Shareholder Diversification and the Decision to Go Public

Andriy Bodnaruk
Maastricht University

Eugene Kandel[1]
Hebrew University

Massimo Massa
INSEAD

Andrei Simonov
Stockholm School of Economics

First Draft January 2004

This Draft: November 2005

Abstract

We study the IPO process, focusing on the effects of the degree of portfolio diversification of the shareholders taking the firm public. Standard theory suggests that less diversified shareholders have more to gain from taking the firm public, and are more willing to accept a lower price for the sale of their shares, i.e. tolerate higher underpricing. We test these hypotheses using the data on **all** the IPOs that took place in Sweden in the period 1995-2001. We have obtained detailed information on the portfolio composition of the investors in the firms being taken public, both before and after the IPO, as well as the portfolio composition of investors in similar (in terms of size and industry) firms not taken public. The information is detailed at the stock level, for both private and public firms. We construct several proxies for portfolio diversification of the shareholders and relate them to the probability of the IPO and the underpricing. We show that firms held by less diversified shareholders are more likely to go public and suffer a higher underpricing when they do. We show that the effects of diversification of the controlling shareholders on the IPO process are significant both economically and statistically. This suggests that the degree of diversification of controlling shareholders should play a prominent role in the discussion of the process of going public.

***JEL classification*:** G120, G140, G240, G320**.**
***Keywords*:** IPO, diversification, underpricing.

---

[1] Corresponding author: Eugene Kandel, Dept. of Economics, Hebrew University, Mount Scopus, Jerusalem, Israel, 91905, tel: 972-2-588-3137, fax: 972-2-581-6071, email: mskandel@mscc.huji.ac.il. We are grateful to Sven-Ivan Sundqvist, for numerous helpful discussions and for providing us with the data. We are also grateful to Yakov Amihud, Efraim Benmelech, Thierry Foucault, Dennis Gromb, Ilan Kremer, Alexander Ljungqvist , Jay Ritter, Kristian Rydqvist, Ivo Welch, Luigi Zingales, and seminar participants at Hebrew University, BI (Oslo), Washington University, and ESSFM at Gerzensee in 2004, EFA 2005 in Moscow, and EFMA 2005 in Sienna for their helpful comments and suggestions. Andrei Simonov and Andriy Bodnaruk acknowledge financial support from Jan Wallander och Tom Hedelius Stiftelse. Eugene Kandel acknowledges financial support from the Kruger Center for Finance Research at Hebrew University, and the hospitality of the Olin School of Business at Washington University, where he visited while working on this paper.

Shareholder Diversification and the Decision to Go Public

Abstract

We study the IPO process, focusing on the effects of the degree of portfolio diversification of the shareholders taking the firm public. Standard theory suggests that less diversified shareholders have more to gain from taking the firm public, and are more willing to accept a lower price for the sale of their shares, i.e. tolerate higher underpricing. We test these hypotheses using the data on **all** the IPOs that took place in Sweden in the period 1995-2001. We have obtained detailed information on the portfolio composition of the investors in the firms being taken public, both before and after the IPO, as well as the portfolio composition of investors in similar (in terms of size and industry) firms not taken public. The information is detailed at the stock level, for both private and public firms. We construct several proxies for portfolio diversification of the shareholders and relate them to the probability of the IPO and the underpricing. We show that firms held by less diversified shareholders are more likely to go public and suffer a higher underpricing when they do. We show that the effects of diversification of the controlling shareholders on the IPO process are significant both economically and statistically. This suggests that the degree of diversification of controlling shareholders should play a prominent role in the discussion of the process of going public.

JEL classification**:** G120, G140, G240, G320**.**
Keywords**:** IPO, diversification, underpricing.

Introduction

The literature on the IPO is vast and expanding. It studies why firms go public, what drives the IPO process, including the underpricing, and what is the long-term performance of the newly listed shares. Among the numerous hypotheses that are advanced and tested (see Jenkinson and Ljungquist (2001) and Ritter and Welch (2002) for surveys of the literature),[1] one stands out by its relative absence.[2] We refer to the effect of the degree of portfolio diversification of the founding shareholders on the IPO process. Finance theory suggests that non-diversification reduces the valuation of securities, thus the ability to diversify the portfolio by taking the firm public should, in principle, affect the decisions of the controlling shareholders. The associated hypotheses are not tested because they require data on investors' holdings in private firms, which is not available in the US and most industrialized countries. It turns out, however, that reporting requirements in Sweden – an industrialized country with a per capita income comparable to that of the US – provide direct information on investors' holdings. We exploit this information to construct a data set of Swedish firms that allows us to proxy for the degree of diversification of shareholders of private firms, some of which end up going public. We formulate and directly test the hypotheses on the effect of diversification of the controlling shareholders on the propensity to initiate an IPO and on the ensuing underpricing.

We start with a simple model in which the controlling shareholders may choose to go public for a variety of reasons, including, but not limited to portfolio diversification. After deciding on the number of primary and secondary shares they want to issue, the controlling shareholders choose the optimal issue price, trading off losses from underpricing against the increased probability of a successful IPO. The model predicts that the underpricing of a firm going public should decline in the degree of the diversification. The intuition is straightforward: given that, all else equal, more diversified shareholders have less to gain from the IPO, they will

[1] See also: Rock (1986), Amihud and Mendelson (1988) Allen and Faulhaber (1989), Welch (1989), Benveniste and Spindt (1989), Benveniste and Wilhelm (1990), Hughes and Thakor (1992), Welch (1992), Chemmanur (1993), Chemmanur and Fulghieri (1994, 1999), Zingales (1995), Booth and Chua (1996), Black and Gilson (1998), Pagano, Panetta and Zingales (1998), Stoughton and Zechner (1998), Krigman, Shaw and Womack (1999), Ellis, Michaely and O'Hara (2000), Sherman (2000), Habib and Ljungqvist (2001), Cornelli and Goldreich (2002), Loughran and Ritter (2002), Sherman and Titman (2002), Ellul and Pagano (2003), Edelen and Kadlec (2004), Loughran and Ritter (2004), Rocholl (2004), Kim and Weisbach (2005).

[2] A notable exception is Leland and Pyle (1977) who study the decision of undiversified shareholders to take their firm public. However, they focus on the signaling role of the share of equity offered for sale and are not concerned with the heterogeneity of diversification among the controlling shareholders.

be less likely to agree to a large discount. Also, the resulting probability that the firm is taken public is either independent of the degree of the diversification (when the firm's main goal is to raise capital) or declines in it. Again, the intuition is that well diversified shareholders that do not need capital from the equity market have little reasons to incur the costs of an IPO.

We test these hypotheses by studying *all* the IPOs that took place in Sweden in the period 1995-2001.[3] For each IPO we have obtained (in addition to the standard variables) detailed information on the portfolio composition of the investors, both *before* and *after* the IPO, as well as the portfolio composition of the investors in similar firms in terms of size, book-to-market and industry not taken public. The information is detailed at the stock level, for both private and public firms. That is, we are able to observe the holdings in *both* publicly traded and privately held firms.

We construct five proxies of portfolio diversification of the shareholders before and after the IPO. We then relate the probability of the IPO, and the underpricing to the degree of portfolio diversification of the controlling shareholders prior to the IPO, while controlling for other variables used in the literature. We show that, as predicted, the probability of an IPO is negatively related to the degree of diversification of the controlling shareholders. Firms held by more diversified shareholders are less likely to be taken public. One standard deviation increase in the shareholders' diversification accounts for up to one third of the unconditional probability of an IPO.

We also document a negative and significant relation between the degree of diversification and the underpricing. Firms controlled by more diversified shareholders suffer a lower underpricing in an IPO; between one third and a half of the magnitude of the underpricing may be attributable to a one standard deviation change in diversification. Moreover, even after conditioning on the decision of being taken public, firms that are held by more diversified shareholders still display lower underpricing. We also show that the degree of diversification of the non-controlling shareholders has no effect on the probability of an IPO or the degree of underpricing. This suggests that the combination of the decision rights and the diversification affect the decisions.

Moreover, we document that the diversification of the institutional controlling shareholders has a strong effect on the decision to go public, but little effect on the underpricing. The degree of diversification of the private shareholders has a much stronger effect on the

[3] In particular, due to data availability, the sample starts in July 1995 and ends in June 2001.

underpricing. We attribute this result to the fact that VCs may be less sensitive to underpricing, as, instead of selling the shares at the IPO with a discount, they can distribute them to the Limited Partners at market prices. They are, however, very keen on timely exists, since these allow them to raise future rounds of financing.

These findings make two main contributions. First, they shed light on a hitherto unexplored dimension of the IPO process. Second, they provide evidence on the importance of the portfolio diversification, one of the main tenets of finance, in a clean experiment.

While surveying the IPO literature is outside the scope of this paper, we would like to focus on two related papers. Loughran and Ritter (2002) argue that behavioral biases in general, and Prospect Theory in particular, may explain underpricing. Shareholders are willing to suffer underpricing if their "reference point" is low enough to make them perceive the selling price as satisfactory. They are more tolerant of large underpricing if the post-market valuation is higher than they expected. In light of our findings the "reference point" can be interpreted in terms of risk aversion and portfolio diversification. Less diversified investors are willing to sell at a lower price to diversify their portfolio. This effectively reduces their reference points.

Edelen and Kadlec (2003) offer a rational story. They show that issuers trade-off the issue proceeds and the probability of the IPO completion. This implies that the probability of observing an IPO and the price at which it takes place are related. We show that the degree of portfolio diversification of the inside shareholders taking the firm public is one factor that directly affects both variables they study.

Ritter and Welch (2002) suggest that in an IPO "… simple fundamental market mis-valuation or asset pricing risk premia are unlikely to explain the average first-day return…". The valuation assumption underlying this statement is from the point of view of a fully diversified investor. We conjecture that a significant part of underpricing may be explained by the idiosyncratic risk premium of the existing shareholders. Ritter and Welch (2002) also point out that there has been little research on how the surplus is split among the buyers and the sellers of the new issues. Also, traditionally, few explanations have directly focused on the characteristics of the shareholders of the firm being taken public, this paper contributes to this line of inquiry as well. Overall, our findings add to the multitude of results in the literature concerning the drivers of the IPO process. Rather than being mutually exclusive with the results in the literature, our paper complements them in furthering our understanding of the going public process.

The paper is structured as follows. In Section 1 we set up a simple model and derive testable hypotheses. Section 2 describes the data and the construction of the variables. In Section 3 we discuss the econometric issues and report the main empirical results. Section 4 deals with robustness, and is followed by a brief conclusion.

1. Model and Testable Hypotheses.

Diversification is one of the cornerstones of the portfolio theory. The degree of diversification dictates the required rate of return, which, in turn, determines the valuation of the stock by the non-diversified shareholder relative to the valuation of the same stock by well-diversified investors. Therefore, the degree of diversification determines the size of the surplus that must be divided between the existing shareholders and the outside investors at the IPO. To ascertain that this phenomenon is economically significant, we estimate the non-diversified investors' discount that is part of this surplus in our sample of firms. We show (see Appendix 1) that this discount equals to roughly 25% of the diversified investor value of an average firm in our sample. Sarin, Koeplin and Shapiro (2000) show that privately held firms are sold at a discount of 20-30% relative to the market price of similar public firms; our findings indicate a similar magnitude. This suggests that that the diversification of the controlling shareholders may have a large effect on the size of the surplus, which warrants further study.

All else equal, the surplus for the well-diversified controlling shareholders is smaller, making them less inclined to incur the costs of the IPO.[4] Moreover, when the surplus is small the owners of a firm that choose to go public for diversification reasons are not likely to part with their shares if their pre-IPO valuation is high.[5] Thus, if the IPO takes place, we should expect to observe a negative relation between the degree of diversification and the underpricing. The main idea in this paper is that the size of the surplus created by the IPO may affect the probability of the IPO as well as the underpricing. We use a simple model to illustrate the intuition behind this idea. This simple model is designed to show the intuition behind the hypotheses on the effects of the diversification, rather than to contribute to the modeling of the IPO process in general.

The benefits of going public include diversification, speedy access to the stock market when the firm needs to raise equity, as well as liquidity for its owners. At the same time there are significant costs of running a public firm: the listing fees, the shareholder relations costs, the compliance, and the litigation costs.

[4] We show below that if the IPO's goal is to raise capital, then the degree of diversification has no effect.
[5] While the literature has found that it is common for owners to part with their shares below the post-IPO *market* valuation (i.e. the underpricing), the non-diversified owner's valuation was not considered.

We specifically focus our attention on the effects of the controlling shareholders' degree of diversification on the probability of the IPO and the level of underpricing and abstract from many important issues that would complicate our presentation.

We denote the value of the assets of the (all stock) publicly traded firm that is held by fully diversified investors by V. The value of the same assets to their private owners prior to the IPO is denoted by BV (Before Value); it depends on the degree of diversification of the current shareholders and the liquidity premium. Whenever $V > BV$ the owners may consider taking the firm public. The fixed cost of preparing the firm to go public is denoted by C_0, whereas if the IPO actually goes through, there is an additional cost of C_1. We ignore the variable cost for expositional simplicity, since it does not affect the results qualitatively. We also abstract from the presence of the investment banker, and assume a somewhat simplistic IPO process.

The number of shares held by the original owners is normalized to 1. The owners choose to issue γ additional shares of the firm (primary shares), and sell a proportion α of their original shares to outside investors (secondary shares). If the IPO goes through, the ownership of the original investors is diluted to $(1 - \alpha)/(1+\gamma)$ of the new firm; the new investors hold the remaining $(\alpha+\gamma)/(1+\gamma)$. If the firm needs to raise capital for investments, it would have to issue primary shares, γ, and the amount should be determined by the investment needs of the firm. Selling secondary shares does not advance this goal, as pointed out by Kim and Weisbach (2005). We, therefore, conjecture, that the sale of secondary shares, α, is related to the desire of the original shareholders to diversify their portfolio and/or make it more liquid. In this section we treat α and γ as parameters of the model, and focus on the choice of the IPO price.[6]

The original owners must decide on the IPO price per share, P. The per-share value of the remaining shares in the hands of the original investors is denoted by AV (After Value) – it depends on the degree of diversification of the original shareholders post-IPO, and the present value of their investment opportunities in the firm. Formally (we omit the firm subscript):

$$BV = V[\,g(0,D) - L\,], \qquad (1)$$

$$AV = g(\alpha,D)[V + \gamma K] \qquad (2)$$

where $g(\alpha,D) \leq 1$ is the multiplier applied to this security by an investor that is not perfectly diversified ($D < 1$) and who sold α of his shares in the IPO. We assume that both first derivatives

[6] It is reasonable to treat the number of primary shares as exogenously determined by the capital needs of the firm. Treating α as exogenous complicates the model significantly. We address this issue in the robustness section.

of $g(\alpha,D)$ are positive, while the second and cross derivatives are negative. Prior to the IPO this multiplier is: $g(0,D)$, while if the shareholder is perfectly diversified, or sold all of his shares, then the multiplier equals one. L denotes the liquidity discount of a non-traded firm,[7] and K represents the present value of future activities the firm is financing by raising primary capital.

We denote the probability that the IPO fails by f. Given that it is more convenient to optimize directly with respect to f, we denote by $P(f)$ the IPO offer price corresponding to the failure probability. We assume that $P'(f) > 0$ and $P''(f) > 0$, which captures the fact that if the issuer insists on a higher price, the probability of finding enough interested investors to take up the entire IPO declines. This assumption is consistent with a number of models in the IPO literature (e.g. Welch, 1992, Ritter and Welch, 2001, Loughran and Ritter, 2002, and Edelen and Kadlec, 2003). This function represents the demand side of the IPO, against which the issuer in our model chooses the optimal price.

Using this simple setup, we study the decision of the controlling original shareholders on whether to undertake the IPO, and which price to offer. The objective function of the controlling shareholders of the private firm is to choose between retaining the firm as a private firm, and initiating an IPO. To compare the two options they have to first set the optimal price for an IPO. We set $V = 1$, thus all values and prices are expressed in relative terms. We postulate the following objective function:[8]

$$\begin{aligned} &Max_f (1-f)[(1-\alpha)AV + \alpha P(f)]/(1+\gamma) - (1-f)C_1 + fBV - C_0 \\ &= (1-f)[(1-\alpha)AV + \alpha P(f) - (1+\gamma)(BV + C_1)]/(1+\gamma) + BV - C_0 \end{aligned}$$

The first term represents the value created by the IPO times the probability of its success. The other two terms represent the relative benefit of not initiating the IPO. The first order condition is:

$$\alpha[(1-f^*)P'(f^*) - P(f^*)] - (1-\alpha)g(\alpha,D) + (1+\gamma)[g(0,D) - L + C_1] = 0, \qquad (3)$$

At this stage it is convenient to assume the functional form of the price function as follows:

$$P(f) = P_0 + \delta\phi(f)/(1-f). \qquad (4)$$

This implies that for prices not exceeding P_0 the probability of a failed IPO is zero. Then, as the failure probability increases the price increases as well. This formulation simplifies the

[7] It could include additional discounts, as long as they are not related to the degree of diversification.
[8] Notice that if the IPO does not succeed, the original shareholders do not suffer any additional penalty beyond the cost of the IPO. Some reputational cost may exist in reality; we ignore this possibility.

algebra, and does not impose significant restrictions on the behavior around the relevant values of ***f***, which are small. The first order condition becomes:

$$\alpha[\delta\phi'(f^*)-P_0]-(1-\alpha)g(\alpha,D)+(1+\gamma)[g(0,D)-L+C_1]=0 \qquad (5)$$

The second order condition is then simply: $\phi''(f^*)<0$.

The first question of interest is the effect of the degree of diversification, ***D***, on the optimal price in the IPO. It is easy to see that:

$$df/dD \propto (1+\gamma)g_2(0,D)-(1-\alpha)g_2(\alpha,D)>0 \qquad (6)$$

The intuition is straightforward: higher diversification of the original shareholders reduces the public firm's premium over the private one, making the original shareholders less willing to offer a large discount to reduce the probability of a failed IPO. Notice that the magnitude of this effect declines in α.

Once the choice of the optimal IPO price is made, the decision of whether to go public is simple: the firm goes public only if the cost of initiating the IPO process is below a certain threshold, C_0^*. This threshold is obtained by equating the value of the private firm to the controlling shareholders to the value of their share of the public firm less the cost of going public:

$$C_0^* = (1-f^*)[(1-\alpha)AV+\alpha P(f^*)-(1+\gamma)(BV+C_1)]/(1+\gamma) \quad (7)$$

The marginal effect of an increase in ***D*** on C_0^* is proportional to:

$$dC_0^*/dD \propto (1-\alpha)g_2(\alpha,D)[1+\gamma K]-(1+\gamma)g_2(0,D) \qquad (8)$$

The sufficient condition for $dC_0^*/dD<0$ is that $\gamma(K-1-\alpha)<\alpha$. When $\gamma=0$, i.e. the firm does not need to raise capital for new investments, $dC_0^*/dD<0$, the threshold always declines in the degree of diversification, making the IPO less likely. When the firm sells only the primary equity, then:

$$dC_0^*/dD \propto \gamma(K-1)$$

In this case, the effect of an increase in diversification on the likelihood of the IPO is ambiguous and depends on the magnitude of the investment opportunities the firm faces. If the new activities that the firm plans to finance exceed the value of the firm's current assets, the above expression is negative. In such case, however, the firm goes public to raise the required funds, thus the diversification plays no role. This suggests that in the cross-section of firms an

increase in the degree of diversification is likely to reduce the likelihood of an IPO. The above results allow us to formulate two testable hypotheses:[9] one in terms of probability of taking the firm public and one in terms of the underpricing at the IPO. Let us start with the probability of initiating an IPO. Less diversified shareholders are more likely to resort to the IPO, since they have more to gain from diversifying their portfolio.

Hypothesis 1: *A higher degree of diversification in the portfolio of the controlling shareholders of a firm reduces the likelihood of this firm to go public, all else equal.*

Let us now formulate the hypotheses regarding the underpricing at the IPO. The underpricing is defined as the return on the investment that buys the IPO at the offer price and sells at the close of the first day of trading. Recall that the offer price is increasing in the degree of diversification of the *original controlling shareholders*; while the first day price is based on the degree of diversification of the *new shareholders*, which are assumed to be well-diversified. Thus, the higher is the degree of diversification of the original controlling shareholders, the lower is the underpricing. This provides our second testable prediction:

Hypothesis 2*: If the firm does go public, higher degree of diversification in the portfolio of the controlling shareholders reduces the level of underpricing.*

We proceed to test these hypotheses by constructing measures of portfolio diversification of the shareholders of the firm being taken public and relating them to the probability of the IPO and the level of underpricing. In the next section we describe the data and present our proxies for portfolio diversification.

2. The data and the measures of portfolio diversification

2.1 IPO data

We analyze all the IPOs undertaken on Stockholm Stock Exchange (SSE)[10] from July 1995 to June 2001: altogether 124 firms. Offer price, first day close price, size of the issue, timing of the

[9] The same hypotheses can be obtained in a model where the current shareholders and the new investors are assumed to share the surplus that going public creates. It is consistent with Chemmanur and Fulghieri's (1999) view that IPO is a way of increasing the dispersion of ownership.

[10] Construction of our data base required to verify many variables. We have sent inquiries to the firms about their underwriters and the type of issue (IPO or private placement or even SEO). We also requested annual reports from Royal Library - the ultimate storage facility for all printed documents in Sweden. We then confirmed the offer and first day close prices through various sources (stock exchange registries, newspapers etc). We eliminated the firms, which have been delisted because of merger, acquisition, or

IPO, and name of the underwriter are provided by SSE. We cross-check this information with SDC, IPO prospectuses and Mediearkivet[11], a registry of publications in Swedish newspapers. Percentage of cash flow and voting rights offered to outside investors are collected from IPO prospectuses. There is a customary lockup period of six months following the IPO.

For each IPO firm we have information on the offer price and the (unadjusted) first day close price, size of the issue, exchange of the listing, percentage of cash flow and voting rights offered to outside investors, and name of the underwriter. We define *underpricing* as the difference between the first day close price and the offer price of the issue normalized by the offer price.

2.2 Individual stockholdings

We use the data on individual shareholders collected by Vardepapperscentralen (VPC), the Security Register Center. The data contain both stockholding held directly and on the street name, including holdings of US-listed ADRs. In addition, SIS Agarservice AB collects information on ultimate owners of shares held via trusts, foreign holding firms and the like (for details, see Sundin and Sundquist 2002). Our data cover the period 1995-2001. Overall, the records provide information about the owners of 98% of the market capitalization of publicly traded Swedish firms. For the median firm, we have information about 97.9% of the equity, and in the worst case we have information on 81.6% of market capitalization of the firm. We also possess information about equity holders of (almost) all privately held limited liability Swedish firms. For each investor we have detailed information about its individual holdings of stocks (broken down at the stock level) and its type (private person or institutional investor). For private investors, we also have information whether the investor is a member of the board of directors of a particular firm.

It is important to note that we observe the stockholdings data twice a year: December 31 and June 30. The IPOs do however take place throughout the year. This implies that the time that passes between the calculation of the diversification of the shareholders, and the time of the IPO is random. The further is the IPO from the time of the last diversification measure calculation, the

---

failure to comply with the exchange rules within half a year period after the IPO date, or with unreliable data on offer or (unadjusted) first day close price. These are mostly very small firms with a market capitalization less that US$1Mln. The elimination of these firms is mostly motivated by data availability – typically the firms which have been delisted from the exchange leave very few traces in data sources. This resulted in dropping 7 observations. Our sample is slightly smaller than the sample reported by Holmen and Högdfeld (2004) for two reasons. Firstly, unlike them we do not consider spin-offs and private placements. Second, there has been considerable IPO activity at the end of 2001 and in 2002 and our sample period does not extend that far.

[11] For more information see www.mediearkivet.se.

less precise that measure is for predicting the IPO. Many changes may have occurred in the meantime. The post-IPO measure is also imprecise. To gauge the degree of the problem, we also re-estimate the basic regressions in Tables 3, 4, and 5 using dummy variables for the month of the IPO. The results confirm our main findings and suggest that no bias is induced by this sampling procedure.[12]

We restrict our analysis to investors, who should have influence over firms' decisions as in Faccio and Lang (2002). For private investors, we require an investor to control at least 10% of voting rights in the IPO firm. There are 114 such private investors in our sample who hold 117 controlling positions in IPO firms. We also explore the broader definition of controlling shareholders that includes the directors that do not hold significant share. Using this definition, the number of controlling private investors goes up to 390. For institutional investors the requirement is to control at least 10% of voting rights. There are 88 such institutional investors in our sample; they hold 177 positions. We also study the distribution of the number of controlling shareholders in the sample of firms going public (Figure 1). Over a quarter of the firms have just one controlling shareholder, while 80% of them have four or less, suggesting that these are tightly controlled firms. In such an environment, the coordination is reasonably easy. This justifies our approach of averaging the measures of diversification across the controlling shareholders creating a sort of "representative shareholder".

2.3 Firm-level information and other data

We use the SIX Trust Database to obtain individual security returns (including dividends), and to track the overall market index (SIX Index). We use the Market Manager Partners Databases for the firm-level characteristics. These two databases are the equivalents, respectively, of CRSP and COMPUSTAT for the US. For the analysis of private firms which did not undertake IPO during the sample period we require them to have reliable information on the total assets, return on assets, and book value of equity for a one year period prior to corresponding IPO date.

2.4 Proxies of portfolio diversification

We consider four different measures of portfolio diversification. The first two measures are derived from Goetzmann and Kumar (2002); we refer the reader to their paper for a more extensive description of these proxies. The first measure of diversification, D_1, is constructed as:

[12] Not reported but available from the authors.

$$D_1 = -\sum_{i=1}^{N}(w_i - w_{mkt})^2$$

where w_i is the weight of the stock in the portfolio of the investor and w_{mkt} is the weight that the same stock would have in the market portfolio. This measure expresses diversification in terms of divergence of the financial portfolio of the investor from the market portfolio.

The second measure, D_2, is the average correlation of the return of the industry to which the IPO firm belongs with the investor's total portfolio returns, multiplied by –1.[13] We define the industry return as the weighted average of returns of all the publicly traded firms that fall into the same industrial category (SNI92[14]), weighed by their market capitalization. There are 12 industries. D_2 proxies for the degree of industry diversification of the investor. Diversification increases when the investor includes in her portfolio stocks from industries whose returns are not highly correlated with each other.

We also consider two additional proxies that capture the relative importance of the firm being taken public in the shareholders' portfolio. D_3 is the negative of the fraction of the portfolio of the investor allocated to the firm being taken public and D_4 is the negative of the fraction of the portfolio allocated to the firms that belong to the same industry. The proxy D_3 (D_4) captures the sensitivity of the investor's equity portfolio to his exposure to the specific firm (the industry). As the fraction of her portfolio allocated to particular asset or industry goes down its diversification increases. All these measures are therefore constructed in such a way that they increase in the degree of diversification.

To construct the proxies, we use information on all the holdings in both public and private equity. Public equity is evaluated at the market close at the date of the IPO. The value of private equity is estimated as the most recent pre-IPO book value of investor's holdings multiplied by the corresponding average industry market-to-book ratio. We present the exact definitions of the proxies in Appendix 2.

One possible objection is that our measures of diversification are just based on equity holdings and do not account for the rest of the wealth of the investor. We therefore construct a fifth measure (D_5) to deal with this issue for the specification on underpricing. This is defined as the negative of the ratio of the investor's holdings in the IPO firm over the total estimated wealth of the investor. We estimate the total wealth of investor by using tax records and the information

[13] We also tried alternative definition based on correlation with the non-IPO part of the investor' portfolio. The results are not qualitatively different from the ones reported.
[14] For more information see www.scb.se .

based on the wealth tax declarations. Indeed, investors in Sweden are required to pay 1.5% tax on wealth in excess of 800K SEK. Data were collected manually in the Swedish Tax office; for this reason we had to limit this data to firms that went public, thus it applies only to the underpricing tests. Moreover, we also consider a set of specifications in which the simple diversification measures (D_1 to D_4) are interacted with -D_5. That is, the degree of diversification of the investors is scaled up by the fraction of the investor's wealth in the company. The higher is D_5, i.e. the more is at stake, the degree of diversification (or the lack of it) of the investor should matter more.

All the proxies, D_1 to D_5, are constructed first at the investor level and then aggregated at the firm level by averaging the degree of diversification of each investor in the firm. We use the value-weighed average, where the weights are given by the percentage of firm cash flow rights held by each investor. We aggregate the individual measures for subsets of investors: two partitions are particularly relevant: institutional versus private investors, and controlling versus non-controlling ones. These partitions yield four mutually exclusive investor groups. We use the superscript "*ip*" ("*inp*") to denote the institutional investors who have a controlling (minority) stake, and the superscript "*pp*" ("*pnp*") to denote the private investors who have a controlling (minority) stake. An investor is assumed to have a controlling stake if he is member of the board or has at least 10% of the votes in the firm.

2.5 Control variables

We consider five sets of control variables, which we take from the literature on IPOs: measures of uncertainty of issuer's valuation, IPO market conditions, momentum variables, measures of general market conditions, and underwriter's reputation. The comparisons of our control variables to those in other studies are presented in Table A1.1.

We control for the uncertainty of the IPO firm valuation by including the following set of variables: the logarithm of age of the firm being taken public (*age*), its market capitalization at the close of the first trading day (*size*), a dummy that shows if the issue was backed by venture capitalist (*Venture Capital*), and the fraction of cash flow rights in the post-IPO firm offered to outside investors (*outside rights*). We also include a variable that controls for the financial solidity of the firm (*own equity*), which is defined as a ratio of equity to firm's total assets. We also include two dummies (*telecom* and *carve-out*), which take the value of 1 if the IPO is a telecom (carve-out) and zero otherwise.

We control for the IPO market conditions controls by including the average underpricing (*market underpricing*) and the number of IPOs taken place in the previous six months (*number of*

IPOs). We also include the return on the market portfolio in the previous six months (*momentum*) and its average daily standard deviation in the analogous period (*volatility*) to control for the market momentum and the riskiness of the investment environment respectively. As a response to market conditions, issuers can partially adjust the offer price (Hanley, 1993). We therefore follow the literature and include a variable that controls for this partial adjustment. This is constructed as difference between the final offer price and the offer price at the announcement of IPO scaled down by the offer price at the announcement.

Finally, we include a variable that proxies for the reputation of the underwriter (*underwriter reputation*), which are claimed to explain part of the underpricing. The variable has been constructed to represent the number of deals conducted by the leading manager over the observed period. This criterion is similar to the one used by Balvers *et al*. (1988) and Beatty, *et al*. (1998) who partition underwriters into "prestigious" and "non-prestigious" groups based on their appearance in the Top 25 annual ranking by the Institutional Investor. In Sweden, firms that appear at the top of the rankings receive most of the deals.

3. Empirical findings

3.1 Descriptive statistics and preliminary findings

The descriptive statistics about our sample are reported in Table 1. In Panel A, we describe the level of underpricing and the main financial and accounting variables of the firms being taken public. The mean underpricing is a little over 14%, which is consistent with many studies around the world, and suggests that our sample is representative. Industry distribution of the IPO firms is presented in Panel B: Business Services and Hi-Tech constitute the majority. Panel C presents the distributions of types of institutional investors in the sample: Swedish non-financial institutions dominate the sample. These include corporations, as well as VCs. Panel D reports the descriptive statistics for the main control variables as described in Section 2.5. The descriptive statistics show the substantial variation in firm characteristics. Averages are very different from medians. The average age of the firm taken public in our sample is only 15 years (median of 11), which is close to the US IPOs average of 18 (median of 8) as reported by Field and Karpoff (2002).

Table 2 focuses on our diversification measures. In Panel A, we report the descriptive statistics of shareholders' diversification, partitioned into four shareholder groups. As expected, the diversification of the private controlling investors is usually the lowest, followed by the

private non-controlling investors. In all categories there is a significant variation in the degree of diversification across firms.

Panel B shows the correlation matrix between various diversification measures for the controlling shareholders. The four measures are highly correlated within each investor group, never dropping below a 70% correlation. However, the correlation is far from perfect, suggesting that the different proxies are not redundant. The correlation of the same proxy between the institutional and private investors is very low, never exceeding 20%, thus suggesting that both of them could potentially affect the IPO process.

Panel C presents a test of differences between the firms going public and those that stay private. We first partition all firms into High and Low groups based on whether their diversification proxy is above or below the median of the entire sample. We then show that firms that stay private are only slightly more likely to be of the "High" type. On the contrary, firms that end up going public are disproportionately (by at least 15%) located in the "Low" diversification category. The degree of diversification seems to affect the decision of going public, as conjectured.

Panel D shows similar results, but from a different angle. It presents the comparison of diversification proxies before and after the IPO for firms that end up going public. Given that we observe the holdings every 6 months, "before" means the last semi-annual observation before the IPO, and "after" means the first semi-annual observation after the IPO. It is clear that private investors significantly increase their portfolio diversification. Panel D shows that following the IPO the controlling shareholders reduced their exposure to the firm that is being taken public. Out of 117 private controlling shareholders positions, 15 (i.e., 13% of the sample) sold their entire holdings at the IPO, while a further 53 (i.e., 45% of the sample) reduced them by 12% on average.[15] This suggests that private investors do use IPOs to reduce their risk exposure. Similarly, out of the 177 institutional investors positions, 111 (i.e., 67% of the sample) sold their entire holdings at the IPO, while additional 25 (15%) reduced theirs.[16]

It is worth noting that most IPOs in our sample are subject to the customary lockup period during which the original shareholders cannot sell shares. It may well be that we are underestimating the increase in the diversification of the controlling shareholders by looking at their holdings before the end of the lockup period, since we observe their holdings twice a year.

[15] If we use extended definition of insiders (both members of the board of directors and 10% stakeholders), we observe that 13% exits at IPO, while 26% reduce their holdings at IPO.

[16] Notice that in our data "sale" is defined as a reduction in holdings. Thus a VC fund that distributes the shares to the Limited Partners would be classified as selling the shares. We discuss this issue more later.

To test this hypothesis we repeat the test in Table 2 Panel D, looking at the difference between the post-IPO diversification of controlling shareholders before and after the customary 6-months lock-up period expires. The results (not reported) show that there is no further difference in the degree of diversification, suggesting that our earlier findings are not affected by the lock-up restriction. It turns out that only 1 (3) individuals (institutions) sold their entire holdings during that period, and 3 (6) further reduced their holdings, following the expiration of the lockup. This is consistent with the evidence provided by Holmen and Hogfeld (2004).

In the Appendix, we provide some evidence of the difference between the rate of return required by the shareholders – depending on their degree of portfolio diversification – and that of fully diversified shareholders – constructed according to the market portfolio. We use a methodology based on the Fama-French three-factor pricing model, similar to the one adopted by the ADR literature (e.g., Karolyi, 1998). [17] The undiversified shareholders' required rate of return depends on the degree of diversification of their portfolios. It is always the case that the rate of return required by the main classes of investors holding shares in the firm before the IPO, being private investors or institutions, controlling or minority shareholders, is higher than that required by the market (i.e., diversified investors). This difference is always strongly statistically significant, both in terms of mean and median tests.

This suggests that the existing shareholders have a significantly higher required rate of return than the fully diversified shareholder. That is, a variation in the degree of diversification may create significant variation in the size of the surplus. A large variation in diversification may translate into a large variation in the propensity to undergo an IPO, and in the degree of underpricing, which we may be able to capture in the data. In the next section we proceed to test these hypotheses.

3.2 Probability of an IPO and portfolio diversification

The decision to go public has been the subject of many studies. We consider the specification used by Pagano, Panetta, and Zingales (1998), adding our measures of portfolio diversification. In particular, we estimate the probit model:

$$l_i^* = \alpha_1 + \beta_1 D_i + \gamma_1 C_{1,i} + \varepsilon_{1,i}, \qquad (9)$$

[17] The results based on one factor model are similar and are omitted for brevity. We did not use four-factor model. As it was shown by Rouwenhorst (1998), the momentum effect in Sweden is negligible.

where, for the i^{th} firm, l_i^* is a latent unobservable variable that represents the decision to list the firm. In practice we observe l_i, a dummy that takes the value of 1 if the firm is listed and zero otherwise. That is, $l_i = 1$ if $l_i^* > 0$ and $l_i = 0$ if $l_i^* \leq 0$. The probability of listing ($Prob(l_i=1)$) is modeled as a normal c.d.f. All the other variables are defined as before. The estimates are based on a robust variance-covariance matrix.

We use an expanded dataset that contains all the non-listed firms that are similar (in terms of size and industry) to the one being taken public. It includes a total of 1,309 firms/observations for non-listed firms. For these firms, we construct all the control variables as defined before. $C_{1,i}$ is the vector of control variables defined above and D_i is one of our measures of portfolio diversification. Recall that Hypothesis 1 requires that $\beta_1 < 0$; i.e. more diversified firms should be less prone to initiate an IPO. The results are reported in Table 3. We report three different specifications, based on the different measures of portfolio diversification, to test the robustness of results.

In Panel A, we report the results for the measures of portfolio diversification based on value-weighted average among investors with controlling rights in excess of 10% using the entire set of IPOs. We use as weights the fraction of the firm capital held by the shareholders. For robustness, we also considered a smaller sample of larger firms (assets exceeding 50 Mln. SEK); the results are reported in Panel B. In Panel C we report the results for the measures of portfolio diversification based on the value-weighed average for all the controlling shareholders (either having controlling rights in excess of 10% or sitting on the board of directors). We also considered specifications based on industry fixed effects and using simple average of individuals' measures of portfolio diversification (not reported). The results are qualitatively similar to those reported.

The results show a strong and negative correlation ($\beta_1 < 0$) between the degree of the controlling shareholders' portfolio diversification, D_1 - D_4, and the probability of going public. As predicted, more diversified shareholders are less likely to initiate an IPO. These results are consistent across our diversification measures, and the effect is quite strong.[18] In particular, if we concentrate on Panel A, the effect of a one standard deviation change in the diversification measure for private individuals results in a 2.26% reduction in the IPO probability for D_1 (3.46%,

[18] The results in Panel C are weaker as expected. The degree of diversification of the directors without significant holdings in the firm should not affect their decisions, thus introducing additional noise. This also suggests that it is only the shareholders with significant control make the IPO decision.

3.32% and 3.10%, respectively, for D_2, D_3, and D_4).[19] The unconditional probability of going public in our sample is 8.65%, which means that diversification explains a significant part of the reported variation, making it an economically as well as statistically significant feature of the IPO process. The corresponding marginal effects for institutional investors are smaller. They are about 1.19% if we consider D_1 and 2.27%, 2.15% and 1.68% for the D_2, D_3, and D_4, respectively.

3.3 Underpricing and portfolio diversification

Next we relate the degree of underpricing to portfolio diversification. We estimate:

$$u_i = \alpha_2 + \beta_2 D_i + \gamma_2 C_{1,i} + \varepsilon_{2,i}, \qquad (10)$$

where u_i is the underpricing for the i[th] firm being taken public, $C_{2,i}$ is the vector of control variables defined above and D_i is one of our measures of portfolio diversification for the controlling shareholders. Equation (10) is estimated by using a heteroskedasticity-consistent estimator and the estimates are robust and the errors have been clustered at the industry level. [20] We consider the five measures of diversification, (D_1-D_5), and the interaction between the simple measures of diversification (D_1-D_4) and -D_5. As we mentioned before, this allows us to control for the importance that the firm being taken public plays in the portfolio of the investor. It effectively accounts for the amount at stake. The results are reported in Table 4.

Recall that Hypothesis 2 predicts $\beta_2 < 0$. We consider three alternative specifications, based on the different measures of portfolio diversification described in section 2.3. In Panel A, we report the results for the measures of portfolio diversification based on the value-weighted averages, considering only the investors with a controlling stake at least equal to 10% of the voting rights. In Panel B, the results for the measures of portfolio diversification based on the value-weighted averages for the wider definition of the controlling shareholders.[21]

---

[19] When we estimate the impact that one standard deviation in our measure D_i has on probability of going public decision marginal effect for this variable is multiplied by its standard deviation. Marginal effect in probit analysis $\frac{\partial p}{\partial D_i}$ is calculated as $f(Z)\cdot\beta_i$, where $f(Z)=\left(\frac{1}{\sqrt{2\pi}}exp(-\frac{1}{2}Z^2)\right)$, Z is a right hand side of the probit equation evaluated at variables' means and β_i is the coefficient on D_i . .

[20] We report the clustered results. The non clustered ones are significant and available upon request.

[21] As a robustness check, we also estimate a specification in which we restrict the sample to the IPO firms that have at least 50 million SEK in assets (roughly $5 Mln). The results are consistent with the ones reported and available upon request.

The results clearly show that underpricing declines in the degree of diversification, as predicted: $\beta_2 < 0$. That is, more diversified controlling shareholders require a higher price (lower underpricing), while less diversified are willing to settle for a lower one (higher underpricing). This is true for all our measures of diversification for the private controlling shareholders; and in seven out of nine of them the relationship is significant at 5% level (in another two cases it is significant at 10% level). In terms of economic significance, a one standard deviation increase in the degree of portfolio diversification of the private institutional controlling shareholders reduces underpricing from its unconditional mean of 14.2% to 8.5% if we consider D_1, and to 6.9%, 8.1%, 8.1%, and 8.5% for D_2-D_5, respectively. Analogous results hold in the case of the specifications in which the simple measures of diversification have been interacted with the percentage value of the IPO in the overall wealth of the investor (i.e.,-D_5). As in the previous section, our results are the strongest in the case of a narrow definition of insiders and weaken (although remain statistically and economically significant) for the case of a wider definition, which introduces additional noise

We then replicate the same estimation procedure with the non-controlling shareholders (using the stricter definition as in Panel A) and find no relation between their diversification and the degree of underpricing (the results are reported in Panels C of Table 4). The comparison clearly indicates that it is the diversification of the controlling shareholders that matters since they determine whether to take the firm public and its offer price.

An interesting result is that the negative relationship is entirely due to private controlling investors. The diversification of institutions with a controlling stake, while strongly affecting the decision to go public (see Table 3), does not seem to affect the issue price. These findings are consistent across specifications and may arise for two reasons. First, it may be that the estimation of Equation (10) does not account for a potential selection bias: the same factors that determine the underpricing may also determine the probability of the firm being taken public. We address this issue below.

Alternatively, our findings may be due to the fact that among the institutional investors with controlling stakes there are many Venture Capital and Private Equity Funds, while the private investors are mostly the original inventors or entrepreneurs. The former may not even sell at the IPO, yet become fully diversified by distributing their shares to the Limited Partners in the fund using market prices (see Gompers and Lerner 1998). Such VCs do not really suffer from the underpricing. Those VCs that do sell part of their holdings at the IPO, realize that they play a repeated game vis-à-vis the market, thus are willing to forego some of the current gains to

increase the probability of the next successful exit.[22] The private investors are much more likely to sell some of their shares at the IPO, and usually view it as a one-shot game, which makes them less willing to make concessions. This would mean that non-diversified VCs (and PE funds) as well as the private owners would push for a quicker exit, while the underpricing is more likely to be set by the degree of diversification of private shareholders.

It is worth noting that these findings are consistent with Hypothesis 1, which states that less diversified investors are more likely to push for an IPO than the more diversified ones. The statement above simply argues that the tradeoffs between the quicker exit (an IPO) and a higher price, conditional on exit, differ between the institutions (especially VCs) and the private investors.

3.4 Selection bias and underpricing

In the previous section we directly related underpricing to investor characteristics and a set of control variables. It is however, possible that the very same variables that determine the probability of the IPO, also determine the size of the underpricing. This may generate a sample selection problem. To address this issue we resort to an econometric specification that explicitly controls for it. Let us assume that:

$$l_i^* = \alpha_1 + \beta_1 D_{1i} + \gamma_1 C_{1i} + \varepsilon_{1i} \qquad (11)$$

$$u_i^* = \alpha_2 + \beta_2 D_{1i} + \gamma_2 C_{2i} + \varepsilon_{2i} \ . \qquad (12)$$

We also know that $u = u_i^*, l_i = 1$ if $l_i^* > 0$ and that u_i is not observed and $l_i = 0$ if $l_i^* \leq 0$. Equation (12) represents the level of underpricing, conditional on the firm being taken public and equation (11) represents the probability that such IPO takes place. This specification captures the fact that we do not observe the underpricing for firms that are not taken public. However, the

[22] It is well known that General Partners at VCs are very sensitive to timely exits, one reason being that they have to sell their shares (usually at a discount) in firms that did not get an exit at the time the fund is liquidated. In some cases they have to forego their shares in such firms entirely (see Kandel, Leshinskii and Yuklea 2005). GPs, who make all the decisions in the VC funds, are very much interested in raising their next fund, which is dependent on their success rate (exits) and less on the exact return they had delivered. Gompers (1996) shows that younger VCs, for whom establishing reputation is more important, are pushing for earlier IPOs an dare willing to tolerate higher underpricing than their more established peers. Lin and Smith (1998) hypothesize that VCs would like to establish the reputation for not selling overpriced shares and are willing to tolerate underpricing. They find evidence consistent with this hypothesis. In both cases VCs are worried about reputation. This consideration is largely absent for most private investors, which also leads to our conjecture above.

probability of being taken public is itself a function of the some of the explanatory variables that affect the premium. We assume the following correlation structure:

$$\begin{pmatrix} \varepsilon_{1i} \\ \varepsilon_{2i} \end{pmatrix} \approx NID\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{matrix} \sigma_1^2 & \sigma_{12} \\ \sigma_{12} & \sigma_2^2 \end{matrix} \right).$$

In this case, the standard OLS estimates of equation (12) are biased (Maddala, 1983). We, therefore, adopt the Heckman (1979) two-stage procedure. We first estimate equation (11) using a standard probit choice model, and then we estimate:

$$u_i^* = \alpha_2 + \beta_2 D_j + \gamma_2 C_{2i} + \delta\lambda_i + \varepsilon_{2i} \qquad (13)$$

where $\lambda_i = \dfrac{\phi(\alpha_1 + \beta_1 O_{1i} + \gamma_1 C_{1i})}{\Phi(\alpha_1 + \beta_1 O_{1i} + \gamma_1 C_{1i})}$ is the Heckman's Lambda and is estimated from the results of the first stage. In equation (13) the standard errors are corrected for heteroskedasticity and selection bias (Greene, 1981). The value and significance of the δ provides a test of the null of no sample selection bias.

The results are reported in Table 5. As in the previous section, we consider nine different specifications, based on the different measures of portfolio diversification. The results show two important points. First, selection bias seem to be important, since the coefficient of Heckman's Lambda is almost always significant. While the ownership variables are significant as in table 4, point estimate are consistently larger in absolute values (by 15-40%). However, qualitatively our results stay the same. Indeed, underpricing is negatively related to the degree of diversification of the shareholders before the IPO. This holds in across specifications of the diversification proxies and control variables.

As in the previous section, the negative relationship is restricted to private controlling shareholders, while the institutional controlling investors do not seem to play a role. These findings provide a useful robustness check and show that the underpricing of an IPO can be partially explained by the degree of diversification of the private controlling shareholders. In particular, an increase of a one standard deviation of the degree of portfolio diversification of the private controlling shareholders reduces the underpricing from its unconditional mean of 14.2% to 5.3 - 7.7% depending on the choice of the diversification measure we use. Analogous results hold when the simple measures of diversification are interacted with, $-D_5$; the percentage value of the IPO in the overall wealth of the investor. This suggests that diversification has a significant economic effect on the IPO underpricing.

4. Robustness

We now discuss the robustness of our results to alternative factors related to an IPO. We focus on the need to raise capital for investments, and on the desire to make the shareholders' portfolio more liquid.

Raising New Capital Versus Diversifying the Portfolio.

Pagano, Panetta, and Zingales (1998) argue that the main reason for the IPOs is the desire of the shareholders to make their holdings liquid. While Kim and Weisbach (2005) argue that raising new capital for investments is the main motive for the IPOs, at the same time they concede that liquidity considerations may be important as well. They show that while some firms issue only primary shares, which raise capital, others also offer secondary shares that were already held by the insiders. We add the desire for the diversification as another potential driver of an IPO.

Following Kim and Weisbach (2005), we assume in the model that primary issues, γ, are mostly related to the desire to grow and expand and are not correlated with the desire to diversify. Therefore, primary capital should not be related to shareholder diversification, but driven by the investments needs (or by debt repayment obligations). We, therefore, do not expect to see a correlation between the number of the primary shares issued, and the degree of diversification of the existing controlling shareholders.

In the case of secondary issue, α, the story may be different. Indeed, the fraction of the original shareholders holdings in the firm that is sold at the IPO increases their post-IPO portfolio diversification. Consequently, we expect to observe a positive correlation between the fraction of the secondary shares issued, and the degree of diversification. However, as many other

considerations, such as control of the firm, expectations about the future value, and signaling to the market, may drive the decision on α, given the choice of γ; the effect of the degree of diversification on α may significantly weaken.

The relation between α and underpricing may be weak as well. The timing of the IPO decisions is as follows: first, the firm observes its capital requirements and decides whether it needs to raise money in the IPO. If the answer is strongly positive, then the entire process is likely to be driven by these considerations, leaving the diversification in the background. If capital requirements are not the main driver for the reason to go public, then the diversification and other issues come to play. In either case, the decision about the choice of α is made when preparing the prospectus, which is before the information about the demand for the IPO is realized. In term of the model this means that $P(f)$ is not known when α is chosen. Therefore, considering the choice of α as exogenous when f (or **P**) is chosen may not be far from reality.

We evaluate the relation between the primary and secondary capital and the diversification by first comparing the firms that differ in terms of the types of shares they issue. We calculate for each IPO the ratio of the number of new shares issued (primary capital) to the total number of shares outstanding prior to the IPO; as well as the ratio of the number of shares sold by the existing shareholders to the total number of shares outstanding before the IPO. These are the γ and α from the model. Panel A of Table 6 presents univariate statistics for all the diversification measures for private shareholders (the ones that affect underpricing the most), while partitioning the IPO firms into two groups in three different ways. First, we partition the sample into High (above the median) and Low (below the median) by the amount of primary capital, γ, they raise. Then we do the same with the secondary shares, α, and finally we partition the sample into firms that sell some secondary shares and those that don't sell any.

The results show that firms with different γ do not display statistically or economically significant differences in the prior diversification of their shareholders. This holds for all five measures of diversification. In the case of secondary capital the same result obtains for D_1, D_3, and D_5, however for D_2 and D_4 there seems to be a larger difference, which is marginally significant. Firms that sell more secondary shares seem to be less diversified, however very slightly so. These differences disappear when we partition the sample into the sellers of their shares, and those that either keep them or buy more shares at the IPO.[23] There does not seem to be a significant relation between the amount of secondary capital and the degree of diversification.

[23] Controlling shareholders of four firms in the sample actually increased their holdings following the IPO.

We then run the underpricing regression from Table 4 Panel A using the partition of the sample into firms that sell some secondary shares (86 firms) and those that don't (34 firms). The results are in Panel B of Table 6. In firms that sold secondary shares, the effect of diversification on pricing is reinforced; however for the firms that did not sell any shares the result disappears. The coefficient becomes insignificant, and in some cases even changes sign. One has to be cautious, given the small sample size, but these findings are consistent with the prediction that the effect of the degree of diversification on underpricing should manifest itself in firms that exhibit some desire to diversify, i.e. sell some secondary shares. For the remaining firms the driving force behind the IPO is the need to raise capital, thus diversification plays no role.

This begs a question whether our results capture the effect of diversification on underpricing, or alternatively, whether the diversification directly affects α, while α determines the degree of underpricing. To test this hypothesis we run two sets of regressions: one is a regression of α on the diversification measures, and the other is the same as the regression in Table 5, but replacing the diversification measures with α. The first regression does not yield any discernible relation between the diversification and α, which is consistent with Panel A of Table 6. In the second regression the coefficient of α is not significant. In both regressions the relevant point estimates are negative, thus the indirect effect, which should have been the product of the two, cannot be negative. This suggests that the results in Table 5 capture the direct effect of diversification on underpricing.[24] We do not report the results of these regressions to save space.

Liquidity

Amihud and Mendelson (1988) and Pagano, Panetta and Zingales (1998) argue that one of the most important features of an IPO is that it dramatically increases the liquidity of the firm's shares, thus increasing its value[25]. This argument is similar to ours: in both cases the post-IPO outside investor values the stock more than the pre-IPO insider. Consequently, we cannot rule out that the demand for liquidity may be partly responsible for the results that we observe, along with the demand for diversification. Listing the stock on an exchange creates the potential for diversification, while selling the secondary shares utilizes this potential. The former does not require the latter, and the latter can take place without the former, however, in practice these are very much related.

[24] We had also tried to include α in the regression in Table 5 (not reported), but its coefficient was not significant in the presence of the diversification measures.
[25] We would like to thank Y.Amihud for suggesting this line of inquiry to us.

While we would like to test the liquidity hypothesis separately, unfortunately, we do not observe investors' holdings of cash and bonds, does not allow us to estimate the liquidity of their overall portfolio. The effects of diversification are much less sensitive to these omissions. Not surprisingly, the liquidity of the equity portfolio for shareholders in our sample increases significantly following the IPO.

5. Conclusion

We study IPOs from a new perspective, by focusing on the degree of portfolio diversification of the shareholders taking the firm public. We argue that a less diversified shareholder is willing to accept a lower price for the sale of shares than a more diversified shareholder. At the same time higher idiosyncratic risk induces shareholders to rebalance their portfolio. This implies that the more undiversified the shareholder is, the more willing he is to diversify by taking the firm public.

We test these hypotheses by considering all the IPOs that took place in Sweden in the period 1995-2001. We construct measures of portfolio diversification of the holders of the stocks of the firms being taken public, before the IPO and then we relate them to the probability of the IPO and the underpricing of the IPO. We find that the degree of portfolio diversification of the main shareholders matters. The probability of the firm being taken public is negatively related to the degree of diversification of the controlling institutional shareholders. We also show that there is a negative and significant correlation between the level of underpricing and the degree of diversification of the controlling private shareholders. These results are robust across alternative specifications and different measures of the degree of shareholder portfolio diversification and after controlling for selection bias.

These findings shed additional light on the IPO process using a very basic concept in finance – the benefits of portfolio diversification.

References

Allen, F. and G. Faulhaber (1989): ”Signalling by Underpricing in the IPO Market”, Journal of Financial Economics, 23, 303-323.

Amihud, Y. and H. Mendelson, (1988): Liquidity and Asset Prices: Financial Management Implications, Financial Management, Spring, 5-15.

Balvers, R.J, McDonald, B. and Miller, R.E., (1988): Underpricing new issues and the choice of auditor as a signal of investment banker reputation. The Accounting Review, 63, 605-622.

Beatty, R.P., Bunsis, H. and J.R.M Hand, (1998): The indirect economic penalties in SEC investigations underwriters, Journal of Financial Economics, 50, 151-186.

Benveniste, L. and P. Spindt (1989): ”How Investment Bankers Determine the Offer Price and Allocation of New Issues”, Journal of Financial Economics, 24, 343-361

Benveniste, L. and W. Wilhelm (1990): ”A Comparative Analysis of IPO Proceeds Under Alternative Regulatory Environments”, Journal of Financial Economics, 28, 173-207

Black, B.S. and R. J. Gilson (1998): ”Venture Capital and the Structure of Capital Markets: Banks versus Stock Markets”, Journal of Financial Economic, 47, 243-277

Booth, James R.; Chua, Lena (1996): “Ownership Dispersion, Costly Information, and IPO Underpricing”, Journal of Financial Economics, 41, 291-310.

Chemmanur, T. J. (1993): ”The Pricing of Initial Public Offerings: A Dynamic Model with Information Production”, Journal of Finance, 48, 285-304

Chemmanur, T. J. and P. Fulghieri (1994): ”Investment Banker Reputation, Information Production, and Financial Intermediation”, Journal of Finance, 49, 57-79

Chemmanur, T. J. and P. Fulghieri (1999): ”A theory of the going-public decision”, The Review of Financial Studies, 12, 57-79

Cornelli, F. and D. Goldreich (2002): ”Bookbuilding: How Informative is the Order Book?”, Journal of Finance, 58, 1415-1444

Edelen, R.M. and Kadlec, G.B., (2003): Issuer Surplus and the Partial Adjustment of IPO Prices to Public Information, Mimeo.

Ellis, K., R. Michaely, and M. O’Hara (2000): ”The Accuracy of Trade Classification Rules: Evidence from NASDAQ”, Journal of Financial and Quantative Analysis, 35, 529-551

Ellul, A., and M. Pagano (2003). "IPO underpricing and after-market liquidity," CSEF Working Papers 99, Centre for Studies in Economics and Finance (CSEF), University of Salerno, Italy.

Faccio, M. and L. Lang (2002): ”The Ultimate Ownership of Western European Corporations”, Journal of Financial Economics, 65, 365-395

Field, L.C., and J. M. Karpoff, (2002): “Takeover defences at IPO firms”, *Journal of Finance*, 57, 1857–1889.

Jenkinson, T. and Ljungqvist, A. (2001): Going Public: The Theory and Evidence on How Companies Raise Equity Finance, Second Edition, Oxford University Press.

Goetzmann, W. and A. Kumar (2002): ”Equity Portfolio Diversification”, NBER Working Paper No. 8686.

Gompers, P, (1996) "Grandstanding in the Venture Capital Industry," Journal of Financial Economics, 43, pp. 133-156.

Gompers, P. and J. Lerner, (1998) “Venture Capital Distributions: Short-Run and Long-Run Reactions”, *The Journal of Finance*, Vol. 53, No. 6, pp. 2161-2183.

Greene, W. H. (1981): ” On the Asymptotic Bias of the Ordinary Least Squares Estimator of the Tobit Model”, Econometrica, 49, 505-513

Habib, M. and A. Ljungqvist (2001): ”Underpricing and Entrepreneurial Wealth Losses in IPOs: Theory and Evidence”, Review of Financial Studies, 14, 433-458.

Hanley, K., (1993): “Underpricing of initial public offerings and the partial adjustment Phenomenon”, *Journal of Financial Economics*, 34, 231-250.

Heckman, J. (1979): ”Sample Selection Bias as a Specification Error”, Econometrica, 47, 153-161

Holmén,M. and P. Högfeldt, (2004): “Law and Finance analysis of Initial Public Offerings”, *Journal of Financial Intermediation*, 13, 324–358.

Hughes, P. and A. Thakor (1992): ”Litigation Risk, Intermediation and the Underpricing of Initial Public Offerings”, Review of Financial Studies, 5, 709-742

Kandel, E., D. Leschinskii, and H. Yuklea, VC Fund's Limited Horizon as a Source of Inefficiency, W.P., Hebrew University.

Karolyi, G.A., 1998, Why do firms list shares abroad? A survey of the evidence and its managerial implications, *Financial Markets, Institutions & Instruments* 7, 3-12.

Kim, Woojin and Weisbach, Michael S., "Do firms Go Public to Raise Capital?" (February 22, 2005). Mimeo.

Krigman, L., W. Shaw, and K. Womack (1999): ”The Persistence of IPO Mispricing and the Predictive Power of Flipping”, Journal of Finance, 54, 1015-1044.

Leland, H.E. and D.H. Pyle, (1977): Informational Asymmetries, Financial Structure, and Financial Intermediation, Journal of Finance, 32, 371-388.

Loughran, T., and J. R. Ritter (2002): ”Why Don’t Issuers Get Upset About Leaving Money on the Table in the IPOs?”, Review of Financial Studies, 15, 413-443.

Loughran, T., and J. R. Ritter (2004): ”Why Has IPO Underpricing Changed Over Time?”, Mimeo.

Ljungqvist, A., and W.J. Wilhelm, (2003), \IPO pricing in the dot-com bubble", Journal of Finance, forthcoming.

Maddala, G. S. (1983): ”Limited-Dependent and Qualitative Variables in Econometrics”, Cambridge, MA: Cambridge University Press

Pagano, M., Panetta, F. and L. Zingales, (1998): "Why do firms go public? An empirical analysis", Journal of Finance, 53, 27-65.

Ritter, J. R. and I. Welch (2002): ”A Review of IPO Activity, Pricing and Allocations”, Journal of Finance, 57, 1795-1828.

Rock, K. (1986): ”Why New Issues Are Underpriced”, Journal of Financial Economics, 15, 187-212.

Rocholl, J. (2004): “The private benefits of listing”, Mimeo.

Rouwenhorst, K. G. (1998): “International momentum strategies”, *Journal of Finance,* 53, 267-284.

Sarin, A., J. Koeplin, and A.C. Shapiro, (2000): ”The Private firm Discount”, Journal of Applied Corporate Finance, Vol. 12, No. 4, Winter.

Sherman, A. E. (2000): ”IPO’s and Long-Term Relationships: An Advantage of Book Building”, Review of Financial Studies, 13, 697-714

Sherman, A.E. and S. Titman (2002): ”Building the IPO Order Book: Underpricing and Participation Limits With Costly Information”, Journal of Financial Economics, 65, 3-29

Smith, R.L., and T. Lin (1998) "The Unwinding of Venture Capital Investments: Insider Selling During Equity IPOs," Journal of Corporate Finance, 4, pp. 241-263.

Stoughton, N. and J. Zechner (1998): ”IPO-Mechanisms, Monitoring and Ownership Structure”, Journal of Financial Economics, 2, 251-271.

Sundin, A. and Sundquist, S.I., (2002): "Owners and power in Sweden's listed firms", SIS, Agarservice, 1986-2002.

Welch, I. (1989): ”Seasoned Offerings, Imitation Costs, and the Underpricing of the Initial Public Offerings”, Journal of Finance, 44, 421-449

Welch, I. (1992): ”Sequential Sales, Learning, and Cascades”, Journal of Finance, 47, 695-732

Zingales, L. (1995): ”Insider Ownership and the Decision to Go Public”, The Review of Economic Studies, 62, 425-448

Appendix 1

In this appendix, we focus on shareholders' required rate of return, as a function of the degree of diversification of the shareholders. We report the required rate of return of the firm's shareholders and compare it to the required rate of return for a well-diversified shareholder before the IPO. We calculate the diversified required rate of return using the Fama-French three-factor pricing model. We construct the undiversified required rate in the following way. For each investor, we calculate the "beta" between the return on the stock and the average return on the investor portfolio. This is then multiplied by the excess return of the investor portfolio over the riskless rate (3 month Swedish T-bill). Then, the required rate of return for each investor is aggregated across all the shareholders of each taken public firm. We consider a breakdown for institutional and private investors as well as for controlling and minority shareholders. We estimate the parameters using either 36 or 60 months. Let us, for example, consider the required rate of return of the controlling institutions. This is determined as follows.

First, we identify the institutions with controlling power among the shareholders. Then, for each of them, we calculate their required rate of return on the basis of their portfolio holdings. Finally, we construct the aggregate required rate of return for the institutions with controlling power by averaging the required rate of returns individually constructed for all the controlling institutions. Both in the case of diversified and undiversified shareholders, the return on the firm stock before the IPO as well as the return of all stocks held in the portfolio of the investors which are not listed, are proxied by the return on "similar" (in terms of size and book-to-market) listed stocks. We use two criteria to select such firms: a) we first select firms with a market capitalization within 30% of the market capitalization of the firm at the date of IPO; b) among the firms satisfying condition a) we pick those that have the book-to-market ratio closest to the book-to-market ratio of the firm going public[26]. We report the *mean values* of the estimates of the required rates of return, the t-*stat* and the significance levels (one-sided) for the *mean test*, *Wilcoxon z-score* and significance level (one-sided) for *median test* of the undiversified required rate of return of particular group of investors being larger than that required by diversified investors. We report in Table A1.1 the difference between the required rate of return of different classes of shareholders as a function of their degree of diversification.

Appendix 2

We summarize here the definitions of our proxies for the degree of diversification.

1. D_1 is defined as follows:

$$D_1 = -\sum_{i=1}^{N}(w_i - w_{mkt})^2$$

   where w_i is the weight of the stock in the portfolio of the investor and w_{mkt} is the weight of the same stock in the market portfolio.
2. D_2 is the correlation of the return of the industry portfolio to which the IPO firm belongs (R_{indipo}), with the return of the total shareholder's portfolio, multiplied by –1. We construct the industry return as a weighted average of the returns of all the publicly traded firms in the same SNI92[27] industrial category, weighed by their market capitalization. This classification contains 12 industries.

[26] Average (median) control firm is 3.98% (5.07%) smaller in terms of market capitalization and has book-to-market ratio lower by 0.057 (0.042).

[27] For more information see www.scb.se

$$D_2 = -corr\left(R_{indipo}, \sum_{i=1}^{N} w_i R_i \right)$$

3. D_3 is the negative of the percentage of the portfolio of the investor allocated to the firm being taken public:

$$D_3 = -w_{i=ipo} .$$

4. D_4 is the negative of the percentage of the portfolio of the investor allocated to the industry to which the firm in question belongs.

$$D_4 = -\sum_{i=1}^{N} \delta\left(industry_i = industry_{ipo}\right) w_i .$$

5. D_5 is the negative of the ratio of IPO firm wealth (estimated at first trading day close as number of shares times close price) in total non-equity estimated wealth of investor in the fiscal year prior to IPO (W(t-1)) plus equity wealth estimated at IPO first trading day close. We estimate non-equity wealth of investor using tax records and the fact that individual investors in Sweden are required to pay 1.5% tax on wealth in excess of 800K SEK. We made adjustments to peculiarities of tax legislation (only shares of the firms listed on primary list of Stockholm Stock Exchange are subject to wealth tax). In practice, W(t-1) contains real estate, valuables, boats, bond holdings and bank account balances.

$$D_5 = -\frac{N_{IPOshares} P_{ipo,t0}}{W(t-1) + \sum_{i=1}^{N} N_{shares,i} P_{i,t0}}$$

Table A2.1 summarizes the control variables used in various IPO underpricing studies.

Table 1: Descriptive statistics for the firms going public

Panel A reports some descriptive statistics for the underpricing and main financial and accounting variables of the taken public firms. The data are obtained from the SIX Trust Database and the Market Manager Partners Databases. *Underpricing* is defined as the difference between the first-day close and offer price normalized by the offer price. *Size* is defined as the market capitalization of the firm (in *Mln.* of SEK) on the first trading day (during the period of our sample the exchange rate varied between 7 and 10 SEK per USD). *Mkt/bk* is market-to-book value of the firm at the closest end of January/June date after the IPO. *Total assets* and *ROA* are, respectively, the total accounting value of the firm assets and the return on total assets at the closest available date before the IPO. *Own equity* is defined as a ratio of the firm own equity to firm total assets. *Panel B* reports the distribution of IPOs over industries based on SNI92 classification. *Panel C* reports the distribution of institutional investors by type. *Panel* D displays the descriptive statistics for the control variables we use in our regressions. We report the following variables: *age* – time in years from the registration of the IPO firm to its IPO date, *outside rights* – fraction of the cash flow rights offered to the outside investors at the IPO, *telecom* and *carve-out* – telecom industry dummy and carve-out dummy, *market underpricing* and *number of IPOs* – average underpricing and number of IPOs over the previous six months period, *momentum* and *volatility* – total return and average daily standard deviation on the market portfolio in the previous six months, *underwriter reputation* – the highest number of deal conducted by the leading manager over the observed period. Venture Capital takes a value of 1 if the firm has venture capitalists among their major shareholders, 0 otherwise. Partial Adjustment (Hanley, 1993) is defined as the difference between the final offer price and the offer price at the announcement of IPO scaled down by the offer price at the announcement. Offer price at the announcement is taken from IPO prospectuses. In case only a price interval is indicated offer price at the announcement is defined as the mean value of the price interval. Leverage is a ratio of long term debt to total assets of the firm. Primary capital is defined as IPO proceeds that resulted from sale of new equity. Total capital is defined as IPO proceeds that resulted from sale of both new and seasoned (existing) equity. α is defined as the ratio of secondary equity sold at IPO to total equity existed before IPO. γ is defined as the ratio of primary capital sold at IPO to existing equity before IPO.

Panel A: Underpricing, underperformance, main financial and accounting variables

Variable	Mean	Median	StdDev	Interquartile Range	Minimum	Maximum
Underpricing	0.142	0.075	0.324	0.204	-0.467	2.435
Size (Mln. SEK)	1915	512	4814	1431	20	32995
Mkt/bk	4.73	3.76	3.29	3.07	0.57	18.47
Total assets (Mln. SEK)	753	114	3649	249	15	38232
ROA	0.012	0.015	0.315	0.184	-2.646	0.713
Own equity	0.655	0.689	0.242	0.354	0.076	0.999

Panel B: Distribution of IPO's by industry

Industry	Number	%
Mining and heavy machinery manufacturing	11	9%
Other manufacturing	7	6%
Trade	12	10%
Transport	5	4%
Financials	3	2%
Business services	51	41%
High tech	32	26%
News and entertainment	3	2%
Total	124	100%

Panel C: Distribution of Institutional Investors by Type

Type of Institution	Number of IPO	Percentage in the Sample	Percentage of the IPO value
Foreign non-financial	16	9.04%	12.23%
Foreign financial	16	9.04%	9.64%
Swedish non-financial	82	46.32%	46.13%
Swedish financial	59	33.33%	30.71%
Others	4	2.26%	1.28%

Panel D: Control variables

Variable	Mean	Median	StdDev	Interquartile Range	Minimum	Maximum
Age	15.089	11.000	16.088	9.500	1.000	96.000
Outside Rights	0.351	0.297	0.177	0.226	0.045	0.855
Telecom Dummy	0.250	0.000	0.435	0.500	0.000	1.000
Carve-Out Dummy	0.194	0.000	0.397	0.000	0.000	1.000
Market Underpricing	0.160	0.127	0.123	0.158	0.014	0.657
Number of IPOs	11.815	12.000	5.537	8.000	1.000	24.000
Momentum	0.132	0.179	0.166	0.198	-0.299	0.525
Volatility	0.013	0.011	0.004	0.007	0.007	0.022
Underwriter Reputation	15.468	12.000	8.513	15.500	2.000	27.000
Venture Capital	0.419	0.000	0.495	1.000	0.000	1.000
Partial Adjustment	0.002	0.000	0.060	0.000	-0.283	0.244
Leverage	0.366	0.317	0.263	0.388	0.001	0.890
Primary / total capital	0.679	0.750	0.382	0.502	0.000	1.649
α	0.152	0.106	0.188	0.177	0.000	0.817
γ	0.292	0.237	0.294	0.180	0.000	2.329

Table 2: Descriptive statistics on diversification proxies

Panel A reports the descriptive statistics for the average levels of diversification of the shareholders of the firms being taken public, breaking them down into institutional and private shareholders, controlling and minority shareholders. The measures of diversification are defined as follows: D_1 is the negative of the sum of squared differences between the weight a particular position has in the investor's portfolio and its weight in the market portfolio, D_2 is the average correlation of the return of the industry to which the firm belongs with the return of the rest of investor's portfolio, multiplied by –1. We construct the industry return as a weighted average of the returns of all the publicly traded firms in the same SNI92[28] industrial category, weighed by their market capitalization. The classification contains 12 industries, D_3 is the negative of the percentage of the portfolio of the investor allocated to the firm being taken public, D_4 is the negative of the percentage of the portfolio of the investor allocated to the industry to which the firm in question belongs. D_5 is the negative of the ratio of IPO firm wealth in total estimated wealth of investor. It is defined only for the firms that undertook IPO and only for controlling shareholders. These variables are constructed at the investor level and then aggregated at the firm level by averaging the degree of diversification of each investor in the firm. We consider both the simple average and the value weighed one, where the weights are given by the fraction of shares held by the investors in the firm. We consider the institutional and private investors as well as the controlling investors (for all measures) and the minority ones (for D_1-D_4). We use the superscript "*ip*" ("*inp*") to denote the institutional investors who have a controlling (minority) stake and the superscript "*pp*" ("*pnp*") to denote the private investors who have a controlling (minority) stake. An investor is assumed to have a controlling stake if he is member of the board or has at least 10% of the votes in the firm. *Panel B* displays the correlation matrix among the diversification proxies described above, but only for the controlling shareholders. *Panel C* reports the percentages of the IPO-ed and non-IPOed private firms in lower and upper half of the sample based on diversification measures D_1-D_4. We also report the result of Wilcoxon test of equality between the diversification proxies distribution of the two samples. *Panel D* reports time series changes of the degree of diversification for private and institutional investors before and after the IPO.

Panel A: Diversification Proxies

Variable	Mean	Median	StdDev	Interquartile Range	Minimum	Maximum
D_1^{ip}	-0.723	-0.858	0.316	0.580	-1.000	-0.053
D_1^{inp}	-0.757	-0.999	0.306	0.531	-1.000	-0.048
D_1^{pp}	-0.935	-0.992	0.082	0.074	-1.000	-0.205
D_1^{pnp}	-0.883	-0.998	0.183	0.225	-1.000	-0.208
D_2^{ip}	-0.625	-0.924	0.429	0.864	-1.000	0.006
D_2^{inp}	-0.470	-0.270	0.438	0.756	-1.000	0.123
D_2^{pp}	-0.721	-0.941	0.336	0.593	-1.000	-0.001
D_2^{pnp}	-0.721	-0.858	0.328	0.561	-1.000	0.081
D_3^{ip}	-0.636	-0.776	0.390	0.677	-1.000	-0.001
D_3^{inp}	-0.655	-0.995	0.407	0.767	-1.000	-0.001
D_3^{pp}	-0.926	-0.995	0.109	0.065	-1.000	-0.179
D_3^{pnp}	-0.839	-0.994	0.256	0.225	-1.000	-0.006
D_4^{ip}	-0.713	-0.845	0.329	0.472	-1.000	-0.002
D_4^{inp}	-0.741	-1.000	0.343	0.480	-1.000	-0.015
D_4^{pp}	-0.948	-0.997	0.099	0.046	-1.000	-0.231
D_4^{pnp}	-0.879	-0.999	0.209	0.180	-1.000	-0.074
D_5^{ip}	-0.636	-0.776	0.390	0.677	-1.000	-0.001
D_5^{pp}	-0.815	-0.835	0.130	0.191	-0.999	-0.034

[28] For more information see www.scb.se

Panel B: Correlations among the Diversification Proxies

Variable	D_1^{ip}	D_1^{pp}	D_2^{ip}	D_2^{pp}	D_3^{ip}	D_3^{pp}	D_4^{ip}	D_4^{pp}	D_5^{ip}
D_1^{ip}	1.000								
D_1^{pp}	0.074	1.000							
D_2^{ip}	0.740	-0.051	1.000						
D_2^{pp}	0.198	0.582	0.071	1.000					
D_3^{ip}	0.824	0.064	0.822	0.022	1.000				
D_3^{pp}	0.094	0.778	0.168	0.582	0.051	1.000			
D_4^{ip}	0.756	0.031	0.764	-0.060	0.924	0.008	1.000		
D_4^{pp}	0.055	0.899	0.142	0.539	0.021	0.845	0.028	1.000	
D_5^{ip}	0.824	0.064	0.822	0.123	1.000	0.051	0.924	0.021	1.000
D_5^{pp}	0.142	0.522	0.168	0.281	0.122	0.722	0.111	0.637	0.228

Panel C: Diversification of shareholders of firms going public versus the shareholders of other firms.

				Wilcoxon Test	
Measures of diversification	**Degree of diversification**	**% of IPO**	**% of NON-IPO**	**Z**	**Pr<Z**
D_1	Low	58.06%	49.35%	1.8542	0.0319
	High	41.94%	50.65%		
D_2	Low	58.06	49.35%	1.8310	0.0340
	High	41.94	50.65%		
D_3	Low	61.29%	49.05%	2.6054	0.0046
	High	38.71%	50.95%		
D_4	Low	58.87%	49.27%	2.0419	0.0206
	High	41.13%	50.73%		

Panel D: Test of changes in diversification before and after IPO for private and institutional investors.

	Private		Institutional	
	Wilcoxon's Z	*p-value*	*Wilcoxon's Z*	*p-value*
D_1	-1.570	0.058	-0.466	0.320
D_2	-1.821	0.035	0.215	0.822
D_3	-1.800	0.036	-1.403	0.0803
D_4	-1.675	0.047	0.038	0.4851

Table 3: Probability of an IPO and portfolio diversification

This table reports results of the probit regression of the decision to go public on our proxies of investors' diversification and a set of control variables. We report the results for firms with at least 20 mln SEK (roughly 2 Mln. USD) in total assets (Panels A and C). We also report a robustness check for firms with assets above 50 mln SEK in Panel B. In Panel A, we report the results for the measures of portfolio diversification based on value-weighted average for all shareholders with a controlling stake at least equal to 10% of the voting rights (weights are the fraction of the firm capital held by the shareholders); in Panel B we report the same measure as in Panel A, but for 50 Mln. SEK in total assets of the firm cutoff; in Panel C, the results for the measures of portfolio diversification based on the value-weighed average for all controlling shareholders. Our sample includes 124 firms which were taken public during the sample period and 277 firms which remain private (199 firms which remain private for the 50 mln SEK cut-off). The dependent variable is a dummy that takes the value 1 if the firm got listed in the observed ½ -year period and 0 otherwise. The total number of observations is 1,433 in Panels A, C and D and 1,122 in Panel B. Diversification measures and control variables are defined in Tables 1 and 2.

Panel A: Value-weighted diversification measures – all firms; controlling shareholders are those with at least 10% of voting rights)

Variable	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*
Intercept	-3.401	(-5.25)	-2.316	(-6.12)	-3.693	(-7.00)	-3.775	(-6.37)
D_1^{ip}	-0.286	(-1.77)						
D_1^{pp}	-1.850	(-3.05)						
D_2^{ip}			-0.562	(-4.72)				
D_2^{pp}			-0.760	(-5.04)				
D_3^{ip}					-0.421	(-3.21)		
D_3^{pp}					-2.234	(-4.66)		
D_4^{ip}							-0.386	(-2.51)
D_4^{pp}							-2.257	(-4.13)
Log(Assets)	-0.121	(-3.37)	-0.119	(-3.38)	-0.130	(-3.54)	-0.137	(-3.71)
ROA	0.056	(0.30)	-0.024	(-0.13)	0.015	(0.80)	0.067	(0.35)
Own equity	0.374	(1.88)	0.509	(2.48)	0.447	(2.15)	0.399	(1.95)
Time Dummies	Yes		Yes		Yes		yes	
Log likelihood	-378.639		-360.194		-360.002		-367.668	
Pseudo R^2	0.144		0.186		0.183		0.167	

Panel B: Value-weighted diversification measures – firms with assets exceeding SEK 50 mln; controlling shareholders are those with at least 10% of voting rights)

Variable	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*
Intercept	-0.877	(-2.47)	-1.082	(-3.11)	-2.467	(-4.35)	-2.509	(-4.00)
D_1^{ip}	-0.079	(-0.54)						
D_1^{pp}	-0.832	(-4.71)						
D_2^{ip}			-0.459	(-3.53)				
D_2^{pp}			-0.816	(-4.76)				
D_3^{ip}					-0.348	(-2.44)		
D_3^{pp}					-2.150	(-4.40)		
D_4^{ip}							-0.312	(-1.88)
D_4^{pp}							-2.147	(-3.84)
Log(Assets)	-0.315	(-6.66)	-0.310	(-4.57)	-0.305	(-6.45)	-0.310	(-6.58)
ROA	-0.282	(-1.10)	-0.273	(-1.06)	-0.294	(-1.16)	-0.259	(-1.02)
Own equity	0.460	(2.07)	0.520	(2.31)	0.490	(2.12)	0.455	(2.00)
Time Dummies	Yes		Yes		Yes		yes	
Log likelihood	-310.703		-311.354		-302.573		-304.567	
Pseudo R^2	0.203		0.201		0.224		0.219	

Panel C: Value-weighted diversification measures – all firms

Variable	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*
Intercept	-1.540	(-3.63)	-1.809	(-4.92)	-2.281	(-8.71)	-2.459	(-5.86)
D_1^{ip}	-0.342	(-2.13)						
D_1^{pp}	0.117	(0.34)						
D_2^{ip}			-0.380	(-3.28)				
D_2^{pp}			-0.250	(-1.77)				
D_3^{ip}					-0.495	(-3.86)		
D_3^{pp}					-0.677	(-2.41)		
D_4^{ip}							-0.456	(-3.02)
D_4^{pp}							-0.855	(-2.42)
Log(Assets)	-0.127	(-3.61)	-0.116	(-3.41)	-0.127	(-3.56)	-0.135	(-3.77)
ROA	0.027	(0.15)	0.010	(0.05)	-0.001	(-0.01)	0.059	(0.31)
Own equity	0.400	(2.02)	0.446	(2.25)	0.437	(2.15)	0.388	(1.93)
Time Dummies	Yes		Yes		yes		yes	
Log likelihood	-385.175		-380.076		-374.739		-377.918	
Pseudo R^2	0.098		0.110		0.129		0.115	

Table 4: Underpricing and portfolio diversification

This table presents the results of the regression of underpricing on our diversification measures. We report three sets of results, one for diversification measures equally weighted across investors with controlling stake in the firm and two for value weighted (by cash flow rights) across investors with controlling stake or sitting on the board of directors or both. In the latter case (with and without 10% of voting rights cutoff), The dependent variable is underpricing defined as the difference between the first day close and offer price normalized by the offer price. The number of observations is 124. Diversification measures and control are variables as defined in tables 1 and 2. In Panel A, we report the results for the measures of portfolio diversification based on the value-weighted average, considering only the investors with a controlling stake of at least 10% of the voting rights; in Panel B, the results for the measures of portfolio diversification based on the value-weighted average for all controlling shareholders. Panel C reports the results for value- weighted diversification measures for non-controlling shareholders. All t-statistics are adjusted for heteroscedastisity and clustering over industries.

Panel A: Value-weighted diversification measures (controlling stake >= 10% of voting rights)

	Simple Diversification Measures										Simple Diversification Measures interacted with (-D5)							
Variable	***Estimate***	***t-stat***	***Estimate***	***t-stat***	***Estimate***	***t-stat***	***Estimate***	***t-stat***	***Estimate***	***t-stat***	***Estimate***	***t-stat***	***Estimate***	***t-stat***	***Estimate***	***t-stat***	***Estimate***	***t-stat***
Intercept	-0.385	(-1.63)	-0.029	(-0.15)	-0.251	(-0.72)	-0.285	(-0.92)	-0.072	(-0.26)	0.069	(0.34)	0.029	(0.14)	0.068	(0.32)	0.070	(0.33)
D_1^{ip}	0.065	(1.25)									-0.049	(-1.69)						
D_1^{pp}	-0.698	(-5.41)									-0.255	(-7.22)						
D_2^{ip}			0.009	(0.28)									0.022	(0.88)				
D_2^{pp}			-0.232	(-4.27)									-0.227	(-7.54)				
D_3^{ip}					0.044	(1.84)									0.039	(1.43)		
D_3^{pp}					-0.531	(-2.52)									-0.245	(-9.15)		
D_4^{ip}							0.056	(1.32)									0.040	(1.42)
D_4^{pp}							-0.599	(-3.23)									-0.250	(-6.46)
D_5^{ip}									0.057	(2.49)								
D_5^{pp}									-0.411	(-2.72)								
Log(Age)	0.007	(0.28)	0.016	(0.54)	0.009	(0.37)	0.007	(0.25)	0.005	(0.22)	0.006	(0.23)	0.017	(0.55)	0.007	(0.28)	0.006	(0.24)
Outside Rights	-0.058	(-0.65)	0.014	(0.13)	-0.039	(-0.48)	-0.055	(-0.64)	-0.042	(-0.49)	-0.083	(-0.94)	-0.046	(-0.50)	-0.082	(-0.95)	-0.086	(-0.98)
Telecom Dummy	0.224	(9.00)	0.239	(5.70)	0.211	(9.39)	0.209	(7.64)	0.186	(7.73)	0.197	(8.06)	0.226	(6.70)	0.193	(8.12)	0.194	(7.96)
Carve-Out Dummy	-0.054	(-0.95)	-0.116	(-1.64)	-0.070	(-1.10)	-0.059	(-0.93)	-0.025	(-0.45)	-0.025	(-0.43)	-0.076	(-1.16)	-0.031	(-0.52)	-0.028	(-0.45)
Market Underpricing	-0.130	(-2.22)	-0.128	(-1.27)	-0.123	(-1.98)	-0.141	(-2.39)	-0.120	(-2.26)	-0.148	(-2.42)	-0.137	(-1.32)	-0.142	(-2.29)	-0.144	(-2.41)
Number of IPOs	-0.008	(-4.72)	-0.008	(-4.68)	-0.008	(-4.62)	-0.009	(-4.47)	-0.009	(-4.67)	-0.009	(-5.82)	-0.008	(-4.85)	-0.009	(-5.55)	-0.009	(-5.35)
Momentum	0.215	(1.14)	0.272	(1.35)	0.222	(1.25)	0.227	(1.24)	0.198	(1.06)	0.215	(1.10)	0.264	(1.29)	0.214	(1.10)	0.214	(1.09)
Volatility	-7.645	(-1.10)	-7.095	(-0.94)	-8.039	(-1.15)	-7.595	(-1.09)	-7.315	(-1.08)	-7.115	(-1.04)	-6.512	(-0.90)	-7.274	(-1.05)	-7.244	(-1.05)
Underwriter Reputation	0.002	(1.70)	0.002	(2.28)	0.002	(1.62)	0.001	(1.68)	0.002	(1.75)	0.002	(2.33)	0.003	(2.97)	0.002	(2.36)	0.002	(2.39)
Venture Capital	-0.059	(-1.27)	-0.073	(-1.16)	-0.056	(-1.02)	-0.060	(-1.20)	-0.060	(-1.15)	-0.059	(-1.10)	-0.062	(-0.97)	-0.057	(-1.02)	-0.057	(-1.05)
Partial Adjustment	0.983	(3.19)	1.066	(2.85)	1.016	(3.59)	1.024	(3.52)	1.137	(5.41)	1.069	(4.29)	1.044	(2.91)	1.066	(4.32)	1.073	(4.31)
Leverage	0.082	(2.25)	0.157	(3.06)	0.111	(3.07)	0.095	(3.03)	0.122	(3.98)	0.094	(2.64)	0.114	(3.20)	0.101	(2.77)	0.098	(2.78)
R2	0.307		0.292		0.292		0.298		0.295		0.305		0.321		0.302		0.303	
Adj R2	0.214		0.198		0.198		0.204		0.196		0.213		0.231		0.208		0.210	

Panel B: Value-weighted diversification measures

	Simple Diversification Measures										Simple Diversification Measures interacted with (-D5)							
Variable	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*
Intercept	-0.116	(-0.46)	-0.014	(-0.06)	-0.068	(-0.23)	-0.143	(-0.60)	0.063	(0.27)	0.133	(0.65)	0.082	(0.37)	0.130	(0.62)	0.125	(0.61)
D_1^{ip}	0.047	(1.25)									-0.039	(-1.43)						
D_1^{pp}	-0.427	(-2.41)									-0.203	(-6.06)						
D_2^{ip}			0.013	(0.44)									0.022	(0.99)				
D_2^{pp}			-0.231	(-4.49)									-0.204	(-10.75)				
D_3^{ip}					0.023	(1.08)									0.027	(1.06)		
D_3^{pp}					-0.343	(-2.05)									-0.194	(-4.56)		
D_4^{ip}							0.033	(0.89)									0.027	(1.00)
D_4^{pp}							-0.451	(-2.59)									-0.200	(-5.32)
D_5^{ip}									0.034	(1.35)								
D_5^{pp}									-0.264	(-2.47)								
Log(Age)	0.006	(0.26)	0.018	(0.61)	0.010	(0.41)	0.006	(0.26)	0.007	(0.31)	0.007	(0.31)	0.018	(0.65)	0.008	(0.37)	0.007	(0.33)
Outside Rights	-0.040	(-0.36)	-0.012	(-0.10)	-0.051	(-0.51)	-0.060	(-0.57)	-0.038	(-0.39)	-0.070	(-0.75)	-0.056	(-0.57)	-0.076	(-0.84)	-0.079	(-0.86)
Telecom Dummy	0.187	(7.77)	0.200	(7.16)	0.173	(6.48)	0.179	(6.11)	0.177	(6.97)	0.183	(8.26)	0.195	(8.07)	0.180	(8.01)	0.182	(7.91)
Carve-Out Dummy	-0.085	(-1.15)	-0.143	(-1.90)	-0.093	(-1.15)	-0.081	(-1.07)	-0.053	(-0.78)	-0.051	(-0.79)	-0.100	(-1.53)	-0.054	(-0.83)	-0.049	(-0.75)
Market Underpricing	-0.072	(-1.43)	-0.095	(-0.95)	-0.087	(-1.29)	-0.065	(-1.22)	-0.065	(-0.69)	-0.093	(-1.50)	-0.094	(-1.00)	-0.094	(-1.46)	-0.087	(-1.38)
Number of IPOs	-0.009	(-4.22)	-0.008	(-3.82)	-0.009	(-4.32)	-0.008	(-4.00)	-0.009	(-3.34)	-0.009	(-3.96)	-0.009	(-3.47)	-0.009	(-3.83)	-0.009	(-3.74)
Momentum	0.220	(1.14)	0.308	(1.56)	0.212	(1.17)	0.204	(1.07)	0.159	(0.88)	0.180	(0.99)	0.246	(1.30)	0.176	(0.97)	0.175	(0.96)
Volatility	-8.101	(-1.23)	-5.380	(-0.81)	-7.301	(-1.18)	-8.366	(-1.29)	-8.718	(-1.39)	-8.202	(-1.29)	-6.487	(-1.00)	-8.207	(-1.31)	-8.371	(-1.33)
Underwriter Reputation	0.002	(2.02)	0.002	(2.78)	0.002	(1.97)	0.002	(1.81)	0.001	(0.98)	0.002	(1.63)	0.002	(2.23)	0.002	(1.65)	0.002	(1.63)
Venture Capital	-0.075	(-1.44)	-0.062	(-1.00)	-0.064	(-1.15)	-0.073	(-1.38)	-0.061	(-1.03)	-0.061	(-1.02)	-0.051	(-0.78)	-0.057	(-0.93)	-0.058	(-0.95)
Partial Adjustment	1.141	(4.17)	0.984	(2.76)	1.107	(4.40)	1.102	(4.37)	1.106	(5.40)	1.071	(4.53)	0.957	(3.04)	1.061	(4.56)	1.067	(4.59)
Leverage	0.121	(4.28)	0.148	(3.00)	0.142	(4.01)	0.128	(4.46)	0.143	(4.48)	0.110	(3.43)	0.109	(3.29)	0.115	(3.57)	0.114	(3.49)
R2	0.283		0.291		0.277		0.284		0.276		0.296		0.314		0.292		0.295	
Adj R2	0.187		0.196		0.180		0.188		0.179		0.202		0.222		0.198		0.199	

Panel C: Value-weighted diversification measures, non-controlling shareholders

Variable	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*
Intercept	0.228	(1.10)	0.306	(1.37)	0.254	(1.05)	0.196	(0.83)
D_1^{inp}	-0.035	(-1.48)						
D_1^{pnp}	0.025	(0.24)						
D_2^{inp}			0.037	(0.99)				
D_2^{pnp}			0.083	(1.02)				
D_3^{inp}					0.007	(0.24)		
D_3^{pnp}					0.033	(0.41)		
D_4^{inp}							0.120	(2.57)
D_4^{pnp}							-0.133	(-1.02)
Log(Age)	0.003	(0.11)	0.003	(0.14)	0.004	(0.17)	0.004	(0.16)
Outside Rights	-0.013	(-0.09)	0.017	(0.11)	0.000	(0.00)	0.019	(0.13)
Telecom Dummy	0.198	(8.61)	0.201	(8.69)	0.201	(7.37)	0.184	(7.05)
Carve-Out Dummy	-0.079	(-1.13)	-0.034	(-0.45)	-0.064	(-0.83)	-0.052	(-0.68)
Market Underpricing	-0.140	(-1.13)	-0.204	(-1.52)	-0.161	(-1.44)	-0.197	(-1.73)
Number of IPOs	-0.009	(-6.64)	-0.009	(-7.05)	-0.009	(-6.05)	-0.009	(-8.12)
Momentum	0.237	(1.03)	0.276	(1.28)	0.256	(1.20)	0.270	(1.37)
Volatility	-7.774	(-1.02)	-7.154	(-0.90)	-7.560	(-0.99)	-7.007	(-0.93)
Underwriter Reputation	0.002	(1.82)	0.002	(1.51)	0.002	(1.96)	0.002	(1.73)
Venture Capital	-0.071	(-1.21)	-0.074	(-1.28)	-0.072	(-1.23)	-0.075	(-1.31)
Partial Adjustment	1.207	(4.91)	1.138	(5.95)	1.163	(4.94)	1.052	(5.12)
Leverage	0.184	(2.49)	0.168	(2.44)	0.175	(2.36)	0.160	(2.01)
R2	0.241		0.244		0.241		0.250	
Adj R2	0.140		0.143		0.140		0.149	

Table 5: Underpricing and portfolio diversification (taking into account the endogeneity of an IPO)

This table presents the results of the effect the diversification of investors has on underpricing controlling for self-selection bias. Heckman's lambda is estimated from probit regressions in Table 4. The definition of equally weighted and value weighted aggregation measures is the same as in Table 5. Diversification measures and control variables are defined in Tables 1 and 2. In Panel A, we report the results for the measures of portfolio diversification based on the value-weighed average, considering only the investors with a controlling stake of at least 10% of the voting rights, where the weights are the fraction of the firm capital held by the shareholders. In Panel B, the results for the measures of portfolio diversification based on the value-weighed average for all controlling shareholders. All t-statistics are adjusted for heteroscedastisity and clustering over industries.

Panel A: Value-weighted diversification measures (controlling stake >= 10% of voting rights)

	Simple Diversification Measures										Simple Diversification Measures interacted with (-D5)							
Variable	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*
Intercept	-0.750	(-3.82)	-0.431	(-2.52)	-0.688	(-2.53)	-0.700	(-2.86)	-0.278	(-1.02)	-0.086	(-0.42)	-0.204	(-0.81)	-0.057	(-0.31)	-0.042	(-0.20)
D_1^{ip}	0.025	(0.54)									-0.034	(-1.41)						
D_1^{pp}	-0.817	(-7.15)									-0.271	(-9.25)						
D_2^{ip}			-0.023	(-0.80)									0.004	(0.20)				
D_2^{pp}			-0.339	(-4.52)									-0.271	(-5.08)				
D_3^{ip}					-0.008	(-0.37)									0.017	(0.68)		
D_3^{pp}					-0.716	(-5.14)									-0.264	(-8.33)		
D_4^{ip}							0.008	(0.19)									0.024	(1.05)
D_4^{pp}							-0.764	(-6.73)									-0.264	(-7.57)
D_5^{ip}									0.036	(1.94)								
D_5^{pp}									-0.473	(-3.64)								
Log(Age)	0.004	(0.19)	0.013	(0.52)	0.006	(0.27)	0.003	(0.16)	0.003	(0.13)	0.004	(0.16)	0.013	(0.54)	0.005	(0.19)	0.004	(0.19)
Outside Rights	-0.042	(-0.56)	0.043	(0.50)	-0.030	(-0.46)	-0.042	(-0.60)	-0.031	(-0.40)	-0.072	(-0.84)	-0.042	(-0.51)	-0.078	(-0.94)	-0.080	(-0.93)
Telecom Dummy	0.237	(10.50)	0.260	(6.23)	0.225	(10.97)	0.224	(8.98)	0.188	(8.93)	0.203	(8.94)	0.233	(7.68)	0.197	(8.31)	0.196	(8.59)
Carve-Out Dummy	-0.054	(-1.15)	-0.119	(-2.21)	-0.067	(-1.29)	-0.058	(-1.10)	-0.018	(-0.38)	-0.021	(-0.40)	-0.066	(-1.21)	-0.027	(-0.46)	-0.025	(-0.44)
Market Underpricing	-0.166	(-2.34)	-0.179	(-1.58)	-0.164	(-2.22)	-0.177	(-2.49)	-0.150	(-2.73)	-0.177	(-2.77)	-0.177	(-1.83)	-0.161	(-2.47)	-0.165	(-2.69)
Number of IPOs	-0.005	(-3.04)	-0.004	(-2.25)	-0.005	(-3.13)	-0.006	(-3.13)	-0.007	(-3.60)	-0.007	(-5.51)	-0.006	(-2.67)	-0.008	(-6.69)	-0.008	(-5.47)
Momentum	0.284	(1.53)	0.377	(1.95)	0.291	(1.67)	0.293	(1.62)	0.243	(1.26)	0.263	(1.30)	0.330	(1.56)	0.246	(1.26)	0.246	(1.22)
Volatility	-8.499	(-1.18)	-7.702	(-1.00)	-8.719	(-1.20)	-8.314	(-1.16)	-7.526	(-1.09)	-7.500	(-1.05)	-6.849	(-0.94)	-7.506	(-1.04)	-7.400	(-1.04)
Underwriter Reputation	0.001	(1.37)	0.002	(1.47)	0.001	(1.21)	0.001	(1.26)	0.002	(1.45)	0.002	(2.17)	0.002	(2.36)	0.002	(2.21)	0.002	(2.22)
Venture Capital	-0.056	(-1.05)	-0.070	(-1.02)	-0.053	(-0.85)	-0.057	(-0.99)	-0.059	(-1.04)	-0.057	(-1.00)	-0.056	(-0.83)	-0.056	(-0.94)	-0.057	(-0.97)
Partial Adjustment	0.955	(3.02)	1.015	(2.55)	0.974	(3.26)	0.988	(3.24)	1.132	(5.24)	1.055	(4.28)	1.014	(2.91)	1.066	(4.25)	1.069	(4.27)
Leverage	0.046	(1.47)	0.100	(1.98)	0.060	(2.04)	0.055	(2.04)	0.101	(3.64)	0.072	(2.75)	0.067	(1.97)	0.083	(3.24)	0.085	(2.94)
Heckman Lambda	0.125	(3.98)	0.165	(3.73)	0.136	(5.66)	0.126	(5.23)	0.081	(3.37)	0.075	(1.91)	0.115	(3.28)	0.059	(1.74)	0.053	(1.82)
R2	0.319		0.310		0.308		0.312		0.298		0.310		0.332		0.305		0.306	
Adj R2	0.221		0.210		0.208		0.212		0.197		0.211		0.236		0.205		0.206	

Panel B: Value-weighted diversification measures

	Simple Diversification Measures										Simple Diversification Measures interacted with (-D5)							
Variable	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*	*Estimate*	*t-stat*
Intercept	-0.211	(-0.83)	-0.130	(-0.61)	-0.207	(-0.68)	-0.285	(-1.12)	-0.034	(-0.14)	0.040	(0.20)	-0.016	(-0.08)	0.035	(0.17)	0.035	(0.17)
D_1^{ip}	0.036	(0.98)									-0.031	(-1.15)						
D_1^{pp}	-0.444	(-2.52)									-0.211	(-7.35)						
D_2^{ip}			0.004	(0.13)									0.014	(0.65)				
D_2^{pp}			-0.252	(-4.46)									-0.217	(-8.40)				
D_3^{ip}					0.004	(0.19)									0.012	(0.45)		
D_3^{pp}					-0.384	(-2.29)									-0.207	(-6.22)		
D_4^{ip}							0.016	(0.44)									0.016	(0.60)
D_4^{pp}							-0.495	(-2.92)									-0.212	(-7.04)
D_5^{ip}									0.024	(0.92)								
D_5^{pp}									-0.287	(-2.90)								
Log(Age)	0.004	(0.18)	0.016	(0.58)	0.007	(0.35)	0.003	(0.16)	0.004	(0.23)	0.004	(0.23)	0.015	(0.61)	0.006	(0.28)	0.005	(0.26)
Outside Rights	-0.034	(-0.33)	-0.005	(-0.04)	-0.046	(-0.52)	-0.054	(-0.57)	-0.032	(-0.36)	-0.065	(-0.76)	-0.052	(-0.59)	-0.071	(-0.88)	-0.074	(-0.89)
Telecom Dummy	0.193	(8.76)	0.208	(7.99)	0.180	(7.50)	0.187	(7.06)	0.182	(7.84)	0.190	(9.29)	0.203	(8.96)	0.188	(8.51)	0.188	(8.89)
Carve-Out Dummy	-0.093	(-1.32)	-0.153	(-2.23)	-0.101	(-1.34)	-0.089	(-1.25)	-0.056	(-0.91)	-0.056	(-0.96)	-0.105	(-1.79)	-0.058	(-0.98)	-0.053	(-0.89)
Market Underpricing	-0.065	(-1.22)	-0.091	(-0.84)	-0.082	(-1.10)	-0.060	(-1.02)	-0.065	(-0.72)	-0.088	(-1.46)	-0.092	(-0.96)	-0.091	(-1.45)	-0.089	(-1.48)
Number of IPOs	-0.007	(-3.30)	-0.007	(-3.17)	-0.007	(-3.11)	-0.007	(-2.82)	-0.007	(-2.96)	-0.007	(-3.54)	-0.007	(-3.11)	-0.008	(-3.69)	-0.008	(-3.39)
Momentum	0.235	(1.22)	0.336	(1.69)	0.230	(1.27)	0.223	(1.17)	0.174	(0.93)	0.199	(1.07)	0.267	(1.39)	0.192	(1.05)	0.194	(1.04)
Volatility	-7.923	(-1.20)	-4.974	(-0.75)	-7.000	(-1.12)	-8.151	(-1.26)	-8.481	(-1.35)	-7.961	(-1.25)	-6.207	(-0.96)	-8.032	(-1.26)	-8.087	(-1.27)
Underwriter Reputation	0.001	(1.52)	0.002	(2.09)	0.001	(1.41)	0.001	(1.25)	0.001	(0.70)	0.001	(1.30)	0.002	(1.81)	0.001	(1.31)	0.001	(1.31)
Venture Capital	-0.075	(-1.36)	-0.061	(-0.93)	-0.063	(-1.07)	-0.072	(-1.28)	-0.060	(-0.97)	-0.060	(-0.95)	-0.049	(-0.72)	-0.056	(-0.86)	-0.056	(-0.88)
Partial Adjustment	1.121	(3.85)	0.951	(2.52)	1.078	(3.91)	1.074	(3.89)	1.081	(4.89)	1.041	(4.15)	0.928	(2.86)	1.036	(4.22)	1.042	(4.21)
Leverage	0.114	(4.27)	0.140	(2.80)	0.131	(3.79)	0.118	(4.26)	0.136	(4.20)	0.101	(3.45)	0.100	(3.25)	0.105	(3.59)	0.105	(3.48)
Heckman Lambda	0.041	(1.85)	0.052	(1.86)	0.053	(2.27)	0.052	(2.18)	0.044	(1.73)	0.047	(1.88)	0.050	(1.88)	0.047	(2.15)	0.045	(2.03)
R2	0.285		0.295		0.281		0.288		0.271		0.299		0.318		0.296		0.297	
Adj R2	0.182		0.193		0.177		0.185		0.175		0.198		0.219		0.194		0.195	

Table 6: Diversification and the Type of Capital Raised at the IPO.

We report the results connecting our measures of diversification with ways to raise capital. In panel A, we split firms in two groups based on a) their primary capital – equally; b) their secondary capital – equally; and c) their secondary capital – less or equal to zero, or greater than zero. We then report the mean and the standard error of the five diversification measures. In Panel B we report the regression of underpricing on set of control variables as in Table 4, plus subsamples that are done for positive α and non-positive α. For the sake of space only coefficient on diversification variable for private individuals (along with t-statistics and overall regression R2) is reported.

Panel A: Primary (γ) and secondary (α) capital and diversification measures of private investors: Mean (Standard Error)

Partition	# Obs.	D_1	D_2	D_3	D_4	D_5
Low γ	62	-0.843	-0.853	-0.831	-0.981	-0.983
		(0.029)	(0.06)	(0.043)	(0.023)	(0.023)
High γ	62	-0.845	-0.847	-0.857	-0.981	-0.990
		(0.013)	(0.04)	(0.039)	(0.009)	(0.005)
Low α	62	-0.839	-0.814	-0.826	-0.965	-0.975
		(0.018)	(0.043)	(0.042)	(0.017)	(0.015)
High α	62	-0.848	-0.885*	-0.863	-0.996*	-0.998
		(0.026)	(0.057)	(0.039)	(0.018)	(0.018)
$\alpha \leq 0$	38	-0.850	-0.826	-0.840	-0.984	-0.996
		(0.017)	(0.056)	(0.055)	(0.011)	(0.002)
$\alpha > 0$	86	-0.841	-0.860	-0.846	-0.980	-0.982
		(0.022)	(0.046)	(0.034)	(0.017)	(0.017)

*** Difference is significant at 10% level.**

Panel B:

Sample		D_1^{pp}	D_2^{pp}	D_3^{pp}	D_4^{pp}	D_5^{pp}
All companies	Coeff	-0.698	-0.232	-0.531	-0.599	-0.411
	t-stat	(-5.41)	(-4.27)	(-2.52)	(-3.23)	(-2.72)
	Adj R^2	0.214	0.198	0.198	0.204	0.196
$\alpha \leq 0$ ($n = 38$)	Coeff	0.020	-0.155	0.202	0.395	0.571
	t-stat	(0.08)	(-1.79)	(1.44)	(0.83)	(1.88)
	Adj R^2	0.315	0.371	0.313	0.309	0.364
$\alpha > 0$ ($n = 86$)	Coeff	-0.749	-0.281	-0.613	-0.650	-0.493
	StErr	(-6.28)	(-4.06)	(-4.33)	(-4.84)	(-4.24)
	Adj R^2	0.256	0.235	0.245	0.249	0.248

Figure 1: Frequency distribution of investors in control/firm. Investors in control are defined either as insiders and owners of blocks in excess of 10% of equity (left bars) or as owners of blocks in excess of 10% (right bars).

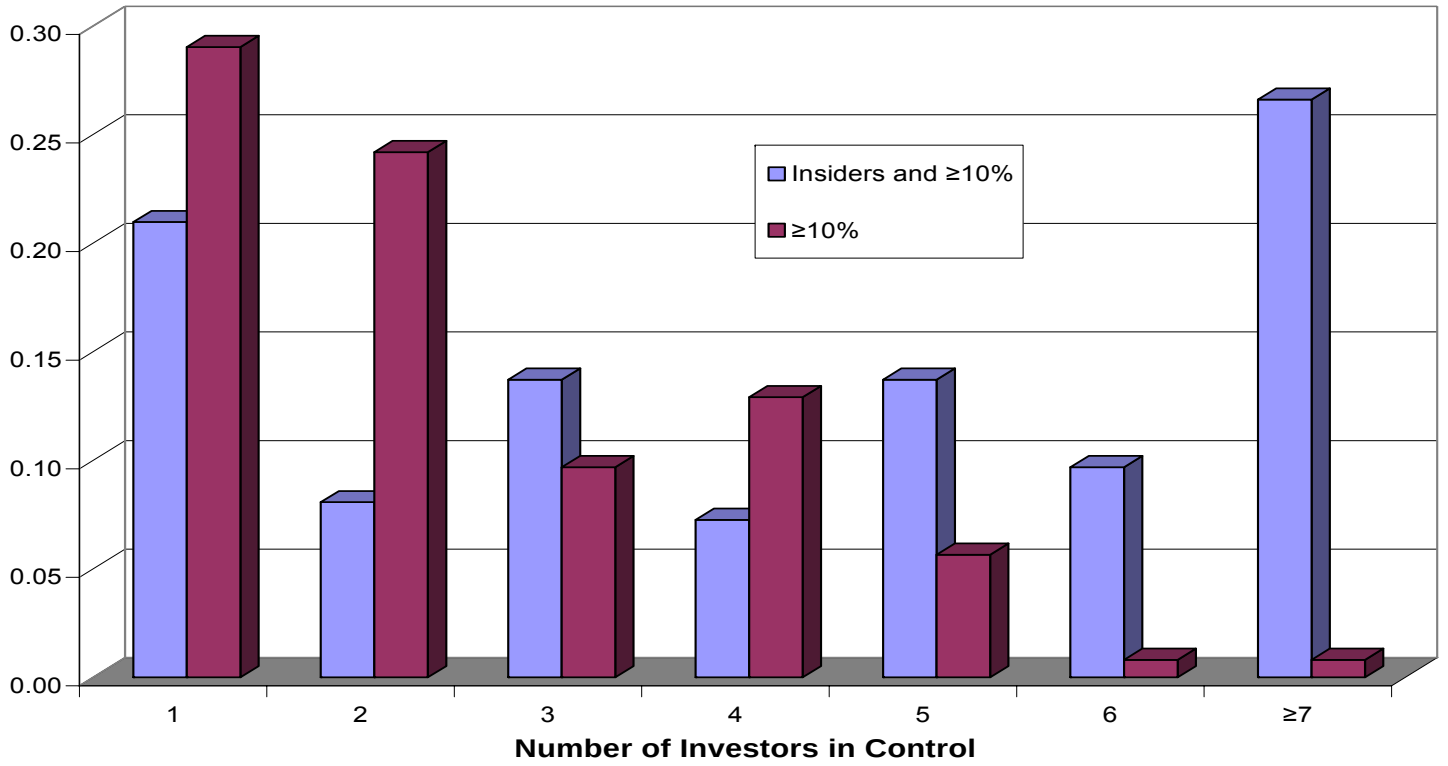

Table A1.1: Excess Required Rate of Return for different classes of shareholders.

This table presents estimates of monthly differences between the required rate of returns for different groups of investors and the ones required by diversified shareholders. For each firm, the diversified required risk premium is constructed as the product between the Fama and French factor risk premium and the loading of the firm return on that factor. The firm stock return in the years before the IPO is proxied by the return of a listed firm with analogous characteristics (in terms of size and book-to-market). The undiversified required rate of returns is constructed as follows. For each investor, we calculate the loading ("beta") between the return on the stock and the return on the investor portfolio. This is then multiplied by the excess return of the investor portfolio over the riskless (30-days T-bill) rate. Then, for each firm being taken public, we calculate the required rate of returns (undiversified as well as diversified) by aggregated across all the shareholders of the firm. As before, we report a breakdown for institutional and private investors as well as for controlling and minority shareholders. We use the superscript "*ip*" ("*inp*") to denote the institutional investors who have a controlling (minority) stake and the superscript "*pp*" ("*pnp*") to denote the private investors who have a controlling (minority) stake. We present the results for 3-factor (Fama-French) models using factor loadings estimated over 36- and 60 months prior to the IPO date. We use the following matching mechanism to identify listed firms most similar to the IPO firms in our sample: a) we select firms with a market capitalization within 30% of the market capitalization of the firm at the date of its IPO; b) among firms satisfying condition a) we select the ones that have the book-to-market ratio closest to the book-to-market ratio of the firm going public. The notations on the types of investors are as in Table 1. We report the *mean values* of the estimates of required rates of return (for undiversified investors and for each group of investors), t-*stat* and significance levels for *mean tests* (one-sided), and *Wilcoxon z-score* and significance level (one-sided) for *median test* of the undiversified required rate of return of particular group of investors being larger than that required by diversified investors. The number of observation is 124 and the number of degrees of freedom for mean and median test is 246.

	Non Controlling Institutions (inp)	***Controlling Institutions (ip)***	***Non Controlling Private (pnp)***	***Controlling Private (pp)***
Excess required rate of returns with loadings constructed over 36 months				
Mean (%)	0.51	0.57	0.67	0.70
t-value	2.45	2.50	2.87	2.85
p-value	0.015	0.013	0.004	0.005
Wilcoxon' Z	2.20	2.47	2.44	2.36
p-value	0.014	0.007	0.007	0.009
Excess required rate of returns with loadings constructed over 60 months				
Mean (%)	0.56	0.59	0.68	0.71
t-value	3.29	3.26	3.68	3.69
p-value	0.001	0.001	0.001	0.001
Wilcoxon' Z	2.44	2.51	2.62	2.66
p-value	0.007	0.006	0.004	0.004

Table A2.1:

This is table that compares our findings for IPO underpricing with the studies of other papers. Overall all the papers use much smaller number of controls than our paper, the results on paper-specific variables which we would not be able to obtain are not reported. Our variables were primarily taken from Ljungqvist (2003) and expanded using other papers. Given the small number of observations we had to be cautious in choosing the variables.

Variable	Our paper	Habib and Ljungqvist (2001)	Booth and Chua (1999)	Ellul and Pagano (2003)	Loughran and Ritter (2004)	Ljungqvist and Wilhelm (2003)	Ljungqvist (2003)	Corwin and Schulz (2004) @
Partial adjustment	+/**	+/***				+/***		+/***
Age	+/INS	-/*		-/*	-/***	-/***	-/***	
ln(sales)		-/*						
Leverage	+/INS	-/**					-/***	
Size (total proceeds)			-/INS	-/INS				
Offer price			+/*					
Venture Capital presence	-/*			-/**				+/**
Total Assets	0/INS			-/INS	-/***			
Sales by insiders				+/INS		-/INS		
IT sector	+/**			+/INS	+/***	+/**	+/***	
Number of IPOs in previous quarter or 180 days	-/**			-/*			-/**	
Underwriter stabilization				+/**				
Underwriter reputation (defined as market share of underwriter)	+/INS			-/* or INS		+/INS		
CEO stake						- or +/INS	-/*	
CEO stake*internet dummy						-/***		
VC stake	Dummy					-/***		
Invesment bank stake						-/*		
Pre-ownership concentration						-/**		
Momentum	+/*							
Mean underpricing previous 180 days	-/INS						+/*** (very small)	
Market return over previous 180 days	+/INS						+/INS	
Dummy if CEO sells							-/* (2.5%)	
Herfindahl index								-/INS
Obs	124	1357	2151	337	1752	2391	1013	1638
AdjustedR^2	21%	33.2%	10.0%	18.56-37.45%	29%	27.36-45.76%	16.5%	49%

@Corwin and Shcultz use ln(1+underpricing) as a dependent variable, and include time and industry dummies. This explains the larger R^2