.70)
		Bid-ask spread	3.21***	-3.44***	3.00**	-3.49***
			(2.72)	(-2.77)	(2.31)	(-2.80)
		Excess return	-1.53***	-0.06	-1.51***	-0.06
			(-3.24)	(-1.50)	(-3.22)	(-1.46)
H3.2	Product market	Market share	0.01	-0.03**	0.01	-0.03**
			(0.55)	(-2.52)	(0.81)	(-2.52)
		Private benefits	0.17	-0.61***	0.19	-0.61***
			(0.46)	(-3.15)	(0.49)	(-3.19)
		Big player	-0.80	-0.34*		
			(-1.25)	(-1.86)		
		Herfindahl index			-2.69	-0.68
					(-1.59)	(-0.85)
		Growth opportunities	-6.74***	4.34***	-6.79***	4.36***
			(-4.81)	(8.87)	(-4.84)	(8.94)
Control variables		Misvaluation	0.11	-1.05***	0.10	-1.06***
			(0.90)	(-6.98)	(0.82)	(-7.01)
		Ln(Sales)	-0.01	0.07**	-0.02	0.07**
			(-0.12)	(2.51)	(-0.30)	(2.42)
		Ln(Age)	-0.29**	-0.31***	-0.29**	-0.31***
			(-2.01)	(-6.06)	(-2.00)	(-6.04)
		Leverage	0.08	0.64***	0.08	0.66***
			(0.18)	(3.34)	(0.18)	(3.45)
		VC backing	0.23	-0.33***	0.23	-0.33***
			(0.82)	(-2.78)	(0.80)	(-2.80)
		Constant	-16.10***	-1.45**	-15.73***	-1.41**
			(-13.25)	(-2.37)	(-11.98)	(-2.29)
Observations			3,755		3,755	
Pseudo R-squared			0.22		0.22	

4.4.2.2 Payoffs of the different exit paths

In this subsection, we compare firm valuations across all the possible exit scenarios faced by a private firm, i.e. (1) going public and being acquired, (2) going public and remaining stand-alone, (3) going public and being delisted, and (4) being directly acquired as private firm. Our aim is to shed light on the payoffs associated with each exit path, therefore quantifying both the potential benefits and costs of a private firm's decision. Since our analysis implies the comparison of the valuation of different firms at different points in time, we face two major concerns. The first one is self-selection in the exit choice. Again, some private firms may not realistically face the option to go public, therefore we have to carefully select firms that were acquired as private by ensuring that they actually had the possibility to choose between IPO and acquisition. To this extent, we restrict the direct acquisitions sample to the 540 firms having the same propensity to conduct a two-stage exit as the firms that went public and were subsequently acquired, to avoid downward bias in the valuation of firms acquired as private. These firms are picked by the propensity score matching methodology discussed and implemented in subsection 4.1.2.

The second issue is related to the time at which we measure the valuation of stand-alone firms. As two-stage firms get acquired 1, 2, or 3 years after going public and surviving firms have data for all these years, we should measure and match the data for two-stage firms with those of stand-alone firms at the same point in time. Thus, we implement a time-matching algorithm used by De and Jindra (2012). First, we note that out of the 540 two-stage firms with available valuation at the acquisition, 119 (22.0%) get acquired in the first year after listing, 201 (37.2%) in the second year, and 220 (40.7%) in the third year. Second, we randomly assign 22.0%, 37.2%, and 40.7% of stand-alone firms into three distinct groups and then measure firm valuation for the first, the second, and the third group 1, 2, and 3 years after the IPO, respectively. This results in a time-matched sample of stand-alone firms for which the length of time of listing has the same distribution as that of the sample of two-stage firms.

We adopt two valuation measures to guarantee robustness to our results: the enterprise value to sales ratio, defined as market value plus total debt minus cash, divided by annual sales; and the Tobin's Q, defined as the ratio of the market value of assets to the book value of assets, where the market value is calculated as the sum of

book value of assets and market value of equity minus the book value of equity. For both variables, the market value is based on the following prices: for the two-stage and direct acquisitions samples, the price paid by the acquirer (net of direct listing costs for two-stage firms); for the delisted sample, the stock price two months before the delisting date; for stand-alone firms, the stock price at the date of the time-matching algorithm that randomly assigns firms into three groups based on the distribution of acquisitions of two-stage firms, as described above.

Table 9 reports the time-matched comparison of the valuation of: (1) firms that go public and are acquired within three years of the IPO (two-stage); (2) firms that are alive and independent at the three-year IPO anniversary (stand-alone); (3) firms that are delisted within three years of the IPO (delisted); and (4) firms that are acquired when still private (direct acquisitions). Significance levels are from the two-sample t-tests for the difference in means and Wilcoxon-Mann-Whitney tests for the difference in medians between the two-stage sample and each of the other three groups. Two-stage firms are acquired subsequent to the IPO at an average EV/Sales of 11.7 (median of 1.9), and an average Tobin's Q of 4.0 (median of 2.5). These valuations are significantly higher, both in means and medians, than those obtained by firms opting for any of the other exit scenarios. This result documents that two-stage exits are a valuable exit path, as firms that succeed in going public and find an acquirer receive the highest possible valuation.

On the other hand, firms that are delisted after the IPO and firms that are directly acquired as private obtain similar valuations, which however are the lowest across the four groups. The average EV/Sales (Tobin's Q) of direct acquisitions and delisted firms is 4.1 (2.0) and 5.4 (1.9), respectively. Therefore, firms that go public but end up being delisted, due to their inability to survive in the financial and/or product market, obtain a valuation that is similar to that the firm would have received by directly selling out when still private. This documents that two-stage exit strategies entail a considerable risk for firms with less viable business models. Finally, stand-alone firms receive valuations that are in-between the two-stage and the delisted/directly acquired firms, with an average EV/Sales and Tobin's Q ratios of 7.5 and 3.1, respectively.

Table 9. Time-matched valuation of two-stage vs. stand-alone vs. delisted firms. This table presents a comparison of the valuation of the four possible exit scenarios faced by a private firm: (1) two-stage are firms going public in Europe during 1995-2009 and acquired within three years of the IPO; (2) stand-alone are firms going public in Europe during 1995-2009 and still alive as independent firms three years after the IPO; (3) delisted are firms going public in Europe during 1995-2009 and delisted from the stock market within three years of the IPO; (4) direct acquisitions are the 540 firms based in Europe and acquired as private during the period 1995-2012 matched on the propensity to undertake a two-stage exit. Two valuation measures are reported: EV/Sales, the enterprise value to last fiscal year sales ratio; Tobin's Q, the ratio of the market value of assets to the book value of assets, where the market value is calculated as the sum of the book value of assets and the market value at the offer price of common stock minus the book value of common stock. For direct acquisitions, enterprise and market values are computed considering the takeover price. EV/Sales and Tobin's Q are measured at the relevant date for each group: for two-stage firms, at the acquisition; for stand-alone firms, the relevant date is based on an algorithm that randomly assigns firms into three groups (year 1–3) based on the distribution of acquisitions of the two-stage sample, as described in subsection 4.2.2; for delisted firms, two months prior to delisting date; for direct acquisitions, at the acquisition. ***, **, and * indicate significance at the 1, 5, and 10 percent levels respectively of the tests of difference in mean (t-test) and median (Wilcoxon-Mann-Whitney test) from the two-stage sample.

	Two-stage (540)		Stand-alone (3,038)		Delisted (140)		Direct acquisitions (540)	
	at acquisition		time-matching		two months prior		at acquisition	
	average	*median*	*average*	*median*	*average*	*median*	*average*	*median*
EV/Sales	11.7	1.9	7.5***	1.6***	5.4***	0.8***	4.1***	1.0***
Tobin's Q	4.0	2.5	3.1***	1.9***	1.9***	1.6***	2.0***	1.0***

4.5 CONCLUSIONS

This paper develops an empirical analysis of a firm's dynamic choice between IPO and acquisition, by accounting for the possibility to conduct a two-stage exit, i.e. of going public and being acquired shortly thereafter. While the IPO vs. acquisition decision has traditionally been modeled as a one-time choice, we show how the possibility of being acquired after the listing alters the initial IPO vs. acquisition trade-off. Using a European sample, we first investigate what are the characteristics of firms that go public and get acquired within three years of the IPO (two-stage) versus those choosing to be acquired when still private (direct acquisitions). We find that firms that have more to gain from a two-stage exit tend to prefer this option. Specifically, those suffering from greater information asymmetry and more severe financial constraints are more likely to go public rather than being directly acquired. Our propensity score matching analysis also documents that firms that first go public and are subsequently acquired benefit from an average 77% valuation premium, net of direct listing costs, over a similar private target. Our two-step Heckman procedure indicates that the premium is larger for firms able to reduce information asymmetry to a greater extent thanks to the going public process, for firms developing superior aftermarket liquidity, and for firms investing more after the IPO.

In the second part of our empirical analysis, we account for the potential costs associated with a two-stage exit by comparing the three possible scenarios faced by a firm that goes public: being acquired; remaining stand-alone; and being delisted. We first shed light on the characteristics of firms that go through each of the three above paths by using a multinomial logit model, and find that firms that are more successful both in the financial and product market draw the attention of potential acquirers, thereby increasing the likelihood of being targeted. On the other hand, firms with low IPO oversubscription, scarce aftermarket liquidity, poor stock performance, and limited growth opportunities face a higher risk of being delisted. Then, we investigate the payoffs associated with all the four possible exit outcomes faced by a private firm: going public and being acquired; going public and remaining stand-alone; going public and being delisted; being directly acquired when still private. We document that the highest valuation is recognized to firms that are acquired subsequent to the IPO, while firms delisted after going public and those that were directly acquired obtain the lowest valuation. Therefore, firms having more viable business models can obtain considerable benefits from a two-stage exit. However, less viable firms may not be successful in the financial market and/or suffer from product market competition, facing a higher risk of being delisted and obtaining poor valuations.

CHAPTER FIVE.
Concluding remarks

The evidence presented in this dissertation makes several contributions to the literatures on IPO valuation and firm exit. Moreover, it allows to draw a number of both theoretical and practical implications that unveil potential research avenues and can be of interest to financial market participants. The first contribution is to the stream of research on IPO valuation, where most of the studies are unable to address how the valuation of firms going public is actually established. Although our results are not surprising, as one may expect underwriters to choose the best comparables available for their issuers, we are the first to empirically demonstrate such a biased selection. Since valuation using multiples is the most common methodology used by investment banks, we unveil the existence of potential agency problems between issuer and underwriter during the price-setting process. While a high valuation is important to the issuer, due to the signalling effect about its quality and to the infusion of capital that can be subsequently invested, underwriters may be tempted to limit valuation to benefit from underpricing as further source of compensation in addition to fees (Chen and Ritter, 2000). A potential limitation to this contribution resides in the fact that we highlight potential agency issues by assuming the issuer's utility to increase monotonically with the amount of capital raised. We hypothesize that issuers are more satisfied the larger is the amount of proceeds from the IPO. This may not always hold. Loughran and Ritter (2004), for instance, model a change in the issuers' objective function that modifies their willingness to accept underpricing, causing a shift of their preferences towards non-price dimensions. Although issuers still care about the maximization of proceeds, the increased emphasis on all-star analyst coverage and their involvement in rent-seeking behaviours, such as spinning (Liu and Ritter, 2010), increase their propensity to hire underwriters with a reputation for severe underpricing.

The second contribution stemming from this dissertation is in documenting that companies going public are willing to pay more to guarantee the underwriter's support to their post-IPO valuation. This evidence provides additional insights about the issuer's objective function, and contributes also to the literature on the remuneration of IPO

underwriters. In particular, it opens a new perspective on the potential sources of market power and differentiation in the underwriting industry for the first time outside the US. A practical implication of the above evidence is that underwriters able to bundle the traditional auditing, marketing and advisory activities with other ancillary services for which issuers are able to pay higher fees, may enjoy an increased bargaining power. Evidence from the US underwriting market is coherent with such implications, as documented by Liu and Ritter (2011). The provision of ancillary services that are considered important by the issuers, such as the availability of all-star analyst coverage, allows underwriters to benefit from a certain degree of market power. However, as in the case of the valuation process of IPO firms, the empirical analysis highlights the existence of potential agency issues in the supply of ancillary services. While underwriters seem to correctly stabilize the price of poorly performing IPOs, such a clear alignment of incentives is not found in the provision of liquidity support. Given that the terms under which these services are supplied is largely discretionary, issuers may promote the adoption of more binding contracting schemes, in order to mitigate potential misalignments between their own incentives and those of their investment banks.

Concerning the role of IPO valuations on firm exit, this dissertation offers a primary contribution to the literature on firm exit and, more broadly, to the interaction between IPO and M&A markets. By accounting for the possibility to be acquired after the IPO, the third paper takes a dynamic perspective and overcomes traditional theoretical models that consider firm exit as a one-time, dichotomous choice between IPO and acquisition. In particular, we document that going public can facilitate the firm's subsequent involvement in the market for corporate control not only as acquirer, as shown by most of the previous studies, but also as target. Firms successfully completing a two-stage exit are able to sell at a considerable premium compared to the valuation they would have obtained by selling out immediately when still private. The implication for entrepreneurs willing to exit their business is that, if the company is sufficiently viable against product market competition, they should consider taking it public before liquidating their ownership stakes. A potential limitation affecting this research lies in the intentionality of the firm. One could argue that, on one hand, not all firms that become M&A targets after the IPO are driven by a pre-planned two-stage exit strategy;

on the other hand, firms going public to pursue such objective may fail in finding a suitable acquirer. Since the firm's intentionality to undertake a two-stage exit is unobservable, unless we conduct interviews to entrepreneurs and top managers of the going public companies, we try to address this concern empirically. We employ econometric tools that allow to control for unobservable factors that may cause endogeneity in the selection of the sample.

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