

Two Stage Exits: An Empirical Analysis of the Dynamic Choice between IPOs and Acquisitions by European Private Firms

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Abstract

A private firm's exit decision has been modeled in the existing empirical literature as a dichotomous choice between IPO and acquisition. In this paper, we take a dynamic approach and analyze how explicitly accounting for dynamic considerations, such as the benefits arising from being acquired after going public at higher valuations relative to a direct acquisition, or the costs arising from being delisted at lower valuations, alters the initial IPO vs. acquisition trade-off. We find that firms that are more viable against product market competition, characterized by larger private benefits of control and lower information asymmetry, are more likely to choose an IPO over a direct acquisition as initial exit mechanism. These firms are also more likely to be acquired post-IPO, while firms characterized by lower product market viability and higher information asymmetry are more likely to be delisted. We document that two-stage acquisitions are a valuable exit route for firms, that are acquired at a 44.7% premium, on average, compared to the valuation they could have obtained in a direct acquisition. On the other hand, firms that are delisted post-IPO suffer from a 31.9% valuation discount relative to a direct acquisition. The valuation premium is higher for firms with more viable business models and affected by lower information asymmetry. Our evidence indicates that explicitly accounting for the benefits and costs arising from post-IPO considerations will tend to push private firms with higher product market viability and lower information asymmetry more towards choosing an IPO rather than an acquisition as initial exit mechanism.

Keywords: firm exit, two-stage, IPOs, acquisitions.

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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 (2014) 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 decisions 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 being 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 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 extent of information asymmetry faced by atomistic investors in an IPO, who may be at an informational disadvantage (and therefore less able to assess the true value of the firm) compared to potential acquirers in the same industry, 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 acquisition: 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 being acquired shortly after the IPO (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 acquisition 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, possibly resulting in a delisting from the stock market.

In our empirical analysis, we assess these and other benefits and costs of a two-stage acquisition over a direct acquisition which, in turn, will allow us to draw implications for a firm's dynamic choice between IPOs and acquisitions. Assessing the above costs and benefits empirically is important, since this will allow us to determine whether the possibility of being acquired post-IPO does indeed affect a firm's choice between IPOs and acquisitions in the first place. Thus, if the costs discussed above are greater than the benefits, then few firms that would have otherwise chosen to be acquired directly (i.e., as a private firm) will decide to choose an IPO in the hopes of being acquired as a public firm subsequent to the IPO (at a much higher valuation). On the other hand, if the benefits arising from being acquired at a much higher valuation

after the IPO dominate the expected loss arising from being unable to survive as a publicly traded firm and being delisted (and obtaining a much lower valuation subsequently, either in a private sale or in a liquidation), then the possibility of a two-stage acquisition will alter the initial trade-off of a private firm, pushing it toward an IPO. Figure 1 depicts the four possible scenarios faced by a private firm at the point of making its initial exit decision.

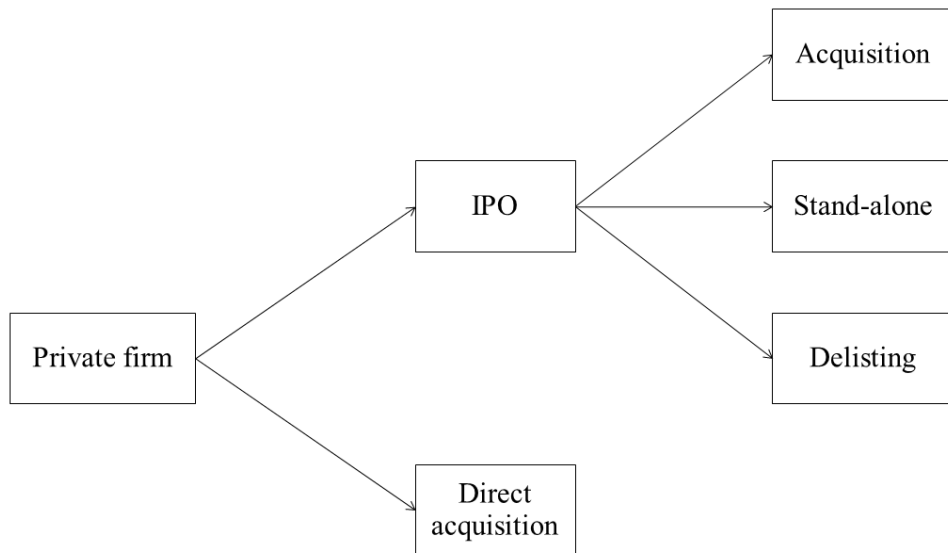


Figure 1: Scenarios faced by a private firm at its initial exit decision

It is not our view that the bulk of firms eventually going through a two stage acquisition intentionally go public in order to be subsequently acquired. While some firms going through a two-stage acquisition might indeed have gone public with a view to being acquired after IPO, it is possible that most firms that end up being acquired subsequent to an IPO originally hoped to remain as stand-alone firms but later chose to be acquired either because they got an acquisition offer at a good valuation (which overcame their benefits from remaining as stand-alone firms), or because remaining as stand-alone firms was no longer viable (for some reason). For the arguments we make here regarding the effects of a two-stage acquisition on a firm's original exit decision to go through, the original intentions of firm insiders are unimportant. All we require is that insiders be aware, at the time of their firm's initial exit decision, that, in addition to remaining a stand-alone firm after IPO, there are various other post-IPO scenarios, such as being acquired at a higher valuation after the IPO and being delisted because their firm is no longer viable as a stand-alone public firm (and interim scenarios such as losing product market share while remaining a stand-alone firm, possibly because the firm

is unable to access the product market support from a larger acquirer which it would have been able to do in the case of a direct acquisition).

Our empirical analysis is structured as follows. Given that the choices we analyze here are in practice sequential, in the first part of our empirical analysis we estimate sequential logit regressions. The sequential logit model consists of estimating logistic regressions for each step or decision for the sample (subsample) that is relevant for making the decision. This approach consists of an additional logistic regression that estimates the likelihood of the firm choosing among the three alternatives: remain stand-alone, be acquired, or be delisted, conditional on the firm having chosen an IPO in the first stage.¹ Thus, a sequential logit model estimates the unconditional sensitivities of the likelihood of IPOs versus acquisitions as a function of firm and market characteristics, and then the likelihoods, conditional on an IPO being chosen, of remaining stand-alone, being acquired, or being delisted (within three years). In the second part of our empirical analysis, we assess the payoffs, in terms of firm valuation, associated with each of the possible exit scenarios, and compute the valuation premium a firm receives by selling in a post-IPO acquisition over a direct acquisition, and the valuation discount a firm incurs by being delisted post-IPO relative to a direct acquisition. We also investigate the determinants of the valuation premium realized by firms acquired after the IPO (two-stage acquisitions), and the valuation discount borne by firms delisted after the IPO.

We conduct our empirical analysis using a sample of European firms that were either directly acquired as private firms or chose to go public in the period 1995-2009. Among the firms that conducted an IPO, we then distinguish those that remained independent, were acquired, or were delisted within three years of the IPO. We obtain data from several databases, such as EurIPO, including information on European IPOs, to identify the population of firms going public and their characteristics; Thomson One, including information on M&A deals, to identify firms that were directly acquired as private and those that were acquired within three years of the IPO; Amadeus, on which we rely to integrate financial data for European

¹ We use a sequential logit model instead of a simultaneous choice multinomial model because multinomial logit assumes that the random errors for each choice are independent (independence of irrelevant alternatives assumption). This assumption implies that the choice between two alternatives is independent of other choices, so if one of the alternatives is removed the other alternatives will experience a proportionate increase in their probability of being chosen. This assumption does not hold in our setting because firms that decide to be directly acquired as private do not face any other subsequent choice.

private firms choosing a direct acquisition as initial exit mechanism; and I/B/E/S, from which we gather analyst coverage information about IPO firms.

The results of our empirical analysis can be summarized as follows. The first stage of our sequential logit model indicates that the viability of the firm in the product market is important in explaining the likelihood of choosing an IPO over a direct acquisition. We find that firms experiencing a greater sales growth rate and with a larger market share are more likely to choose an IPO as their initial exit mechanism, since these firms are better able to fend for themselves against product market competition and do not necessarily need the immediate support of an acquirer. Firms operating in industries characterized by the presence of a big player are less likely to go public, since they may need the help of a potential acquirer to compete successfully against the big player in the product market. Another important factor influencing a firm's initial exit choice is the extent of private benefits of control accruing to the firm's top management. We find that firms operating in industries characterized by larger private benefits of control are more likely to choose an IPO, since such benefits are likely to be lost in the case of an acquisition. Finally, since potential acquirers may be better able to correctly value the firm than the public equity market, we find that smaller firms, characterized by a greater extent of information asymmetry, are less likely to choose an IPO.

The results of the second stage of our sequential logit model of an IPO firm's likelihoods of remaining stand-alone, being acquired, and being delisted within three years of the IPO can be summarized as follows. First, firms characterized by higher viability in the product market, as proxied by higher sales growth and larger growth opportunities, are more likely to draw the attention of potential acquirers and therefore become acquisition targets. Second, firms characterized by larger private benefits of control are less likely to be acquired post-IPO. Third, firms characterized by a smaller extent of residual information asymmetry after the IPO, i.e. firms with greater analyst coverage, higher IPO oversubscription, and lower bid-ask spread, are more likely to be acquired. On the other hand, firms with lower IPO oversubscription, higher bid-ask spread, and poorer stock market performance are more likely to be delisted post-IPO. Overall, the evidence suggests that firms that are more viable in the product market and are characterized by a smaller extent of information asymmetry are more likely to choose an IPO as initial exit mechanism, and these firms are also more likely to receive a favorable acquisition bid after the IPO. This implies that if firms with such

characteristics were able to account for post-IPO considerations at the time of their initial exit decision, their propensity to choose an IPO at the initial exit stage would increase relative to the case in which the IPO vs. acquisition choice were made based on the initial trade-offs alone.

We document that two-stage acquisitions represent a valuable exit route for firms. Our propensity score matching analysis shows that firms that complete a two-stage acquisition are acquired at a valuation that is significantly higher than the one they could have obtained by choosing a direct acquisition at the initial stage. This valuation premium comes to around 44.7%. The largest fraction of this premium (26.2%) is realized at the second stage, i.e. from a firm's IPO valuation to that of the post-IPO acquisition, while the valuation premium received by a firm in an IPO over a direct acquisition is slightly lower (21.8%) but still significantly different from zero. On the other hand, firms that go public and are subsequently delisted incur an average valuation discount of 31.9% over a propensity score-matched firm choosing a direct acquisition as initial exit mechanism. We then analyze the determinants of the valuation premium and discount of two-stage acquisitions and delisted firms, relative to different benchmarks. Our Heckman selection models indicate that firms that are more viable against product market competition, and those that are characterized by a smaller extent of information asymmetry faced by either the IPO market or potential acquirers, receive higher valuation premia both at the IPO and at the subsequent acquisition. On the other hand, firms affected by a larger extent of information asymmetry incur larger valuation discounts at post-IPO delisting.

Our paper is related to several strands in the empirical and theoretical literature. The literature closest to this paper is the small literature in strategy, economics, and finance that has studied some aspects of two-stage acquisitions. For example, 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. Brau, Sutton, and Hatch (2010) document that firms acquired after going public sell at around a 20% higher valuation. 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.² Unlike the above papers which have focused on studying only some specific aspects of firms that are acquired post-IPO and comparing these with directly acquired firms, our focus here is on empirically analyzing the entirety of a

² See also Mantecon and Thistle (2011), who 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.

firm's dynamic exit decision, thereby shedding light on how the two-stage nature of this decision affects a firm's initial exit choice between IPOs and acquisitions.

The empirical literature on IPOs versus acquisitions is also related to our paper. Papers in this literature study the IPO versus acquisition of private firms as a one-time choice: see, e.g., Brau, Francis, and Kohers (2003); Poulsen and Stegemoller (2008); and Chemmanur, He, He, and Nandy (2012). Some papers in this literature document that IPOs have a valuation premium over acquisitions, and analyze the source of this valuation premium: see, e.g., Bayar and Chemmanur (2012). In contrast to this literature, our focus in this paper is on empirically analyzing how dynamic considerations arising from treating the exit decision as potentially a two-stage decision affect a firm's initial choice between IPOs and acquisitions, by quantifying the costs and benefits to firms arising from this two-stage possibility.

Finally, the theoretical literature on a firm's going public decision and its single-stage choice between IPOs and acquisitions is also indirectly related to our paper. Apart from the paper by Bayar and Chemmanur (2011) discussed in detail earlier which specifically analyzes a firm's IPO versus acquisition decision, much of the theoretical literature has focused solely on the going public decision of a firm. Chemmanur and Fulghieri (1999) theoretically analyze the choice of a firm between going public and remaining private in an asymmetrically informed equity market where outsiders can produce information about the firm. They argue that going public reduces information asymmetry since the presence of a publicly observable share price that conveys information across investors reduces the aggregate cost that outsiders need to bear to collect information about the true value of the firm, thus increasing its market value. Zingales (1995) develops a theoretical analysis suggesting that firms benefit from an increased bargaining power vis-à-vis potential acquirers after conducting an IPO.

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 IPOs and acquisitions. By explicitly accounting for the possibility that the firm may be acquired after the IPO (or not be viable as a stand-alone firm), 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 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. We also show that firms that are acquired after IPO are not necessarily those that fail as stand-alone firms after IPO: in fact, we document that firms that have better performing IPOs are the ones that are subsequently acquired, and that the valuations at which these firms are acquired are higher than those of comparable stand-alone firms. These expected benefits accruing from the possibility of being acquired after IPO at higher valuations seem to dominate the expected costs arising from the firm being unable to sustain itself as a stand-alone firm and having to be delisted at lower valuations. Overall, our evidence indicates that explicitly accounting for the benefits and costs arising from the two-stage aspects of exit decisions tends to push private firms more towards choosing an IPO rather than an acquisition as their initial exit mechanism (relative to the case where such benefits and costs arising from post-IPO scenarios other than remaining a stand-alone firm are ignored).

A secondary contribution made by this paper is to present the first European study of the exit decision: all existing studies have made use of U.S. data. Given that the value of entrepreneurial firms based in Europe is significant compared to those based in the U.S., and that the economics of the IPO versus acquisition decision may potentially be quite different in the European context, such a study using European data is long overdue. Clearly, such a study of the exit decisions of European firms will be able to shed considerable additional light on the optimal exit strategies that can be adopted by European entrepreneurs relative to the insights that can be gleaned from studies using U.S. data.

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

2. Theory and hypotheses

In this section, we outline the theoretical framework of the paper and formulate the hypotheses tested in our empirical analysis. We first discuss (in Section 2.1) the trade-offs driving a firm's choice between

IPOs and acquisitions assuming the firm ignores the possibility of being acquired or being delisted after IPO. We then discuss (in Section 2.2) the determinants of the three possible post-IPO scenarios that may face a firm after IPO, namely, remaining a stand-alone firm, being acquired post-IPO, or being delisted, based on which we develop testable hypotheses for the second stage of our sequential logit analysis. Finally (in Section 2.3), we discuss how the post-IPO scenarios (discussed in Section 2.2) affect a firm's initial trade-off between IPOs and acquisitions, based on which we develop testable hypotheses for the first stage of our sequential logit analysis.

2.1 A firm's initial trade-off between IPOs and acquisitions

While our objective in this paper is not to test any particular theoretical model, the general theoretical framework we adopt is that of Bayar and Chemmanur (2011). In their setting, an entrepreneur wants to diversify his equity holdings in a firm and exit at least partially. The entrepreneur has two options: taking the company public (IPO), or selling it to another firm (acquisition). In the first case, he can sell some of their equity holdings in the firm and raise new capital to fund its growth opportunities, while continuing to manage the firm after going public. In the case of an acquisition, the entrepreneur will divest his entire equity holdings in the firm, thereby transferring control to an acquirer. Three crucial factors drive this choice: (1) the firm's viability against product market competition; (2) the extent of the private benefits of control accruing to the firm's top management; and (3) the extent of information asymmetry faced by firm outsiders.

First, consider product market competition. The entrepreneur has private information about the viability of his 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. This implies that firms with more viable business models, as characterized by higher sales growth and greater market share, are more likely to go public rather than be acquired. On the other hand, firms operating in industries characterized by a big player (a competing firm with a dominant market share in the industry) are less likely to go public since such firms may need the help of a potential acquirer to compete successfully against the big player in the product market.

Second, entrepreneurs may derive private benefits of control from managing the firm, and these private benefits are likely to be lost in the case of an acquisition. This means that private firms operating in industries characterized by larger private benefits of control are more likely to choose an IPO rather than an acquisition. Third, 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 implies that private firms characterized by a greater extent of information asymmetry are more likely to choose an acquisition over an IPO, since they are more likely to be correctly valued by an acquirer. We measure the extent of information asymmetry by firm size, as proxied by sales. The age of a firm may also proxy for the extent of information asymmetry faced by a firm, since younger firms may face a larger extent of information asymmetry. However, the effect of age on a firm's IPO versus acquisition choice is ambiguous, since younger firms are also likely to be characterized by larger growth options.

2.2 Determinants of post-IPO scenarios

We now discuss the determinants of the three possible post-IPO scenarios. In terms of post-IPO acquisitions, if a stand-alone firm receives an acquisition bid greater than the sum of its current market value plus any private benefits of control accruing to top management, it is likely to be acquired, since current firm management is likely to agree to the acquisition in that case. If, on the other hand, a firm is unable to meet the conditions imposed by the exchange to remain listed, or top management believes that the benefits of remaining listed are outweighed by the costs of continuing to be listed, then it is likely to be delisted. Finally, if a firm is neither acquired nor delisted, it will remain a stand-alone firm.

We now analyze the determinants of a firm receiving a high enough acquisition bid to be acquired post-IPO. First, an acquirer is likely to make a bid for a stand-alone firm if the former views the operations of the latter as being synergistic with its own future product market activities and as being more successful in its own industry. This implies that firms with characterized by higher sales growth and larger growth opportunities are more likely to be acquired after IPO. The market share of a firm in the product market is also likely to play an important role in determining whether or not it receives a post-IPO acquisition bid. However, we are agnostic about the expected sign of this variable: on the one hand, acquirers may view

firms with greater market share as more attractive targets, since their synergistic value to acquirers may be greater; on the other hand, target firms themselves may be more likely to agree to be acquired if their market share is smaller, since, in this case, they may place greater value on potential help from acquirers in product market competition. Second, the private benefits of control accruing to top management may influence the likelihood of a post-IPO acquisition being consummated. For a given bid made by an acquirer and a given particular intrinsic firm value, the likelihood of a post-IPO acquisition is smaller if the private benefits of control are larger.

Third, an acquirer is more likely to make a bid for a stand-alone firm after IPO if it is easier for him to value the target firm. This means that firms characterized by a smaller extent of information asymmetry in the IPO market, as measured by larger size (proxied by sales), are more likely to be acquired. Further, information production and disclosure requirements associated with an IPO, such as the roadshow and the release of an official IPO prospectus, allow the company to reduce the information asymmetry it faces in the IPO market, which may lower the search costs faced by potential buyers, thereby increasing their willingness to pay for the target. Enhanced visibility may also allow the target to enter the feasible set of more potential buyers, stimulating competition on acquisition bids. This means that, if the target firm is affiliated with a more reputable underwriter, receives greater analyst coverage, has a more successful IPO (as proxied by the extent of IPO oversubscription), and develops greater liquidity (as proxied by the bid-ask spread), potential buyers would face a lower extent of information asymmetry. This implies that these firms are more likely to receive higher post-IPO bids, and therefore more likely to be acquired after IPO. It is also likely that if the acquirers view the firm as being undervalued at IPO relative to its intrinsic value (as measured by the Rhodes-Kropf, Robinson, and Viswanathan (2005) misvaluation measure) then it is more likely to be acquired after IPO.

We now analyze the determinants of a firm being delisted post-IPO. As we discussed earlier, a firm is likely to be delisted if it either cannot meet the requirements of the exchange to remain listed, or if top management does not assess the benefits of continuing to be listed to be greater than the costs. Firms performing more poorly in the product market (as measured by sales growth or market share) are more likely to go bankrupt and therefore be delisted. Firms facing greater information asymmetry in the equity market,

such as smaller firms (proxied by sales), are likely to have smaller trading volume, leading to a greater likelihood of being delisted. Further, since firms that had less successful IPOs are likely to face a greater residual information asymmetry (post-IPO) in the equity market, firms with lower IPO oversubscription and higher bid-ask spread are also more likely to be delisted. Firms that had a poorer performance in the financial market (as measured by excess stock returns) are also likely to attract smaller trading volume, leading to a greater likelihood of being delisted. Finally, firms with lower growth opportunities, as measured by the decomposition of their market to book ratio following Rhodes-Kropf, Robinson, and Viswanathan (2005), are also more likely to be delisted.

2.3 Implications of post-IPO scenarios on the IPO versus acquisition decision

We now discuss how the determinants of the three post-IPO scenarios discussed in Section 2.2 affect a private firm's initial choice between IPOs and acquisitions. First consider product market performance. We argued in Section 2.1 that firms with more viable business models, as captured by higher sales growth or market share, are more likely to go public. However, as we discussed in Section 2.2, such firms are also more likely to be acquired after the IPO and less likely to be delisted. This means that considerations of post-IPO scenarios by private firms at their initial exit stage are likely to make firms with more viable business models to choose an IPO over an acquisition with an even higher likelihood than if the exit choice were made based on their initial trade-offs alone.

Second, consider the magnitude of the private benefits of control accruing to the top management of a private firm at the time of initial exit. We argued in Section 2.1 that firms characterized by larger private benefits of control are more likely to choose an IPO over an acquisition. However, as we discussed in Section 2.2, such firms characterized by larger private benefits of control are less likely to agree to be acquired after the IPO. This means that considerations of post-IPO scenarios are likely to make firms characterized by larger private benefits of control choose an IPO over an acquisition with a *lower* likelihood than if the exit choice were made based on their initial trade-offs alone.

Third, consider the extent of information asymmetry faced by private firms at the time of initial exit. We argued in Section 2.1 that firms characterized by a smaller extent of information asymmetry (as measured by firm size, proxied by sales) are more likely to go public. However, as we discussed in Section

2.2, such firms are also more likely to be acquired after the IPO and less likely to be delisted. This implies that considerations of post-IPO scenarios are likely to make private firms facing a smaller extent of information asymmetry choose an IPO over an acquisition with an even higher likelihood than if the exit choice were made based on their initial trade-offs alone.

2.4 Determinants of the valuation premium

We now discuss the determinants of the valuation premium a firm may receive in a two-stage acquisition or the valuation discount it may receive at the point of delisting. We first discuss the determinants of the valuation premium in two-stage acquisitions. The valuation premium a firm receives in a two-stage acquisition over a direct acquisition can be thought of conceptually as consisting of two parts. The first part is the valuation premium a firm may receive in an IPO over an acquisition. The second part is the valuation premium a firm may receive in the post-IPO acquisition over the IPO valuation. We discuss below how each of the variables affect each of these two components and therefore the overall valuation premium of a two-stage acquisition over a direct acquisition.

First consider product market characteristics, such as the firm's growth options (as measured by sales growth) and viability in the product market (as measured by market share). As we discussed in Section 2.1, firms that are more viable against product market competition are more likely to go public rather than be acquired, given that they are more likely to be successful: i.e., firms above a certain threshold in product market viability will go public, obtaining higher valuations in the IPO market compared to the valuation of firms that are directly acquired. By the same reasoning, within the firms that exceed the threshold of product market viability for going public, firms that are likely to be stronger against product market competition are likely to obtain higher valuations. This implies that firms with more viable business models, as characterized by higher sales growth and greater market share, are likely to obtain higher valuation premia over a direct acquisition.

We turn now to the valuation premium of a post-IPO acquisition over the firm's IPO valuation. First, as we discussed in Section 2.2, a firm is likely to receive a post-IPO acquisition bid high enough to agree to the acquisition if it is viewed by potential acquirers as being synergistic with their own future product market activities and as being successful in the product market in their own industry. Further, the higher the value of

the variables that measure the above attributes, the higher the post-IPO acquisition bids such firms are likely to receive. This implies that firms characterized by greater growth opportunities (as measured by sales growth) and greater viability in the product market (as measured by market share) are likely to receive higher valuation premia over their IPO valuations. Since the valuation premium of a two-stage acquisition over a direct acquisition is the sum of the valuation premium of an IPO over a direct acquisition, and a post-IPO acquisition over IPO valuation, this valuation premium can be also expected to be increasing in the sales growth and product market share of the firm.

Second, a variable that may affect the post-IPO acquisition valuation of a firm but not its IPO valuation is the magnitude of private benefits of control accruing to firm management. As we discussed in Section 2.2, the target firm top management is likely to require a higher bid from an acquirer (for a given intrinsic firm value) to agree to the acquisition if private benefits from remaining in control are larger. This may provide target firm top management greater bargaining power and thus the ability to extract a large fraction of the gains generated from the acquisition, resulting in a higher valuation premium for such firms in a post-IPO acquisition over their IPO valuation. This will also imply a higher valuation premium of a two-stage acquisition over a direct acquisition since it is the sum of the valuation premium of an IPO over a direct acquisition, and a post-IPO acquisition over IPO valuation.

Third, we turn to the effect of the information asymmetry faced by the firm on valuation premium. As discussed in Section 2.1, firms facing a smaller extent of information asymmetry are more likely to go public rather than be directly acquired, since atomistic investors in the IPO market are less able than potential acquirers to correctly value the firm. By the same reasoning, within the set of firms meeting the information asymmetry threshold for going public, those characterized by a smaller extent of information asymmetry will receive higher IPO valuations, and therefore a larger IPO valuation premium over a direct acquisition. This implies that variables that measure information asymmetry, such as IPO underwriter reputation (higher the underwriter reputation, smaller the information asymmetry), are likely to be associated with a higher IPO valuation premium. Further, as discussed in Section 2.2, acquirers are more likely to make a post-IPO bid for firms that have gone public if it is easier for them to value potential target firms, so that firms characterized by a smaller extent of residual information asymmetry after the IPO are more likely to

receive such bids. In addition, since acquirers face a smaller extent of valuation uncertainty if the information asymmetry they face is smaller, they are likely to offer higher bids for firms for which they face a smaller extent of information asymmetry. This implies that firms characterized by higher reputation of the IPO underwriter, smaller bid-ask spread, and greater analyst coverage are likely to receive higher post-IPO acquisition premia over their IPO valuation. Finally, since the valuation premium of a two-stage acquisition over a direct acquisition is the sum of the valuation premium of an IPO over a direct acquisition, and a post-IPO acquisition over IPO valuation, this valuation premium can also be expected to increase with information asymmetry variables, namely higher underwriter reputation, smaller bid-ask spread, and greater analyst coverage. Since, as discussed in Section 2.2, firms that had a more successful IPO are also likely to receive higher post-IPO acquisition bids, the valuation premium of a post-IPO acquisition over the IPO valuation as well as over a direct acquisition will be increasing in the IPO oversubscription as well.

We turn now to the valuation discount of a post-IPO delisting over the firm's IPO valuation. As we discussed in Section 2.2, firms performing more poorly in the product market, facing greater information asymmetry in the equity market, and conducting less successful IPOs are more likely to be delisted. By the same reasoning, within this set of firms, those characterized by a lower level of product market viability (as proxied by sales growth and market share), greater information asymmetry (as proxied by underwriter reputation and bid-ask spread), and lower IPO success (in terms of IPO oversubscription) are likely to receive lower valuations and therefore to incur larger discounts relative to their previous IPO valuations. Finally, since the valuation discount of a delisted firm over a direct acquisition is the sum of the valuation premium of an IPO over a direct acquisition, and the valuation discount of a post-IPO delisting over the IPO valuation, this overall valuation discount can also be expected to be larger in presence of lower product market viability, greater information asymmetry, and lower IPO success.

3. Data, sample and variables

3.1 Data and sample selection

The data used in this study are drawn from several databases. The sample of direct acquisitions of private firms is obtained from Thomson One database. We require that the firm is based in Europe, targeted

in a M&A during the period 1995-2009, and that the deal valuation is available in Thomson One. Since a fraction of private firms lacks of adequate financial data in Thomson One, we integrate information from Amadeus and obtain a direct acquisitions sample of 4,270 private firms acquired during the period 1995-2009. The population of European IPOs is from the EurIPO database³, providing offer- and firm-level data for each firm going public in the stock exchanges of the four largest European economies (London, Euronext⁴, Frankfurt and Milan stock exchanges), except analyst coverage data which we are able to collect through I/B/E/S and Investext. To keep track of the first three years of life as a listed firm, we start from the population of 3,755 firms going public from 1995 to 2009, and obtain a final sample of 3,433 IPOs for which we have complete data.

We then identify within the sample of 3,433 IPO firms those that are acquired (two-stage acquisitions), are still operating as independent firms (stand-alone), and are delisted from the stock market (delisted) at the three-year IPO anniversary. First, we obtain a sample of 577 two-stage acquisitions, i.e. firms going public in Europe during 1995-2009 and being acquired within three years, by matching information from EurIPO with M&A deals data available in Thomson One. Second, by cross-checking Thomson One and Datastream, we define the stand-alone sample of 2,716 firms that still operate as independent firms at their three-year IPO anniversary, without having completed any M&A deal as target over the previous three years. Third, the delisted sample is composed of 140 firms being delisted (for reasons other than acquisition) within three years of their IPO, based on information from EurIPO and Datastream. Table 1 presents the annual composition of the sample. Of the 3,433 firms that went public in Europe during 1995-2009, 577 (16.8%) were acquired and 140 (4.1%) were delisted from the stock market during the first three years of life as a public company, while the largest fraction (79.1%) was operating as an independent firm three years after its IPO.

3.2 Variables

In this section, we discuss the construction and measurement of the various firm-specific and industry-specific test variables and control variables employed in our analyses. Our test variables are

³ See Vismara, Paleari, and Ritter (2012) for a description of the database (www.euripo.it).

⁴ 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.

measured at the last fiscal year before a private firm's exit choice between IPO and acquisition is made. They can be categorized as product market, private benefits, and information asymmetry variables. Product market and private benefits variables are available in the both the steps of the analysis of a firm's exit decision (IPO vs. acquisition decision, and post-IPO scenarios), while some of the information asymmetry variables, such as underwriter reputation and analyst coverage, are available only for the second step (post-IPO scenarios), i.e. for firms that choose the IPO as initial exit mechanism. Concerning product market variables, we define two proxies of firm viability against product market competition: the average annual sales growth rate up to three years prior to the initial exit decision⁵, and the firm's market share in terms of sales in its industry (three-digit SIC level). We then determine whether there is a dominant player in a firm's industry at the time of its initial exit choice by defining a big player dummy variable equal to 1 if there is a firm with a market share more than 30%⁶ in the same three-digit SIC industry. Private benefits of control are proxied by the same industry wide dummy variable used by Bayar and Chemmanur (2012), inspired by Rajan and Wulf (2006) who empirically analyze perk consumption by firm executives. Therefore, the private benefits dummy equals 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) industries⁷.

We then define a set of proxies for a firm's level of information asymmetry. First, we use firm size, measured by the logarithm of annual sales, and age, measured as the logarithm of 1 plus age in years at the exit decision. We then focus on the extent to which firms reduce information asymmetry by going public, by defining four additional proxies for firms that choose an IPO as their initial exit mechanism: (1) underwriter reputation, defined as the IPO underwriter's market share in terms of proceeds raised in European IPOs during 1995-2009; (2) analyst coverage, defined as the number of analysts covering the firm at the IPO; (3) IPO oversubscription, defined as the ratio between the number of shares demanded and the number of shares placed in the IPO; (4) bid-ask spread, defined as 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

⁵ 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. For 794 IPO firms and 1,394 direct acquisition firms there are no available financial data prior to the firm's exit decision. We therefore conduct our multivariate analyses both on the whole sample, i.e. by excluding the sales growth variable, and on the restricted sample with sales growth.

⁶ As a robustness check, we set the threshold to 25% and 35% with results remaining qualitatively unchanged.

⁷ 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.

and 2 months before acquisition or delisting. Firms affiliated with more reputable underwriters, receiving greater analyst coverage, experiencing higher IPO oversubscription, and with a lower bid-ask spread are expected to face a smaller extent of information asymmetry. We also measure the firm's performance on the financial market by computing its excess return, defined as the firm's buy-and-hold stock return over 3 years after the IPO (if it remains stand-alone) or up to 2 months before acquisition or delisting, minus the FTSE Euromid index buy-and-hold return over the same period. Finally, we decompose the market-to-book ratio of the firm implied by its offer price at the IPO into its growth opportunities and misvaluation components, following Rhodes-Kropf, Robinson, and Viswanathan (2005). These are defined as the logarithm of the ratio between the firm's intrinsic value and book value, and the firm's market value and intrinsic value, respectively⁸.

The set of control variables is constructed as follows. We include leverage, defined as the ratio of total debt to total assets, to control for the firm's capital structure. Current market conditions are proxied by market momentum and market volatility, defined as the FTSE Euromid index return and the standard deviation of daily returns, respectively, over the 100 days prior to the exit decision. We also control for the effects of SOX-like regulatory changes affecting European financial markets by defining a EU SOX dummy, equal to 1 if the firm's exit decision occurs after the introduction of a SOX-equivalent corporate governance code by one of the four European countries of our sample⁹. Since the increased costs of compliance with SOX are found to have decreased the market value of small firms (Iliev, 2010), the propensity of firms to choose an acquisition, either as initial exit mechanism or post-IPO, might have increased. Finally, we control for the presence of a venture capitalist among the IPO firm's existing shareholders by employing a dummy for VC-backed IPOs.

4. Empirical tests and results

⁸ We compute a firm's intrinsic value as in Fu, Lin, and Officer (2013, Appendix A).

⁹ The German Corporate Governance Code was introduced by the German government 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. See Akyol, Cooper, Meoli, and Vismara (2014) for details.

In this section, we present the empirical tests and results of our univariate and multivariate analyses. We first analyze the determinants of a private firm's initial exit decision between IPO and acquisition, and the likelihood of each post-IPO outcome conditioned on the firm having conducted an IPO. Then, we document the valuation obtained by firms going through each of the possible exit scenarios, and assess the benefits and costs of each exit route by computing the valuation premium (or valuation discount) with respect to different benchmarks. Finally, we analyze the determinants of this valuation premium.

4.1 Determinants of a firm's exit decision

In this section, we present our empirical results of the analysis of the determinants of a firm's exit decisions. We first conduct univariate tests on our independent variables, then we model the sequential likelihood of a firm going through each of the possible exit routes in a multivariate setting.

4.1.1 Univariate analysis

Table 2 describes the characteristics of the firms that go through each of the possible exit routes. Panel A compares the characteristics of firms choosing a direct acquisition as initial exit mechanism with those of firms choosing an IPO, while Panel B compares the characteristics of firms that, after conducting an IPO, go through each of the three possible post-IPO outcomes, i.e. being acquired (two-stage acquisition), remaining independent (stand-alone), and being delisted from the stock market (delisted) within three years of the IPO.

Panel A of Table 2 shows that private firms that initially choose an IPO instead of a direct acquisition are characterized by a higher sales growth rate (105.8% vs. 49.7%) and larger market share in their industry (1.6% vs. 0.4%). The difference between the two groups is statistically significant, in line with the prediction that more viable firms tend to prefer the IPO as initial exit mechanism. This is consistent with previous literature, such as Bayar and Chemmanur (2012) and Poulsen and Stegemoller (2008) who find that firms characterized by greater growth and larger firms are more likely to go public. The presence of a big player in the firm's industry is not significantly different between the two groups, while the fraction of firms operating in industries characterized by larger private benefits of control is significantly higher among firms that choose to go public (11.8% vs. 4.7%). This suggests that private benefits of control may increase the

likelihood of choosing an IPO over a direct acquisition. Firms that choose an IPO are on average larger than those opting for a direct acquisition (263.1 vs. 61.8 €m in sales, on average), suggesting an increased preference for IPOs of firms affected by a smaller extent of information asymmetry, that are therefore easier to value. However, IPO firms are also younger than direct acquisitions (14.8 vs. 17.1 years), and are characterized by higher leverage (27.2% vs. 24.4%). Predictably, IPOs tend to be conducted when financial market conditions are favorable, as they are associated with a better market momentum than direct acquisitions (5.2% vs. 2.2% prior market return) and a lower volatility (80.9% vs. 92.8%), on average. Finally, the fraction of firms going public after the introduction of SOX-like regulatory changes is lower compared to that of firms being directly acquired (39.6% vs. 46.6%). This suggests that the regulatory tightening might have increased the attractiveness of direct acquisitions relative to IPOs.

We now turn to the comparison of firms that choose an IPO as initial exit mechanism and go through each of the three possible post-IPO scenarios, namely two-stage acquisition, stand-alone, and delisting. Panel B of Table 2 shows that firms that are acquired after the IPO are characterized by the highest average sales growth rate (162.2%), followed by delisted (120.3%) and stand-alone firms (93.1%), suggesting that higher sales growth may increase the firm's attractiveness as a target. Stand-alone firms are the largest in terms of market share (1.8%), suggesting that the larger the market share of a firm, the lower its likelihood of either being acquired or delisted. Delisted firms have the lowest market share (0.6%), while two-stage acquisitions are in between (1%). Firms operating in industries where there is a dominant player show the highest propensity to be acquired (30.6%), while delisted firms show the lowest (7.1%), and stand-alone firms are in between (15.3%). The presence of a big incumbent in the same industry seems therefore to increase the likelihood of a post-IPO acquisition, in line with our prediction. On the other hand, the fraction of firms that are acquired post-IPO and operate in industries characterized by greater private benefits of control is smaller (8.1%) compared to stand-alone and delisted firms (12.4% and 15.9%, respectively). This is consistent with the idea that greater private benefits of control make a firm's managers less likely to accept an acquisition bid.

Concerning information asymmetry-related variables, stand-alone firms are the largest and oldest firms (298.1 €m sales and 15.3 years, on average), while firms that are delisted after the IPO are the smallest

and youngest (108.8 €m and 9.1 years). Our financial market proxies for information asymmetry tend to report the most positive values for two-stage acquisition, and the most negative values for delisted firms, with stand-alone firms being in between. On average, two-stage acquisitions exhibit the highest level of IPO underwriter reputation (1.9%), analyst coverage (2 analysts), IPO oversubscription (8.4 times), and the lowest level of bid-ask spread (4.2%). This is consistent with the idea that firms that are acquired post-IPO are those that are able to reduce information asymmetry to a greater extent by means of their success in the IPO market. On the other hand, the lowest underwriter reputation (1.2%), analyst coverage (1.2 analysts), IPO oversubscription (4.6 times), and the highest bid-ask spread (10.2%) are associated with delisted firms. The average excess stock return of two-stage acquisitions (-10.6%) is instead between the values associated with stand-alone (-6.1%) and delisted firms (-49.0%). This suggests that, while a lower extent of information asymmetry attracts acquisition bids, firms exhibiting high stock returns may become too costly for potential acquirers.

In line with the above evidence on information asymmetry, two-stage acquisitions are associated with the largest extent of growth opportunities (0.4) and the lowest extent of misvaluation (0.4), as measured by the decomposition of their market to book ratio. Delisted firms are instead characterized by the smallest amount of growth options (0.2) and the highest level of misvaluation (1.1). Finally, our control variables show that, on average, the fraction of post-EU SOX firms is similar among two-stage acquisitions and delisted firms (44.4% and 47.1%, respectively), while it is sensibly lower among stand-alone firms (38.2%). Two-stage acquisitions also have the lowest fraction of VC-backed IPOs (31.9%).

4.1.2 Multivariate analysis: sequential logit regressions

We now test whether the results of our univariate analysis of the determinants of a firm's exit decision hold in a multivariate setting as well. Table 3 reports the estimates of our sequential logit model. The first step models a private firm's likelihood of choosing an IPO over a direct acquisition on the sample of 7,703 private firms, and the second step explains the likelihood of a firm going through each of the three post-IPO scenarios, i.e. being acquired, remaining stand-alone (base outcome), and being delisted, conditioned on the firm having chosen an IPO in the first step. Since pre-exit sales growth is not available for

all the observations, we estimate the model on the whole sample by excluding the sales growth variable, and repeat the estimation in the subsample with available sales growth.

We first discuss the evidence from the first step estimation. The results show that the coefficients of our two proxies for a firm's viability in the product market, i.e. sales growth and market share, are positive and significant, consistent with our prediction that firms with more viable business models are better able to fend for themselves against product market competition, and are therefore more likely to choose an IPO over a direct acquisition as initial exit mechanism. On the other hand, less viable firms are more likely to need the support of an acquirer in order to increase their survival chances in the product market, and are therefore more oriented toward a direct acquisition. The coefficient of the big player dummy is negative and significant, which documents that firms operating in industries characterized by a dominant player are less likely to choose an IPO relative to an acquisition as initial exit mechanism. This is in line with our idea that the presence of a competing firm with a dominant market share in the industry increases a firm's likelihood of being acquired, in order to benefit from the acquirer's support in competing against the big player.

The private benefits dummy reports a positive and significant coefficient, which documents that firms operating in industries characterized by larger private benefits of control are more likely to choose an IPO relative to an acquisition. This finding supports our prediction according to which entrepreneurs or managers that derive private benefits of control from managing the firm are less likely to give up such benefits by accepting an acquisition bid.

As for the effects of information asymmetry, we find that the coefficient of the sales variable is not significant in the whole sample estimation (model 1), but becomes significant with the inclusion of sales growth (model 2). This is consistent with our theoretical argument based on the fact that atomistic investors in an IPO may be at an informational disadvantage with respect to potential acquirers. Private firms affected by a greater extent of information asymmetry are therefore more likely to choose an acquisition over an IPO, since an acquirer is better able to assess their correct valuation due to its industry expertise. On the other hand, the coefficient of firm age is negative and significant, implying that older firms are less likely to choose an IPO as initial exit mechanism, probably because younger firms embed greater growth options than older, more mature firms.

The coefficients of our control variables reveal that firms making their initial exit decision in periods of high market volatility, or after the introduction of SOX-like regulatory changes, are less likely to choose an IPO. On the other hand, leverage and market momentum are positively associated with a private firm's likelihood of conducting an IPO. Overall, the evidence from the first step estimation of our sequential logit model is broadly consistent with the predictions we formulated in Section 2.1 about a private firm's initial trade-offs between IPO and acquisition.

We now turn to the evidence of our second step estimation, by first discussing the likelihood of being acquired post-IPO (two-stage acquisition) over remaining stand-alone, which is the base outcome. The coefficient of the sales growth variable is positive and significant, revealing that IPO firms experiencing greater sales growth rates are more likely to be acquired. This supports our prediction according to which an acquirer is more willing to make a bid for firms that are perceived to be more successful in their industry and more synergistic with its own future product market activities. Market share has a negative effect on the likelihood of being acquired post-IPO, suggesting that target firms with smaller market shares may place greater value on potential help from acquirers in product market competition, although statistical evidence is weak. The presence of a dominant player in a firm's industry does not affect its post-IPO acquisition likelihood. On the other hand, the coefficient of the private benefits dummy is negative and (weakly) significant, consistent with the idea that, for a given intrinsic value of the target, the likelihood of a post-IPO acquisition decreases with the extent of private benefits of control.

Consistent with the view that, among firms that have conducted an IPO, acquirers are more likely to formulate a bid for those that imply a smaller extent of information asymmetry, the coefficient of the sales variable is positive and significant (model 2). The age coefficient is negative and significant without the inclusion of the sales growth variable (model 1), otherwise its influence disappears. The coefficients of all our proxies for the firm's residual information asymmetry after the IPO show the expected sign. In particular, greater analyst coverage, higher IPO oversubscription, and lower bid-ask spread significantly increase a newly listed firm's likelihood of completing a two-stage acquisition over remaining stand-alone. These factors significantly contribute to reduce the extent of information asymmetry faced by potential acquirers in assessing the quality of the target firm. The coefficient of the growth opportunities component of

a firm's market to book ratio is also positive and significant, suggesting that firms embedding larger growth options draw greater attention from potential acquirers. On the other hand, the coefficient of the misvaluation variable is negative and significant, since less overvalued firms are cheaper, and therefore more attractive, targets. Among our control variables, we find that more leveraged firms are more likely to be acquired, and so are firms going public after the introduction of SOX-like regulatory changes, possibly as a response to the increased compliance costs of remaining listed. On the other hand, the coefficient of the VC backing dummy is negative and significant, showing that VC-backed firms are less likely to be acquired post-IPO.

Concerning a firm's likelihood of being delisted over remaining stand-alone after the IPO, the coefficient of market share is negative and significant, consistent with the view that firms in a weaker competitive position in the product market face a greater risk of bankruptcy and, therefore, delisting. As for the effects of a firm's extent of information asymmetry, we find that firm age, analyst coverage, IPO oversubscription, and bid-ask spread variables all report significant coefficients with the expected sign. This supports our prediction that firms affected by a larger extent of residual information asymmetry after the IPO, as proxied by the above four variables, are less able to attract sufficient trading volumes and are therefore more likely to be delisted. The coefficient of the excess return variable is also negative and significant, documenting that firms with poorer stock performance in the aftermarket are more likely to be delisted. Finally, firms characterized by a smaller amount of growth opportunities are significantly more likely to be delisted. Overall, the evidence from the second step estimation is broadly consistent with the predictions we formulated in Section 2.2 about the determinants of a firm's likelihood of going through each of the three post-IPO scenarios.

In summary, the empirical evidence of our sequential logit analysis in Table 3 shows that firms with more viable business models in the product market and firms characterized by a smaller extent of information asymmetry are more likely to choose an IPO over an acquisition as an initial exit mechanism. Furthermore, this type of firms are subsequently more likely to become acquisition targets after having conducted an IPO. This means that if these firms were able to account for post-IPO considerations at the time of their initial exit decision between IPO and acquisition, their propensity to choose an IPO as initial exit mechanism would increase. The higher likelihood of receiving a favorable acquisition bid after going public,

as predicted by a higher product market viability and lower information asymmetry, would make these firms choose an IPO with a higher likelihood than if the choice were made based on their initial trade-offs alone.

4.2 Firm valuation and exit outcomes

In this section, we assess the payoffs associated with the different exit outcomes by computing the valuations of firms that go through each of the possible exit scenarios, i.e. direct acquisition or, if the firm goes public, two-stage acquisition, stand-alone, and delisting. We then assess the benefits and costs associated with each exit outcome by computing the valuation premium (or discount) received by a firm, with respect to the valuation obtained by firms in other exit alternatives.

We first assess the valuation a firm receives in each of the possible exit scenarios. When comparing the valuations of firms going through different exit routes, we need to account for self-selection in the firm's choice. Therefore, we compute the valuation premium each firm receives in a given exit scenario by estimating the valuation it could have possibly obtained in other exit scenarios. For this purpose, we use propensity score matching procedures to mitigate the selection on observable characteristics, and find for each firm in a given exit scenario a comparable firm going through an alternative scenario, as follows. First, we estimate a firm's propensity to undertake a given exit route along several dimensions (firm-specific, industry-specific and market-specific) that are predicted to determine the likelihood of an exit decision, based on our earlier empirical analysis in Section 4.1. With these propensity score values estimated by means of a logit regression, we match each firm to another firm in the alternative scenario with the closest propensity score (nearest neighbor criterion), within the same industry (two-digit SIC level) and year of exit. We then define the valuation premium (or discount, if negative) received by each firm i by computing the logarithm of the ratio between its valuation and that obtained by its propensity score-matched firm in the other scenario, in line with Bayar and Chemmanur (2012). Our valuation measure is the Enterprise Value to Sales ratio (EV/Sales).¹⁰ Valuation premium is defined as follows:

¹⁰ There are other valuation measures commonly used in literature, such as EV/EBITDA, EV/Book Value of Equity, or Tobin's Q. For many private firms, however, EBITDA and book value of equity are negative, therefore we use EV/Sales multiple to avoid estimation bias, coherent with Bayar and Chemmanur (2012). 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.

$$\text{Valuation premium}_i = \log\left(\frac{EV/Sales_i}{EV/Sales_{peer,i}}\right)$$

Table 4 shows the valuation and valuation premia associated with the different exit outcomes, which are also summarized in Figure 2. Panel A reveals that the EV/Sales implied by the takeover price of firms that are directly acquired is, on average, 1.9 (1.0 in median), and is lower than the 3.0 average EV/Sales (1.9 median) implied by the offer price of firms that decide to go public. Therefore, the average valuation received by companies choosing a direct acquisition as their initial exit mechanism is one third lower than that received by firms going through an IPO. Since, however, going public may not be a real option for all directly acquired firms, it is important to look at the valuation premium obtained by each IPO firm relative to an appropriate acquired firm having a similar propensity to go public. We find that the valuation premium of IPOs over direct acquisitions, defined as the logarithm of the ratio of the EV/Sales obtained by the IPO firm and the EV/Sales obtained by the similar acquired firm, is positive and statistically different from zero. After controlling for industry, time of exit, and other observable firm- and market-specific characteristics affecting the choice between IPOs and acquisitions, firms going public get a 21.8% higher valuation, on average, than the one they would have obtained by choosing a direct acquisition. The existence and the magnitude of our valuation premium for IPOs over acquisitions is consistent with previous literature. For instance, Brau, Francis, and Kohers (2003) find that the average takeover payoff for private firms is 78% of an IPO payoff.

Panel B of Table 4 shows the EV/Sales and the valuation premium or discount obtained by a firm that goes through each of the possible post-IPO scenarios. Firms that are acquired shortly after having conducted an IPO (two-stage acquisitions) are characterized by the highest valuations. The average EV/Sales at which these firms are acquired is 3.4 (1.8 in median). On the other hand, firms that are delisted within three years of their IPO receive the lowest valuations, with an average EV/Sales of 1.8 (0.8 in median). The valuation of firms that remain stand-alone after the IPO are in between, with an average EV/Sales of 2.5 (1.1 in median). This suggests that the benefit a firm may get from choosing an IPO as initial exit mechanism is the possibility to be subsequently acquired at a higher valuation; on the other hand, by going public the firm faces the risk of being delisted at a lower valuation.

Firms completing two-stage acquisitions are acquired post-IPO at a higher valuation than the one they previously received at the time of the IPO, as the valuation premium of two-stage acquisitions over IPOs is, on average, positive and significant at 26.2% (19.9% in median). By summing up the valuation premium obtained by choosing an IPO with that obtained by being acquired post-IPO, firms undertaking a two-stage acquisition eventually receive a 44.7% average valuation premium over their comparable firms that chose a direct acquisition as initial exit mechanism. On the other hand, the valuation of firms that end up being delisted is significantly lower than the valuation they previously obtained when going public. The valuation discount of delisted firms compared to their own valuation at the IPO is 56.2% on average (64.1% in median). By summing up the valuation premium obtained by choosing an IPO, and the valuation discount incurred for being delisted post-IPO, firms that go public and are subsequently delisted from the stock market receive a 31.9% average valuation discount relative to their comparable firms that chose a direct acquisition as initial exit mechanism.

Overall, the evidence in Table 4 documents that firms that decide to go public instead of being directly acquired at their initial exit choice can get substantial benefits but, at the same time, may face considerable costs. On one hand, the benefit of choosing an IPO as initial exit mechanism is associated with the possibility of being acquired at a significantly higher valuation than the one the firm could have obtained in a direct acquisition. On the other hand, the cost of choosing an IPO as initial exit mechanism is associated with the risk of being delisted from the stock market at a significantly lower valuation than the one the firm could have obtained by being directly acquired. Therefore, with respect to the direct acquisition scenario, two-stage acquisitions are a valuable exit route, while firms that initially decide to go public but end up being delisted are worse off.

4.3 Determinants of the valuation premium

In this section, we provide evidence of the univariate and multivariate tests of the empirical predictions formulated in Section 2.4 about the determinants of the valuation premium obtained by firms undertaking a two-stage acquisition, and the determinants of the valuation discount associated with firms that go public and are subsequently delisted. We focus on two-stage acquisitions and delistings because these represent the main benefits and costs, i.e. the positive and negative outcomes, faced by a firm who decides to

go public at its initial exit stage. Remaining a stand-alone firm after the IPO can be considered neither a cost, as it may prove the firm's ability to survive independently, nor a benefit, as it may be a consequence of the firm's inability to find an acquirer.

In order to address sample selection bias that may arise due to unobservable factors, we investigate the cross-sectional determinants of valuation premium by using a two-stage Heckman selection model. This allows to control for the existence of unobservable factors, such as private information of firm insiders about the intrinsic quality of their firm, that simultaneously affect both the probability of a firm self-selecting its treatment (exit choice) and the treatment outcome (valuation premium). The procedure consists in a first stage logit regression model predicting each firm's probability to undertake a given exit outcome, which determines the inverse Mills ratios. The independent variables in the first stage are the same as those used in the sequential logit model in Table 3. The inverse Mills ratios calculated for each firm in the first stage capture unobservable information affecting both the firm's exit choice and the valuation premium it receives. In the second stage, we then regress valuation premium on a set of independent variables that include the observable covariates used in the sequential logit model and the inverse Mills ratios obtained in the first stage.

We first explain the determinants of the valuation premium obtained by firms choosing an IPO as initial exit mechanism over those opting for a direct acquisition. Second, we analyze the determinants of the valuation premium of firms acquired post-IPO (two-stage acquisitions) over two benchmarks, i.e. IPOs and direct acquisitions. Third, we analyze the valuation discount of firms delisted post-IPO, again with reference to IPOs and direct acquisitions. Fourth, we complete our analysis by examining the valuation premium of two-stage acquisitions and the valuation discount of delisted firms using an alternative benchmark, i.e. firms that go public and remain stand-alone.

4.3.1 Valuation premium of IPOs over direct acquisitions

Table 5 reports the results of the univariate and multivariate tests on the valuation premium of the sample of IPOs. The univariate analysis shows the average and median values of the valuation premium of IPOs over direct acquisitions, defined as the logarithm of the ratio of the EV/Sales of a firm choosing an IPO

(implied by the offer price) over the EV/Sales of a propensity score-matched firm in a direct acquisition (implied by the takeover price), by distinguishing IPOs that have a below- and above-median value of the variables reported in rows.¹¹ In the multivariate analysis (Heckman procedure), the first step models the likelihood of firms choosing an IPO on the sample of all private firms facing an exit decision, and the second step explains the cross-sectional variation of valuation premium obtained by firms choosing the IPO as initial exit mechanism. All independent variables are measured at the last fiscal year before the exit decision.

The univariate analysis reveals that firms with greater sales growth and lower market share benefit from a significantly higher premium. While the evidence of the sales growth variable is consistent with the view that more viable firms receive higher valuations, the effect of market share is not. One could argue that higher valuations are recognized to firms with lower market share because these have more room for growth within their industry. Firms with larger sales and affiliated with more reputable underwriters also receive a significantly higher premium, supporting the role of size and underwriter reputation as mechanisms to reduce the amount of information asymmetry associated with the firm.

We now discuss the results of our multivariate analysis. Evidence from the first step, modeling a firm's likelihood of going public, is broadly consistent with the previous results of the sequential logit model. The main focus of this analysis is the second step estimation, which reports that the coefficients of the sales growth and market share variables are positive and significant. This provides support to the prediction that, within firms that exceed a certain threshold of product market viability required to go public, those that are likely to be stronger in product market competition obtain higher valuations. The presence of a dominant player in the firm's industry, which was previously found to negatively affect the likelihood of going public, does not exert any influence on the valuation premium of IPOs over direct acquisitions.

The valuation premium received by IPO firms decreases with firm size, consistent with the result of the univariate analysis. Information asymmetry-based explanations would predict that larger firms, that are associated with a lower extent of information asymmetry faced by potential acquirers, receive higher valuation, in contrast with the above evidence. On the other hand, smaller firms may be perceived as those

¹¹ We exclude the private benefits dummy from the second step estimation as we do not have any theoretical motivation to hypothesize an influence on valuation premium. IPO oversubscription is also excluded as it may be endogenously determined with the valuation premium.

embedding greater growth opportunities, which may lead to a higher valuation premium in an IPO. The coefficient of the reputation of the firm's IPO underwriter is positive and significant, implying that firms whose IPOs are backed by more reputable underwriters realize a higher valuation premium. This provides support to the idea that underwriter reputation is an effective mechanism to reduce the extent of information asymmetry a potential acquirer may face in considering the IPO firm as target. Among our control variables, market volatility shows a negative and significant coefficient, documenting that firms going public during turbulent periods tend to receive lower valuation premia over direct acquisitions. Finally, the Mills ratio is not significant, suggesting that there may not be significant unobservable factors which affect both a private firm's decision between IPO and acquisition and its IPO valuation premium.

4.3.2 Valuation premium of two-stage acquisitions over IPOs and direct acquisitions

We now turn to discuss the estimates of the determinants of the valuation premium received by firms going public and being subsequently acquired (two-stage acquisitions) with respect to two different benchmarks: (1) their own valuation at the time of the IPO; (2) the valuation of their propensity score-matched firm choosing a direct acquisition as initial exit mechanism. We first discuss the evidence of the univariate and multivariate analyses of valuation premium of post-IPO acquisitions over IPOs, as reported in Table 6. The sample is composed of firms that go public and are subsequently acquired (within three years), and the dependent variable is valuation premium defined as the logarithm of the ratio of the EV/Sales at which the firm is acquired after the IPO (implied by the takeover price) over the EV/Sales at which the firm previously went public (implied by the offer price). All independent variables are measured at the IPO.

The results of the univariate analysis show that product market-related factors do not exert significant effects on the valuation premium a firm receives from its IPO to a post-IPO acquisition. Firms that have above median value of these product market variables are characterized by a valuation premium that is not statistically different from that obtained by firms with a below median value. On the other hand, underwriter reputation seems to play a role. Firms whose IPO is backed by an underwriter with higher reputation receive an average valuation premium at the post-IPO acquisition of 34.3% (27.5% in median) over their previous IPO valuation, while this decreases to 17.8% (15.4%) in case of low reputation underwriters. Similarly, firms with more successful IPOs in terms of oversubscription are acquired at an

average 42.1% premium (33.8% median) over their IPO valuation, compared to the 10.3% (12.8%) premium realized by firms with less successful IPOs. Consistent with the idea that firms facing greater growth options receive higher valuations, firms with an above median growth opportunities component of their market to book ratio are characterized by an average 37.5% valuation premium (27.9% median), as opposed to the 14.9% (9.5%) of firms with a below median value of growth opportunities. The extent of firm misvaluation is also found to positively affect valuation premium, while market volatility and the introduction of SOX-like regulatory changes exert a negative impact.

We now turn to the discussion of the evidence of the multivariate analysis in Table 6, where we keep controlling for selectivity bias by using a two-step Heckman procedure. The coefficient of the sales growth variable is positive and significant, documenting that firms experiencing greater sales growth realize higher valuation premia from their IPO to subsequent acquisitions. This is consistent with the idea that firms are likely to receive higher post-IPO acquisition bids if they are viewed by potential acquirers as being successful in the product market in their industry. The coefficient of the private benefits dummy is instead not significant, suggesting that the firm top management does not require a significantly higher bid from an acquirer (for a given intrinsic firm value) to agree to the acquisition. Concerning our information asymmetry proxies, we find that the coefficients of the analyst coverage, IPO oversubscription, and bid-ask spread variables are all significant with the expected sign. Therefore, firms experiencing greater analyst coverage, higher IPO oversubscription, and lower bid-ask spread receive higher valuation premia, consistent with the view that acquirers are likely to make higher bids for firms for which they face a smaller extent of information asymmetry.

We now turn to the analysis of the determinants of the valuation premium of two-stage acquisitions over direct acquisitions. Table 7 reports the evidence of our univariate and multivariate analysis. The sample is still composed of two-stage acquisitions, i.e. firms going public and being subsequently acquired (within three years), while the valuation premium is defined as the logarithm of the ratio of the EV/Sales at which a firm is acquired after the IPO over the EV/Sales at which a propensity score-matched firm is acquired in a direct acquisition. It can also be viewed as the sum of the valuation premium obtained by a firm at its IPO

over a direct acquisition, and the valuation premium obtained by the same firm in a post-IPO acquisition over its previous IPO valuation.

Predictably, the evidence of the univariate analysis confirms the effects of a firm's product market viability and information asymmetry on the two components of the valuation premium (IPOs over direct acquisitions, and post-IPO acquisitions over IPOs), as previously documented. Specifically, firms with higher sales growth are acquired post-IPO at higher valuation premia over direct acquisitions. The presence of a big player also plays a role, since firms operating in such industries receive lower premia (36.8% on average) compared to those obtained by firms in other industries (48.5%). Firms with smaller sales are associated with a larger valuation premium over direct acquisitions, while the positive effects of IPO oversubscription, growth opportunities, and misvaluation persist. Among the control variables, higher market volatility and the introduction of SOX-like regulatory changes still negatively influence a firm's valuation premium in its post-IPO acquisition over a direct acquisition.

We now discuss the evidence of the multivariate analysis in Table 7. Since both the valuation premium of IPOs over direct acquisitions and that of post-IPO acquisitions over IPOs increase with a firm's sales growth rate, also the valuation premium of two-stage acquisitions over direct acquisitions is found to increase with sales growth. This confirms that post-IPO acquirers make higher acquisition bids for firms that are more successful in the product market. The coefficient of the big player dummy is negative and significant (model 2), documenting that the valuation premium is lower for firms operating in industries characterized by the presence of a dominant player. As opposed to what suggested by the univariate analysis, the coefficient of the sales variable is not significant. This documents that the valuation premium a firm receives by being acquired after going public over being directly acquired at the initial stage is not affected by its size. As expected, our proxies for the residual information asymmetry faced by potential acquirers after the IPO, namely analyst coverage, IPO oversubscription, and bid-ask spread all have significant coefficients. Firms able to reduce information asymmetry to a greater extent by going public receive more favorable acquisition bids after the IPO.

The empirical analysis conducted so far also allows to assess whether the effects of product market viability and information asymmetry on valuation premium of two-stage acquisitions are stronger influence

at the initial exit mechanism, i.e. in an IPO, or at the second stage scenario, i.e. in a post-IPO acquisition. A comparison of the evidence in Tables 5 and 6 reveals that the valuation premium associated with more viable firms in the product market, as proxied by sales growth, is realized both at the IPO and at the post-IPO acquisition stage. This means that a higher product market viability is rewarded both by public investors in an IPO and by acquirers in a post-IPO bid. The positive effect of market share is instead in place at the IPO, but not in the post-IPO acquisition. Concerning the effects of a firm's level of information asymmetry on its valuation premium, we find that the value-enhancing effect of underwriter reputation is entirely consummated at the IPO. On the other hand, the effect of analyst coverage comes into play at the time the firm is acquired after the IPO. Therefore, hiring a reputable underwriter is an effective mechanism to raise the valuation of the firm at the initial exit decision, while greater analyst coverage helps to raise the valuation of the firm in a post-IPO acquisition bid.

In summary, the results of our empirical analysis on the valuation premium of two-stage acquisitions over IPOs and direct acquisitions support the predictions of our hypotheses on the effects of a firm's product market viability and information asymmetry.

4.3.3 Valuation discount of delisted firms relative to IPOs and direct acquisitions

We now turn to discuss the estimates of the determinants of the valuation discount received by firms going public and being subsequently delisted with respect to two benchmarks: (1) their own valuation at the time of the IPO; (2) the valuation of their propensity score-matched firm choosing a direct acquisition as initial exit mechanism. We first discuss the evidence of the univariate and multivariate analyses of valuation discount of delisted firms over IPOs, as reported in Table 8. The sample is composed of delisted firms, i.e. firms going public and being subsequently delisted (within three years), and the dependent variable is valuation discount, defined as the logarithm of the ratio of the EV/Sales of a firm two months prior to delisting over the EV/Sales at which the same firm previously went public (implied by the offer price). All independent variables are measured at the IPO.

The univariate analysis in Table 8 reveals that delisted firms with below median market share in their industry are on average associated with a larger valuation discount from their IPO valuations (-105.6%)

compared to firms with above median market share (-9.4%). The difference in the average valuation discount is even larger between firms that operate in an industry where there is a dominant player (-201.1%) and firms in other industries (-46.3%). Consistent with the notion that firms characterized by a lower level of information asymmetry tend to receive better valuations, delisted firms with lower bid-ask spread are associated with a significantly smaller discount (-10.4%) than firms with a higher bid-ask spread (-95%), on average.

We now discuss the evidence of the multivariate analysis in Table 8. The results of the univariate analysis concerning the effects of a firm's market share and the presence of a big player in its industry do not hold in a multivariate setting. Product market-related variables seem indeed to be unimportant in explaining the cross-sectional variation of the valuation discount borne by delisted firms over their previous IPO valuation. What seems to drive the extent of the valuation discount is the firm's residual level of information asymmetry post-IPO, as documented by the significant coefficient of the bid ask spread variable. Consistent with the univariate tests, firms affected by higher information asymmetry, as characterized by a higher bid-ask spread, incur a larger valuation discount.

We now turn to the analysis of the determinants of the valuation discount of delisted firms over direct acquisitions. Table 9 reports the evidence of our univariate and multivariate analysis. The sample is still composed of firms that go public and are subsequently delisted, while the valuation discount is defined as the logarithm of the ratio of the EV/Sales of a firm two months prior to delisting over the EV/Sales at which a propensity score-matched firm is acquired in a direct acquisition. It can also be viewed as the sum of the valuation premium obtained by the firm at the IPO over a direct acquisition, and the valuation discount incurred by the firm at the post-IPO delisting over its previous IPO valuation.

The univariate analysis shows that the presence of a big player in a firm's industry plays a role on its valuation discount. Firms operating in industries characterized by a big player report an average discount of -231.7%, much larger than the -17.4% discount associated with firms operating in all other industries. The results also show that, on average, delisted firms with an above median level of market share and those operating in industries characterized by greater private benefits of control receive a positive valuation premium over direct acquisitions (25.6% and 33.3%, respectively) as opposed to the negative discount

associated with firms with lower market share and private benefits (-89.3% and -43.2%). Consistent with the prediction that firms characterized by a larger extent of information asymmetry receive larger discounts, we find that firms affiliated with a highly (above median) reputable IPO underwriter, receiving greater analyst coverage, and with a lower bid-ask spread are associated with a positive valuation premium, while other delisted firms incur a discount.

We now discuss the evidence of the multivariate analysis in Table 9. The coefficient of the sales growth variable is negative and significant, implying that firms with higher pre-IPO sales growth rates suffer from a larger valuation discount over direct acquisitions. We interpret this finding with the fact that a firm characterized by greater sales growth at the time of its initial exit decision could have obtained a relatively high valuation in a direct acquisition. This results in a larger discount when the above valuation is then compared to the one the firm gets at the time of its post-IPO delisting. Further, the coefficient of the bid-ask spread variable is negative and significant, supporting the notion that firms facing a larger residual extent of information asymmetry, as proxied by a higher level of bid-ask spread, are affected by a larger discount. Firms with a higher leverage are instead characterized by a smaller valuation discount.

In summary, the results of our empirical analysis on the valuation discount of delisted firms over IPOs and direct acquisitions support the predictions of our hypotheses on the effects of a firm's information asymmetry, while we do not find evidence in support of our product market viability predictions.

4.3.4 Stand-alone firms as an alternative benchmark

In this section, we complete our analysis of the determinants of valuation premium by adopting a different benchmark, i.e. stand-alone firms. We therefore compare the valuation of a firm that is acquired post-IPO (two-stage acquisition) and of a delisted firm with that of a propensity score-matched firm that goes public and remains stand-alone. While our previous analysis of the valuation premium of two-stage acquisitions and delisted firms versus IPOs implies a comparison of the same firm's valuation at different points in time (e.g., at the post-IPO acquisition and at the IPO), potentially raising concerns about changing market conditions and other factors that may play a role in the meantime, we now compare firm valuations at the same point in time. We therefore compute (1) the valuation premium of two-stage acquisitions over

stand-alone firms, defined as the logarithm of the ratio of the EV/Sales at which a firm is acquired post-IPO (implied by the takeover price) over the EV/Sales of a propensity score-matched stand-alone firm at the day of the acquisition; (2) the valuation discount of delisted firms over stand-alone firms, defined as the logarithm of the ratio of the EV/Sales of a firm two months prior to delisting over the EV/Sales of a propensity score-matched stand-alone firm in the same day.

Table 10 reports the results of the multivariate estimation. We first discuss the left-hand side of the table, where the dependent variable is the valuation premium of two-stage acquisitions over stand-alone firms. The coefficient of the sales growth variable is positive and significant, again supporting the idea that firms that are more successful in the product market receive larger premia. Also the effect of a firm's level of information asymmetry is still in place, with firms conducting more successful IPOs, as proxied by IPO oversubscription, and characterized by a lower bid-ask spread being associated with a higher valuation premium. Overall, the evidence is consistent with that obtained by using the same firm's valuation at the IPO as benchmark, and supports the predictions of our hypotheses on the effects of a firm's product market viability and information asymmetry on valuation premium.

We now turn to the discussion of the results of the analysis of valuation discount incurred by delisted firms over stand-alone firms. Different from the evidence of the previous analysis using the same firm's IPO valuation as benchmark, the coefficient of the market share variable is negative and significant. This is consistent with the idea that firms with a lower product market viability, as proxied by their market share, tend to suffer from larger discounts. Further, the coefficient of underwriter reputation is positive and significant, suggesting that the extent of information asymmetry that is reduced by affiliating with a reputable underwriter still alleviates the valuation discount suffered by delisted firms. Finally, the bid-ask spread variable is again an important predictor of the extent of the valuation discount associated with delisted firms, as pointed out by its negative and significant coefficient. Overall, the evidence is consistent with that obtained by using the same firm's valuation at the IPO as benchmark, and offers some additional evidence on the determinants of the valuation discount. Again, the predictions of our hypotheses on the effects of a firm's product market viability and information asymmetry on valuation discount find support.

5. Conclusions

This paper develops empirical predictions on a firm's dynamic choice between IPO and acquisition by accounting for post-IPO considerations, such as the possibility of being acquired shortly after the IPO at a higher valuation (two-stage acquisition), or the risk of being delisted at a lower valuation. While the IPO vs. acquisition decision has been traditionally modeled as a dichotomous, one-time choice, we investigate how such dynamic considerations can alter the initial IPO vs. acquisition trade-off. Using a European sample, we analyze the determinants of a private firm's likelihood of choosing an IPO over an acquisition as initial exit mechanism, and the likelihood of being acquired, remaining stand-alone, or being delisted conditioned on the firm having conducted an IPO. Product market viability, private benefits of control, and information asymmetry are three important factors in explaining a private firm's exit decision. Firms characterized by higher viability against product market competition, larger private benefits of control accruing to top management, and smaller extent of information asymmetry are more likely to choose an IPO over a direct acquisition as initial exit mechanism. Further, higher product market viability and lower information asymmetry also increase a firm's likelihood of being acquired shortly after having conducted an IPO, and decrease the likelihood of delisting post-IPO.

In terms of valuation, our propensity score matching analysis reveals that firms that go public and are subsequently acquired sell at a 44.7% premium, on average, over the valuation they could have obtained in a direct acquisition. The largest fraction of this gain is realized by the firm at the second stage, i.e. from its IPO to the time of the subsequent acquisition. On the other hand, delisted firms incur an average valuation discount of 31.9% compared to a direct acquisition. We also test several predictions regarding the determinants of the valuation premium received by two-stage acquisitions, and of the valuation discount incurred by delisted firms. We find that, among firms that are acquired post-IPO, those characterized by higher product market viability and lower residual information asymmetry faced by potential acquirers receive higher valuation premia over their previous IPO valuations, and over propensity score-matched firms in direct acquisitions and stand-alone firms. On the other hand, delisted firms affected by a higher level of information asymmetry suffer from larger valuation discounts. Overall, our evidence implies that considerations of post-IPO scenarios by private firms at their initial exit stage are likely to make firms with a

more viable business model and a lower level of information asymmetry to choose an IPO over an acquisition with an even higher likelihood than if the exit choice were made based on their initial trade-offs alone.

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Table 1. Yearly distribution of direct acquisitions, two-stage, stand-alone, and delisted firms. 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 1995-2009. Data are from EurIPO and Thomson One Banker databases.

	IPO firms				Private firms
	No. IPOs	Two-stage	Stand-alone	Delisted	Direct acquisitions
1995	78	21	56	1	277
1996	206	37	162	7	263
1997	200	33	156	11	245
1998	251	47	199	5	329
1999	333	54	269	10	361
2000	535	87	417	31	410
2001	180	21	154	5	293
2002	107	11	91	5	184
2003	81	7	70	4	180
2004	275	42	207	26	281
2005	393	72	306	15	330
2006	389	68	314	7	371
2007	331	63	267	1	395
2008	53	9	42	2	263
2009	21	5	6	10	88
Total	3,433	577	2,716	140	4,270

Table 2. Summary statistics and univariate tests by exit outcome. Summary statistics and univariate tests for firms that go through each of the possible exit outcomes. Panel A refers to the first step of a firm's exit decision (IPO vs. direct acquisition): Direct acquisitions are 4,270 private firms acquired during 1995-2009; IPOs are 3,433 firms going public during 1995-2009. Panel B refers to the second step of a firm's exit decision (post-IPO scenarios): Two-stage acquisitions are 577 IPOs acquired within 3 years; Stand-alone are 2,716 independent firms at the 3-year IPO anniversary; Delisted are 140 firms delisted within 3 years of the IPO. All variables are measured at the IPO vs. acquisition decision. *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 (it is available for 2,876 direct acquisitions and 2,639 IPOs); *Market share* is the firm's market share in terms of sales in its 3-digit SIC industry; *Big player* is a dummy equal to 1 if a company in the firm's industry (3-digit SIC level) has a market share of 30% or more; *Private benefits* is a dummy equal to 1 for firms operating in industries with 2-digit SIC codes of 13 (oil & gas production), 28 (chemicals and allied products), 29 (oil refining), and 37 (transportation equipment), based on the classification by Rajan and Wulf (2006); *Sales* is last fiscal year sales; *Age* is firm age in years; *Underwriter reputation* is the lead underwriter market share in terms of proceeds raised in European IPOs during 1995-2009; *Analyst coverage* is the number of analysts covering the firm at the IPO; *IPO oversubscription* is the ratio between the number of shares demanded and the number of shares allocated; *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 acquisition/delisting; *Excess return* is the firm's buy-and-hold stock return over 3 years after IPO or up to 2 months before acquisition/delisting, minus the Euromid index buy-and-hold return over the same period; *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; *Leverage* is last fiscal year total debt to total assets; *Market momentum (volatility)* is the FTSE Euromid index return (standard deviation of daily returns) over the 100 days prior to IPO/acquisition; *EU SOX* is equal to 1 for IPOs/acquisitions occurring after the introduction of SOX-like regulatory changes (from Q2 2002 onwards); *VC backing* is equal to 1 for venture capital-backed IPOs. All monetary values are in real terms. Tests for the difference in means (t-test) and medians (Wilcoxon-Mann-Whitney test) are between Direct acquisitions and IPOs in the first step, and from the Stand-alone group in the second step. ***, **, and * indicate significance at the 1, 5, and 10 percent levels respectively.

<i>Panel A. First step (IPO vs. direct acquisition)</i>	Direct acquisitions (4,270)		IPOs (3,433)		Difference IPOs - Direct Acq.	
	<i>average</i>	<i>median</i>	<i>average</i>	<i>median</i>	<i>average</i>	<i>median</i>
Sales growth (%)	49.7	11.3	105.8	50.4	56.1***	39.1***
Market share (%)	0.4	0.0	1.6	0.1	1.2***	0.1***
Big player (%)	15.9	0.0	17.5	0.0	1.6	0.0
Private benefits (%)	4.7	0.0	11.8	0.0	7.1***	0.0***
Sales (€m)	61.8	11.3	2633.1	14.8	201.3***	3.5**
Age (years)	17.1	11.0	14.8	7.0	-2.3***	-4.0***
Leverage (%)	24.4	23.0	27.2	16.8	2.8**	-6.2***
Market momentum (%)	2.2	3.2	5.2	4.4	3.0***	1.2***
Market volatility (%)	92.8	80.7	80.9	74.5	-11.9***	-6.2***
EU SOX (%)	46.6	0.0	39.6	0.0	-7.0**	0.0**

<i>Panel B. Second step</i> <i>(post-IPO scenarios)</i>	Two-stage acquisitions (577)		Stand-alone (2,716)		Delisted (140)		Difference Two-stage - Stand-alone		Difference Delisted - Stand-alone	
	<i>average</i>	<i>median</i>	<i>average</i>	<i>median</i>	<i>average</i>	<i>median</i>	<i>average</i>	<i>median</i>	<i>average</i>	<i>median</i>
	Sales growth (%)	162.2	50.3	93.1	49.2	120.3	70.1	69.1***	1.1	27.2
Market share (%)	1.0	0.0	1.8	0.1	0.6	0.0	-0.8**	-0.1	-1.2	-0.1
Big player (%)	30.6	0.0	15.3	0.0	7.1	0.0	15.3***	0.0***	-8.2	0.0
Private benefits (%)	8.1	0.0	12.4	0.0	15.9	0.0	-4.3***	0.0***	3.5	0.0
Sales (€m)	135.7	23.4	298.1	13.5	108.8	5.6	-162.4	9.9***	-189.3	-7.9**
Age (years)	13.7	6.0	15.3	7.0	9.1	5.0	-1.6	-1.0**	-6.2*	-2.0***
Underwriter reputation (%)	1.9	0.7	1.4	0.4	1.2	0.3	0.5***	0.3***	-0.2	-0.1
Analyst coverage	2.0	2.0	1.7	1.0	1.2	1.0	0.3***	1.0**	-0.5***	0.0***
IPO oversubscription	8.4	4.6	7.0	3.9	4.6	2.2	1.4***	0.7***	-2.4**	-1.7***
Bid-Ask spread (%)	4.2	2.9	5.0	2.7	10.2	5.0	-0.8**	0.2**	5.2***	2.3***
Excess return (%)	-10.6	-20.6	-6.1	-31.6	-49.0	-60.0	-4.5	11.0***	-42.9*	-28.4***
Growth opportunities Ln(V/B)	0.4	0.4	0.3	0.3	0.2	0.2	0.1***	0.1***	-0.1***	-0.1***
Misvaluation Ln(M/V)	0.4	0.1	1.0	0.7	1.1	1.0	-0.6***	-0.6***	0.1	0.3**
Leverage (%)	30.1	20.4	26.6	15.7	27.7	18.1	3.5**	4.7***	1.1	2.4
Market momentum (%)	5.1	4.5	5.2	4.4	4.8	3.9	-0.1	0.1	-0.4	-0.5
Market volatility (%)	79.9	74.0	81.2	74.9	79.4	71.0	-1.3	-0.9	-1.8	-3.9
EU SOX (%)	44.4	0.0	38.2	0.0	47.1	0.0	6.2***	0.0***	8.9	0.0
VC backing (%)	31.9	0.0	38.5	0.0	42.9	0.0	-6.6***	0.0***	4.4	0.0

Table 3. Sequential logit analysis of the determinants of a private firm's exit outcome. Sequential logistic regression analysis of a private firm's exit outcome. In the first step, the dependent variable equals one if the firm goes public (3,723 firms) and zero if it is directly acquired as private (4,270 firms) during 1995-2009; in the second step, the dependent variable is categorical and identifies the three possible post-IPO outcomes (two-stage, stand-alone, delisting, with stand-alone being the base outcome) among firms that previously decided to go public. Independent variables are defined in Table 2. Sales is logarithm of the firm's last fiscal year sales, and age is 1 plus the log of firm age (in years). Sales growth is available for 2,876 direct acquisitions and 2,639 IPOs. Year and industry fixed effects are included. Heteroskedasticity corrected clustered robust z-statistics are in brackets. ***, **, and * represent statistical significance at the 1, 5, and 10 percent levels, respectively.

	(1)			(2)		
	First step	Second step		First step	Second step	
	IPO vs. direct acquisition	Two-stage vs. stand-alone	Delisting vs. stand-alone	IPO vs. direct acquisition	Two-stage vs. stand-alone	Delisting vs. stand-alone
Sales growth				0.24*** (11.02)	0.21*** (6.00)	0.07 (0.89)
Market share	0.07*** (5.46)	-0.02* (-1.70)	-0.03** (-2.11)	0.06*** (5.44)	-0.02 (-1.22)	-0.02* (-1.88)
Big player	-0.18** (-2.10)	0.05 (0.30)	-1.01* (-1.71)	-0.22** (-2.41)	0.21 (1.03)	-1.04 (-1.42)
Private benefits	1.21*** (10.86)	-0.36* (-1.82)	0.22 (0.59)	1.27*** (10.59)	-0.48* (-1.95)	0.33 (0.77)
Sales	0.02 (1.18)	0.04 (1.14)	-0.01 (-0.18)	0.09*** (5.11)	0.14*** (3.28)	-0.07 (-0.66)
Age	-0.50*** (-13.78)	-0.24*** (-3.69)	-0.32* (-1.92)	-0.20*** (-4.63)	-0.10 (-1.04)	-0.32 (-1.46)
Underwriter reputation		0.05 (1.48)	0.06 (0.76)		0.02 (0.67)	0.10 (1.07)
Analyst coverage		0.21*** (3.46)	-1.24** (-1.98)		0.14*** (2.80)	-0.96 (-1.54)
IPO oversubscription		0.02** (2.57)	-0.06* (-1.91)		0.02** (2.41)	-0.05* (-1.66)
Bid-ask spread		-4.08*** (-3.20)	4.10*** (3.27)		-4.32*** (-2.88)	4.03*** (3.12)
Excess return		-0.05 (-1.31)	-0.84*** (-3.28)		-0.07 (-1.50)	-1.00*** (-3.34)
Growth opportunities		3.69*** (8.39)	-5.67*** (-4.33)		3.45*** (7.30)	-5.12*** (-3.61)
Misvaluation		-0.97*** (-6.04)	0.08 (0.71)		-1.01*** (-5.30)	0.13 (1.02)
Leverage	0.51*** (2.96)	0.69*** (3.53)	-0.11 (-0.29)	0.39* (1.73)	0.80*** (3.44)	0.26 (0.63)
Market momentum	0.01*** (4.38)	-0.01 (-0.92)	-0.01 (-0.76)	0.02*** (5.32)	-0.01 (-1.42)	-0.00 (-0.13)
Market volatility	-0.59*** (-6.49)	-0.31 (-1.11)	-0.67 (-1.39)	-0.76*** (-7.30)	0.03 (0.10)	-0.86 (-1.59)
EU SOX	-0.21*** (-3.49)	0.37*** (2.77)	-0.05 (-0.18)	-0.42*** (-6.19)	0.50*** (3.20)	0.07 (0.22)
VC backing		-0.33*** (-2.65)	0.28 (1.00)		-0.38*** (-2.68)	0.20 (0.64)
Constant	0.46* (1.69)	-2.24*** (-3.70)	0.86 (0.52)	-1.53*** (-4.65)	-4.73*** (-5.60)	0.95 (0.51)
Wald Chi-squared		463.6			377.0	
Observations		7,703			5,515	

Table 4. Valuation and valuation premium (discount) of a private firm's exit outcomes. Valuation is measured as the enterprise value to sales ratio (EV/Sales), where enterprise value is implied by the takeover price for direct acquisitions; implied by the offer price for IPOs; implied by the post-IPO takeover price for two-stage acquisitions; and measured two months prior to delisting date for delisted firms. Valuation premium is defined as the logarithm of the ratio between the EV/Sales of a firm that went through the first reported outcome (e.g., IPO) and a comparable firm that went through the second reported outcome (e.g., Direct acquisition), found using propensity score matching. In case of valuation premium with respect to IPOs, the denominator is the same firm's EV/Sales at the time of IPO (implied by the offer price). Tests are on the difference in means (t-test) and medians (Wilcoxon-Mann-Whitney test) from zero. ***, **, and * represent statistical significance at the 1, 5, and 10 percent levels, respectively.

<i>Panel A. First step (IPO vs. direct acquisition)</i>	<i>average</i>	<i>median</i>
Valuation of Direct acquisitions	1.9	1.0
Valuation of IPOs	3.0	1.9
Valuation premium IPO vs. Direct acquisition (%)	21.8***	23.2***
<i>Panel B. Second step (post-IPO scenarios)</i>		
Valuation of Two-stage acquisitions	3.4	1.8
Valuation of Stand-alone firms	2.5	1.1
Valuation of Delisted firms	1.8	0.8
Valuation premium of two-stage acquisitions (%)		
vs. IPOs	26.2***	19.9***
vs. Direct acquisitions	44.7***	38.2***
Valuation discount of delisted firms (%)		
vs. IPOs	-54.9***	-74.2***
vs. Direct acquisitions	-31.9**	-43.3**

Table 5. Valuation premium of IPOs versus direct acquisitions. Univariate and multivariate analysis of the determinants of valuation premium of an IPO over a direct acquisition on the sample of 3,433 IPOs. The left-hand side of the table reports the mean and median (in brackets) values of valuation premium of IPOs over direct acquisition by splitting the sample of IPOs above and below median values of the variables reported in rows. Tests are on the difference in means (t-test) and medians (Wilcoxon-Mann-Whitney test) between the two subsamples. Valuation premium is the logarithm of the ratio between the EV/Sales implied by the firm's offer price (IPO) and the EV/Sales implied by the private firm's takeover price (direct acquisition) found using propensity score matching. The right-hand side of the table shows the estimates of the two-step Heckman selection model on valuation premium of IPOs over direct acquisitions. In the first step, the dependent variable equals 1 in case the firm has conducted an IPO, and 0 in case of a direct acquisition; in the second step, the dependent variable is the valuation premium realized by IPO firms. Year and industry fixed effects are included. Heteroskedasticity corrected clustered robust t-statistics are in brackets. ***, **, and * indicate significance at the 1, 5, and 10 percent levels respectively.

	Univariate analysis			Heckman selection model		
	Below median	Above median	Difference above-below	First step	Valuation premium	
					(1)	(2)
Sales growth	11.6 (9.5)	31.1 (28.3)	19.5*** (18.8***)			0.03*** (5.61)
Market share	31.0 (29.0)	12.5 (12.1)	-18.5*** (-16.9***)	0.07*** (5.46)	0.01*** (3.29)	0.01*** (3.78)
Big player	22.5 (24.2)	17.2 (16.5)	-5.3* (-7.7**)	-0.18** (-2.10)	-0.01 (-0.20)	-0.02 (-0.59)
Private benefits				1.21*** (10.86)		
Sales	33.3 (29.9)	10.3 (8.0)	-23.0*** (-21.9***)	0.02 (1.18)	-0.06*** (-11.56)	-0.06*** (-9.50)
Age	25.7 (26.9)	18.5 (16.2)	-7.2** (-10.7***)	-0.50*** (-13.78)	0.01 (0.41)	-0.00 (-0.15)
Underwriter reputation	19.5 (22.4)	24.0 (24.2)	4.5** (1.8*)		0.02*** (3.96)	0.02*** (3.46)
Analyst coverage	21.4 (21.7)	22.2 (24.6)	0.8 (2.9)		-0.01 (-0.92)	-0.00 (-0.40)
Leverage	27.1 (26.9)	16.4 (17.1)	-10.7*** (-9.8**)	0.51*** (2.96)	0.01 (0.21)	0.01 (0.36)
Market momentum	20.1 (22.6)	23.4 (24.0)	3.3 (1.4)	0.01*** (4.38)	0.00 (1.56)	0.00 (1.39)
Market volatility	26.2 (25.7)	17.3 (20.5)	-8.9*** (-5.2***)	-0.59*** (-6.49)	-0.21*** (-3.05)	-0.19*** (-2.55)
EU SOX	22.0 (21.5)	21.3 (25.3)	-0.7 (3.8)	-0.21*** (-3.49)	-0.13 (-1.02)	-0.18 (-1.30)
VC backing	20.7 (21.3)	23.5 (25.9)	2.8 (4.6**)		-0.01 (-0.38)	-0.01 (-0.52)
Mills ratio					0.02 (0.33)	0.04 (0.55)
Constant				0.46* (1.69)	1.16*** (6.51)	1.04*** (5.52)
Pseudo R2 (%) / Wald Chi2				11.2	261.0	273.6
Observations				7,703	3,433	2,639

Table 6. Valuation premium of post-IPO acquisitions versus IPOs. Univariate and multivariate analysis of the determinants of valuation premium received by the 540 firms acquired post-IPO with disclosed valuation (two-stage acquisitions) with respect to their IPO valuations. The left-hand side of the table reports the mean and median (in brackets) values of valuation premium of two-stage acquisitions over IPOs, by splitting the sample above and below median values of the variables reported in rows. Tests are on the difference in means (t-test) and medians (Wilcoxon-Mann-Whitney test) between the two subsamples. Valuation premium is the logarithm of the ratio between the EV/Sales implied by the firm's post-IPO takeover price (two-stage acquisition) and the EV/Sales implied by the same firm's offer price at IPO. The right-hand side of the table shows the estimates of the two-step Heckman selection model on valuation premium of two-stage acquisitions over IPOs. In the first step, the dependent variable equals 1 in case the firm has been acquired post-IPO, and 0 otherwise; in the second step, the dependent variable is the valuation premium realized by two-stage acquisitions. Year and industry fixed effects are included. Heteroskedasticity corrected clustered robust t-statistics are in brackets. ***, **, and * indicate significance at the 1, 5, and 10 percent levels respectively.

	Univariate analysis			Heckman selection model		
	Below	Above	Difference	First	Valuation premium	
	median	median	above-below		step	(1)
Sales growth	25.4 (20.5)	28.0 (23.9)	2.6 (3.4)			0.05*** (2.69)
Market share	27.2 (21.7)	25.2 (18.4)	-2.0 (-3.3)	-0.01* (-1.91)	-0.01 (-0.88)	-0.00 (-0.30)
Big player	28.8 (23.3)	6.6 (0.0)	-22.2 (-23.3*)	0.01 (0.10)	-0.16 (-1.09)	-0.35** (-2.19)
Private benefits	26.1 (18.6)	27.1 (31.0)	1.0 (12.4)	-0.20* (-1.78)	-0.03 (-0.12)	0.08 (0.32)
Sales	26.3 (21.2)	26.1 (18.2)	-0.2 (-3.0)	0.02 (1.20)	-0.00 (-0.18)	-0.02 (-0.43)
Age	23.9 (19.6)	28.3 (21.8)	4.4 (2.2)	-0.12*** (-3.43)	-0.08 (-0.84)	0.05 (0.68)
Underwriter reputation	17.8 (15.4)	34.3 (27.5)	16.5* (12.1*)	0.03 (1.42)	-0.01 (-0.32)	-0.02 (-0.51)
Analyst coverage	26.3 (20.5)	26.1 (19.2)	-0.2 (-1.3)	0.13*** (3.97)	0.17*** (2.73)	0.14** (2.05)
IPO oversubscription	10.3 (12.8)	42.1 (33.8)	31.8*** (21.0***)	0.01*** (3.22)	0.04*** (4.41)	0.03*** (3.19)
Bid-ask spread	32.3 (27.9)	20.1 (14.1)	-12.2 (-13.8)	-2.43*** (-3.46)	-5.42*** (-2.96)	-4.45** (-2.24)
Excess return				-0.03 (-0.87)		
Growth opportunities	14.9 (9.5)	37.5 (27.9)	22.6*** (18.4***)	2.22*** (10.46)	1.60 (1.09)	0.52 (0.31)
Misvaluation	17.4 (15.8)	35.0 (30.1)	17.6** (14.3**)	-0.48*** (-10.12)	-0.17 (-0.54)	0.08 (0.21)
Leverage	22.5 (20.5)	29.9 (19.7)	7.4 (-0.8)	0.40*** (3.38)	0.36 (1.27)	0.23 (0.62)
Market momentum	28.1 (19.5)	24.3 (20.8)	-3.8 (1.3)	-0.00 (-0.94)	-0.01 (-1.57)	-0.00 (-0.59)
Market volatility	35.7 (32.7)	16.7 (13.9)	-19.0** (-18.8***)	-0.17 (-1.13)	-0.43 (-1.29)	-0.35 (-1.07)
EU SOX	40.2 (30.3)	5.2 (4.1)	-35.0*** (-26.2***)	0.20** (2.54)	-1.19* (-1.85)	-1.23 (-1.30)
VC backing	22.2 (19.8)	34.3 (23.2)	12.1 (3.4)	-0.22*** (-2.97)	-0.10 (-0.58)	-0.01 (-0.06)
Mills ratio					0.78 (0.88)	0.12 (0.11)
Constant				-1.47*** (-4.24)	-0.48 (-0.28)	0.38 (0.16)
Pseudo R2 (%) / Wald Chi2				17.1	137.2	167.9
Observations				3,433	540	396

Table 7. Valuation premium of two-stage acquisitions versus direct acquisitions. Univariate and multivariate analysis of the determinants of valuation premium received by 540 firms acquired post-IPO with disclosed valuation (two-stage acquisitions) with respect to firms acquired as private (direct acquisition) found using propensity score matching. The left-hand side of the table reports the mean and median (in brackets) values of valuation premium of two-stage acquisitions over direct acquisitions, by splitting the sample above and below median values of the variables reported in rows. Tests are on the difference in means (t-test) and medians (Wilcoxon-Mann-Whitney test) between the two subsamples. Valuation premium is the log of the ratio between the EV/Sales implied by the firm's post-IPO takeover price (two-stage acquisition) and the EV/Sales implied by the takeover price of the comparable private target (direct acquisition). The right-hand side of the table shows the estimates of the two-step Heckman selection model on valuation premium of two-stage acquisitions. In the first step, the dependent variable equals 1 if the firm has been acquired post-IPO, and 0 otherwise; in the second step, the dependent variable is the valuation premium realized by two-stage acquisitions. Year and industry fixed effects are included. Heteroskedasticity corrected clustered robust t-statistics are in brackets. ***, **, and * indicate significance at the 1, 5, and 10 percent levels respectively.

	Univariate analysis			Heckman selection model		
	Below median	Above median	Difference above-below	First step	Valuation premium	
					(1)	(2)
Sales growth	35.1 (24.2)	57.0 (52.5)	21.9** (28.3**)			0.08*** (4.16)
Market share	52.5 (49.4)	36.8 (25.0)	-15.7 (-24.4**)	-0.01* (-1.91)	-0.01 (-0.74)	-0.00 (-0.14)
Big player	48.5 (43.2)	15.9 (14.4)	-32.6** (-28.8**)	0.01 (0.10)	-0.18 (-1.13)	-0.36** (-2.14)
Private benefits	44.4 (37.3)	47.1 (49.8)	2.7 (12.5)	-0.20* (-1.78)	0.06 (0.24)	0.13 (0.47)
Sales	57.2 (60.5)	32.2 (22.2)	-25.0** (-38.3***)	0.02 (1.20)	-0.05 (-1.56)	-0.06 (-1.45)
Age	44.0 (37.3)	45.3 (38.6)	1.3 (1.3)	-0.12*** (-3.43)	-0.05 (-0.51)	0.04 (0.48)
Underwriter reputation	37.3 (29.9)	51.8 (41.4)	14.5 (11.5)	0.03 (1.42)	-0.00 (-0.04)	-0.01 (-0.38)
Analyst coverage	45.3 (39.9)	44.1 (37.3)	-1.2 (-2.6)	0.13*** (3.97)	0.17** (2.46)	0.15** (2.00)
IPO oversubscription	28.0 (23.5)	61.4 (60.4)	33.4*** (23.2***)	0.01*** (3.22)	0.04*** (4.23)	0.03*** (3.16)
Bid-ask spread	51.5 (39.0)	37.8 (33.0)	-13.7 (-6.0)	-2.43*** (-3.46)	-6.88*** (-3.45)	-6.23*** (-2.95)
Excess return				-0.03 (-0.87)		
Growth opportunities	30.3 (20.8)	59.0 (57.7)	28.7*** (36.9***)	2.22*** (10.46)	1.92 (1.21)	1.05 (0.58)
Misvaluation	28.8 (21.6)	60.6 (54.6)	31.8*** (33.0***)	-0.48*** (-10.12)	-0.18 (-0.51)	0.02 (0.04)
Leverage	44.6 (45.7)	44.7 (29.7)	0.1 (-16.0)	0.40*** (3.38)	0.44 (1.42)	0.38 (0.96)
Market momentum	46.2 (34.1)	43.1 (39.0)	-3.1 (4.9)	-0.00 (-0.94)	-0.01 (-1.40)	-0.01 (-0.93)
Market volatility	57.4 (48.8)	32.0 (24.9)	-25.4** (-23.9**)	-0.17 (-1.13)	-0.67* (-1.83)	-0.62* (-1.81)
EU SOX	58.7 (54.1)	23.6 (13.0)	-35.1*** (-41.1***)	0.20** (2.54)	-1.05 (-1.52)	-0.96 (-0.96)
VC backing	41.8 (37.3)	50.6 (39.4)	8.8 (2.1)	-0.22*** (-2.97)	-0.12 (-0.63)	-0.05 (-0.20)
Mills ratio					0.93 (0.96)	0.35 (0.30)
Constant				-1.47*** (-4.24)	0.11 (0.06)	0.78 (0.31)
Pseudo R2 (%) / Wald Chi2				17.1	152.8	195.8
Observations				3,433	540	396

Table 8. Valuation discount of delisted firms versus IPOs. Univariate and multivariate analysis of the determinants of valuation discount of 140 firms delisted post-IPO with respect to their IPO valuations. The left-hand side of the table reports the mean and median (in brackets) values of valuation discount of delisted firms over IPOs, by splitting the sample above and below median values of the variables reported in rows. Tests are on the difference in means (t-test) and medians (Wilcoxon-Mann-Whitney test) between the two subsamples. Valuation discount is the logarithm of the ratio between the EV/Sales two months prior the firm's post-IPO delisting date and the EV/Sales implied by the same firm's offer price at IPO. The right-hand side of the table shows the estimates of the two-step Heckman selection model on valuation discount of delisted firms over IPOs. In the first step, the dependent variable equals 1 in case the firm has been delisted post-IPO, and 0 otherwise; in the second step, the dependent variable is the valuation discount. Year and industry fixed effects are included. Heteroskedasticity corrected clustered robust t-statistics are in brackets. ***, **, and * indicate significance at the 1, 5, and 10 percent levels respectively.

	Univariate analysis			Heckman selection model		
	Below median	Above median	Difference above-below	First step	Valuation discount	
					(1)	(2)
Sales growth	-50.7 (-65.0)	-90.6 (-44.5)	-39.9 (20.5)			-0.13 (-1.32)
Market share	-105.6 (-79.5)	-9.4 (-54.9)	96.2** (24.6**)	-0.00 (-0.39)	-0.01 (-0.04)	-0.07 (-0.42)
Big player	-46.3 (-64.0)	-201.1 (-80.6)	-154.8** (-28.8**)	-0.55*** (-2.63)	-1.65 (-1.58)	-0.61 (-0.48)
Private benefits	-64.5 (-70.5)	-6.8 (-58.9)	57.7 (11.6)	0.11 (0.69)	-0.29 (-0.49)	0.08 (0.11)
Sales	-67.6 (-70.6)	-45.1 (-40.9)	22.5 (29.7)	-0.03 (-1.23)	0.04 (0.60)	0.14 (1.50)
Age	-48.9 (-66.0)	-62.0 (-56.8)	-13.1 (9.2)	-0.14** (-2.25)	0.19 (0.55)	-0.06 (-0.15)
Underwriter reputation	-61.7 (-61.4)	-52.0 (-70.9)	9.7 (-9.5)	0.03 (0.95)	-0.05 (-0.36)	0.03 (0.17)
Analyst coverage	-69.3 (-70.5)	108.4 (44.0)	177.7 (114.5)	-0.67*** (-6.12)	0.81 (0.66)	0.64 (0.62)
IPO oversubscription	-69.1 (-64.1)	-43.1 (-66.7)	26.0 (-2.6)	-0.02** (-2.14)	0.01 (0.18)	-0.01 (-0.14)
Bid-ask spread	-10.4 (-43.6)	-95.0 (-75.5)	-84.6** (-31.9***)	2.30*** (5.04)	-6.74** (-2.00)	-7.48** (-2.30)
Excess return				-0.32*** (-3.24)		
Growth opportunities	-37.6 (-63.9)	-75.1 (-68.3)	-37.5 (-4.4)	-3.23*** (-7.52)	-2.35 (-0.49)	-3.08 (-0.67)
Misvaluation	-48.6 (-65.1)	-63.7 (-62.9)	-15.1 (2.2)	0.07 (1.23)	-0.19 (-0.69)	-0.30 (-1.00)
Leverage	-124.4 (-78.9)	10.7 (-44.9)	135.1*** (34.0***)	-0.02 (-0.12)	0.83 (1.32)	0.70 (0.94)
Market momentum	-64.6 (-66.0)	-47.7 (-62.7)	16.9 (3.3)	-0.01 (-0.76)	-0.01 (-0.25)	-0.03 (-0.80)
Market volatility	-51.8 (-64.1)	-60.7 (-65.0)	-8.9 (-0.9)	-0.46* (-1.82)	1.34 (0.99)	-0.71 (-0.46)
EU SOX	-78.0 (-58.9)	-35.6 (-68.3)	42.4 (-9.4)	-0.14 (-1.16)	0.18 (0.35)	0.19 (0.36)
VC backing	-58.0 (-75.1)	-53.9 (-62.9)	4.1 (12.2)	0.16 (1.41)	0.26 (0.66)	0.40 (0.94)
Mills ratio					-0.49 (-0.26)	-0.42 (-0.22)
Constant				0.72* (1.74)	-1.68 (-0.19)	3.83 (0.38)
Pseudo R2 (%) / Wald Chi2				24.4	116.0	127.2
Observations				3,433	140	104

Table 9. Valuation discount of delisted firms versus direct acquisitions. Univariate and multivariate analysis of the determinants of valuation discount of 140 firms delisted post-IPO with respect to firms acquired as private (direct acquisition) found using propensity score matching. The left-hand side of the table reports the mean and median (in brackets) values of valuation discount of delisted firms with respect to direct acquisitions, by splitting the sample above and below median values of the variables reported in rows. Tests are on the difference in means (t-test) and medians (Wilcoxon-Mann-Whitney test) between the two subsamples. Valuation discount is the logarithm of the ratio between the EV/Sales two months prior the firm's post-IPO delisting date and the EV/Sales implied by the takeover price of the comparable private target (direct acquisition). The right-hand side of the table shows the estimates of the two-step Heckman selection model on valuation discount of delisted firms with respect to direct acquisitions. In the first step, the dependent variable equals 1 in case the firm has been delisted post-IPO, and 0 otherwise; in the second step, the dependent variable is the valuation discount. Year and industry fixed effects are included. Heteroskedasticity corrected clustered robust t-statistics are in brackets. ***, **, and * indicate significance at the 1, 5, and 10 percent levels respectively.

	Univariate analysis			Heckman selection model		
	Below median	Above median	Difference above-below	First step	Valuation discount	
					(1)	(2)
Sales growth	-15.0 (-42.4)	-64.3 (-49.0)	-49.3 (-6.6)			-0.26** (-2.49)
Market share	-89.3 (-56.4)	25.6 (36.3)	114.9* (92.7**)	-0.00 (-0.27)	-0.01 (-0.06)	-0.02 (-0.12)
Big player	-17.4 (-42.1)	-231.7 (-58.6)	-214.3** (-16.5)	-0.43** (-1.99)	-1.63 (-1.41)	0.39 (0.33)
Private benefits	-43.2 (-47.4)	33.3 (-27.5)	76.5* (19.9)	0.19 (1.12)	0.49 (0.57)	0.63 (0.77)
Sales	-55.0 (-56.4)	-8.7 (16.6)	46.3 (73.0)	0.03 (1.15)	0.07 (0.84)	0.15* (1.88)
Age	-33.7 (-47.4)	-30.3 (-34.3)	3.4 (13.1)	-0.06 (-1.00)	0.23 (0.74)	-0.11 (-0.29)
Underwriter reputation	-82.8 (-54.2)	21.9 (-30.4)	104.7** (23.8*)	0.02 (0.68)	-0.03 (-0.16)	-0.02 (-0.10)
Analyst coverage	-12.6 (-37.2)	163.7 (86.9)	176.3** (124.1**)	-0.47*** (-4.34)	0.02 (0.02)	0.51 (0.60)
IPO oversubscription	-54.1 (-44.5)	-9.6 (-42.1)	44.5 (2.4)	-0.02* (-1.91)	-0.06 (-1.06)	-0.02 (-0.38)
Bid-ask spread	23.1 (-10.2)	-83.9 (-77.6)	-107.0** (-67.4***)	1.89*** (3.87)	-7.81** (-2.22)	-10.60*** (-3.23)
Excess return				-0.35*** (-3.22)		
Growth opportunities	-12.3 (-44.5)	-51.4 (-42.1)	-39.1 (2.4)	-2.44*** (-5.73)	-2.96 (-0.72)	0.44 (0.12)
Misvaluation	-27.9 (-44.5)	-35.9 (-42.1)	-8.0 (2.4)	0.09 (1.63)	-0.15 (-0.43)	-0.48 (-1.50)
Leverage	-80.8 (-57.5)	25.7 (20.9)	106.5** (78.4**)	0.02 (0.08)	1.98** (2.29)	2.36*** (2.69)
Market momentum	-50.9 (-50.5)	-13.8 (-35.8)	37.1 (14.7)	-0.01 (-0.77)	-0.02 (-0.46)	-0.06 (-1.49)
Market volatility	-13.1 (-33.9)	-49.6 (-44.8)	-36.5 (-10.9)	-0.33 (-1.28)	-1.15 (-0.75)	-2.90* (-1.92)
EU SOX	-64.2 (-45.1)	8.3 (-37.2)	72.5 (7.9)	-0.24* (-1.83)	-0.20 (-0.27)	-0.12 (-0.16)
VC backing	-34.8 (-57.5)	-28.4 (-33.1)	6.4 (24.4)	0.15 (1.32)	-0.11 (-0.21)	-0.81 (-1.43)
Mills ratio					0.51 (0.25)	-0.94 (-0.52)
Constant				-0.83* (-1.90)	-0.93 (-0.08)	2.55 (0.24)
Pseudo R2 (%) / Wald Chi2				17.5	128.8	149.7
Observations				3,433	140	104

Table 10. Alternative benchmark: valuation premium of two-stage acquisitions and valuation discount of delisted firms versus stand-alone firms. Heckman procedures on the determinants of valuation premium and valuation discount of the 540 firms acquired post-IPO with disclosed valuation (two-stage acquisitions) and of the 140 firms delisted post-IPO, respectively. For two-stage acquisitions, valuation premium is the log of the ratio between the EV/Sales implied by the firm's post-IPO takeover price (two-stage acquisition) and the EV/Sales of the comparable stand-alone firm on the day of the acquisition. For delisted firms, valuation discount is the log of the ratio between the EV/Sales of the firm two months prior to delisting and the EV/Sales of the comparable stand-alone firm at the same date. In the first step, the dependent variable equals 1 if the firm has been acquired or delisted post-IPO, and 0 otherwise; in the second step, the dependent variable is the valuation premium/discount. Year and industry fixed effects are included. Heteroskedasticity corrected clustered robust t-statistics are in brackets. ***, **, and * indicate significance at the 1, 5, and 10 percent levels respectively.

	Two-stage acquisitions vs. Stand-alone			Delisted firms vs. Stand-alone		
	First step	Valuation premium		First step	Valuation discount	
		(1)	(2)		(1)	(2)
Sales growth			0.10*** (2.82)			-0.07 (-1.30)
Market share	-0.01* (-1.91)	-0.03 (-1.18)	-0.01 (-0.54)	-0.00 (-0.39)	-0.15* (-1.94)	-0.18** (-2.13)
Big player	0.01 (0.10)	0.31 (0.99)	0.34 (0.99)	-0.55*** (-2.63)	-0.07 (-0.13)	-0.29 (-0.43)
Private benefits	-0.20* (-1.78)	-0.16 (-0.35)	-0.08 (-0.14)	0.11 (0.69)	0.46 (1.48)	0.42 (1.15)
Sales	0.02 (1.20)	-0.13** (-2.13)	-0.16** (-2.10)	-0.03 (-1.23)	-0.08** (-2.00)	-0.08 (-1.61)
Age	-0.12*** (-3.43)	-0.21 (-1.06)	-0.09 (-0.53)	-0.14** (-2.25)	-0.07 (-0.38)	0.00 (0.01)
Underwriter reputation	0.03 (1.42)	0.09 (1.41)	0.09 (1.18)	0.03 (0.95)	0.16** (1.99)	0.15* (1.67)
Analyst coverage	0.13*** (3.97)	0.16 (1.15)	0.13 (0.87)	-0.67*** (-6.12)	-0.68 (-1.07)	-0.73 (-1.37)
IPO oversubscription	0.01*** (3.22)	0.04** (2.42)	0.04** (1.97)	-0.02** (-2.14)	-0.03 (-1.02)	-0.04 (-1.28)
Bid-ask spread	-2.43*** (-3.46)	-9.63** (-2.49)	-8.77** (-2.11)	2.30*** (5.04)	-4.90*** (-2.79)	-4.56*** (-2.65)
Excess return	-0.03 (-0.87)			-0.32*** (-3.24)		
Growth opportunities	2.22*** (10.46)	3.41 (1.11)	2.49 (0.70)	-3.23*** (-7.52)	-1.74 (-0.70)	-2.15 (-0.90)
Misvaluation	-0.48*** (-10.12)	-0.74 (-1.11)	-0.53 (-0.66)	0.07 (1.23)	-0.05 (-0.34)	-0.06 (-0.40)
Leverage	0.40*** (3.38)	0.51 (0.83)	0.30 (0.39)	-0.02 (-0.12)	0.33 (1.00)	0.52 (1.29)
Market momentum	-0.00 (-0.94)	-0.01 (-0.60)	-0.01 (-0.67)	-0.01 (-0.76)	0.03* (1.80)	0.02 (0.99)
Market volatility	-0.17 (-1.13)	-0.35 (-0.50)	-0.62 (-0.93)	-0.46* (-1.82)	0.69 (0.98)	0.02 (0.03)
EU SOX	0.20** (2.54)	0.02 (0.02)	1.38 (0.74)	-0.14 (-1.16)	-0.10 (-0.40)	-0.08 (-0.25)
VC backing	-0.22*** (-2.97)	0.01 (0.02)	0.04 (0.09)	0.16 (1.41)	0.12 (0.58)	0.17 (0.71)
Mills ratio		2.11 (1.14)	1.59 (0.70)		0.56 (0.59)	0.82 (0.85)
Constant	-1.47*** (-4.24)	-0.07 (-0.02)	0.83 (0.17)	0.72* (1.74)	5.50 (1.19)	7.67 (1.50)
Pseudo R2 (%) / Wald Chi2	17.1	71.4	93.1	24.4	142.0	139.9
Observations	3,433	540	396	3,433	140	104

Figure 2. Valuation and valuation premium of a private firm's exit outcomes. This graph presents the average and median (in brackets) enterprise value to sales ratio (EV/Sales) associated with each of the possible exit scenarios faced by a private firm. Valuation premium, defined as the logarithm of the ratio of the EV/Sales of the two comparable firms found using propensity score matching, is computed between the two outcomes pointed by arrows.

