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IPO Underpricing, Post-Listing Liquidity, and Information Asymmetry in the Secondary Market♣

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Abstract

Using a ten-year sample of IPOs undertaken on Euronext with various mechanisms, our study examines the relationship between initial returns and post-listing liquidity, and tests whether it is influenced by ownership structure and information asymmetry. According to most of our findings, post-listing liquidity is positively related to initial underpricing, but we fail to prove that this relation is formed through ownership dispersion. It is more likely attributable to the interest underpriced stocks generate. Information asymmetry is negatively linked to the level of initial underpricing, suggesting that more public information is produced on more underpriced IPOs.

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Keywords: IPO, initial underpricing, ownership structure, post-listing liquidity, information asymmetry

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Abstract

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IPO Underpricing, Post-Listing Liquidity, and Information Asymmetry in the Secondary Market

Articles documenting the average underpricing of initial public offerings are legion. They report average positive initial returns in all markets at all times (Ritter and Welch, 2002), with time-varying (Loughran and Ritter, 2002) and country-depending mean levels, as well as large cross-sectional variances (Gajewski and Gresse, 2006). Those stylized facts have given rise to a large body of theoretical literature, which, in turn, has invited empiricists to test which theories best explained initial underpricing. Oldest models such as Rock (1986) attribute initial underpricing to the information asymmetry between investors about the value of the candidate firm and interpret it as a cost to bear by issuers to attract uninformed investors in the primary market. Ever since, other explanations have been proposed: price support, underwriters' behaviour, analysts' or investors' over-optimism etc. Recently, initial underpricing has been related to secondary market's quality, and in particular liquidity, with divergent empirical findings between the US markets and the UK market.

Several empirical studies are supportive of the notion that initial public offering underpricing boosts the subsequent secondary market liquidity of the stock. Miller and Reilly (1987), Hanley (1993), Schultz and Zaman (1994), Reese (1998), Hahn and Ligon (2004), and Zheng and Li (2008) documented that underpriced IPOs, on average, exhibit higher after-market trading activity than overpriced IPOs. Pham, Kalev, and Steen (2003) and Li, Zheng, and Melancon (2005) evidence that a higher level of underpricing lead to not only increased trading turnover but also lower bid-ask spreads. Consistent with the theory of Booth and Chua (1996), Pham *et al.* (2003) find that this relationship is formed through the mediation of ownership structure resulting from the allocation process. Alternatively, Reese (1998) assigns the positive relationship between underpricing and post-listing liquidity to financial media coverage which reduces information asymmetry, a thesis corroborated by the results of Li, McInish, and Wongchoti (2005) for a sample of NASDAQ IPOs between 1995 and 2000. In contrast, Ellul and Pagano (2006) demonstrate that initial underpricing can be an increasing function of the expected post-listing illiquidity due to asymmetric information because IPO underpricing compensates uninformed investors who participate in the issue for the expected trading adverse selection costs that they will bear in the after-market. In addition, they provide empirical evidence in support of their theory using a sample of UK IPOs.

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Our research aims at departing between the Booth and Chua's and the Ellul and Pagano's theories. More precisely, it addresses the following questions. Does initial underpricing boost post-IPO liquidity, or conversely, is it a compensation for after-market illiquidity and asymmetric information? If underpricing enhances after-market liquidity, does it result from the broader ownership obtained by underpricing the issue?

Our answers to these questions are based on a sample of IPOs undertaken at Euronext Paris between 1995 and 2004, and they contribute to the existing literature in several ways. First, many of the empirical studies that find a positive link between IPO underpricing and post-listing liquidity are based on daily trading volumes only. We rather adopt a microstructure approach, like Pham et al. (2003) and Ellul and Pagano (2006), and use other measures of liquidity. Trading volumes are complemented with other liquidity measures based on daily data, and for continuously-traded securities, we also use spreads and information asymmetry metrics. Second, converse to US samples which are only composed of book-built IPOs, our sample is diversified in terms of IPO mechanisms and includes not only pure book-buildings, but also mixed book-buildings, auctions, and fixed-price offers. This is also a difference with the study of Pham *et al*. (2003), whose sample is mainly compounded of fixed-price offers. The diversity of our sample in terms of issuing procedures ensures that our findings are not driven by the specifics of a given issue mechanism and allows us to compare book-built IPOs to others. Third, most US studies are based on Nasdaq IPOs for which the secondary market has a dealership structure. This is also the case of the Ellul and Pagano's sample in the UK. Their results may therefore be due to the market making role that underwriters can play in this type of market after the listing. Last but not least, our findings contrasts with those of Pham *et al*. (2003) in that we rule out the ownership dispersion story, and they completely oppose to those of Ellul and Pagano (2006) with respect to information asymmetry. This suggest that some other theory should be sought to explain the positive relation between underpricing and liquidity.

The remainder of the article is organised as follows: Section 1 is dedicated to the testable hypotheses and the institutional settings; Section 2 describes the sample, the data, and the variables used in the study; Sections 3 and 4 present the methodology and the results respectively; Section 5 concludes.

1. Testable hypotheses and institutional settings

On the way underpricing relates to after-market liquidity, two theories oppose. A theory first defended by Booth and Chua (1996) stipulates that underpricing is a means to ensure a diffuse ownership and therefore enhance post-IPO liquidity. According to this hypothesis, which will be designated as the liquidity-promotion hypothesis, post-listing spreads should be negatively related to underpricing. Conversely, a more recent theory developed by Ellul and Pagano (2006) posits that post-IPO spreads and asymmetric information measures increase with underpricing because underpricing is a compensation for illiquidity costs expected in the after-market. This hypothesis will be referred to as the illiquidity-compensation hypothesis.

1.1. The liquidity-promotion hypothesis

On the one hand, an IPO candidate may desire a concentrated ownership at the expense of liquidity so as to confer greater monitoring power to pre-IPO or new large shareholders. IPOs seeking a concentrated ownership will not underprice their shares at the issue, as large shareholders possess superior information about the company's true value and do not bear information costs. They could even be overpriced as large shareholders may be prepared to pay a premium for control.

On the other hand, an issuer may wish a diffuse ownership structure in order to obtain higher secondary-market liquidity for its shares, a factor often considered as an important criterion of success of an IPO (Corwin, Harris, and Lipson, 2004). Further, a more liquid secondary market can make corporate governance more effective (Maug, 1998). In general, higher after-market liquidity contributes to increase the firm's value and reduce its cost of capital in several ways. It improves the issuing firm's future access to capital markets namely by attracting investors, reducing transaction costs in future equity raisings (Ibbotson and Ritter, 1995), and lowering gross fees requested by investment banks in subsequent equity offerings (Butler, Grullon, and Weston, 2005). It also reduces the illiquidity premium and thus the returns required by investors to hold the firm's shares (Amihud and Mendelson, 1986; Brennan and Subrahmanyam, 1996). Booth and Chua (1996) demonstrate that IPO firms seeking secondary-market liquidity will underprice their shares in order to attract a large number of small shareholders and create a more dispersed ownership structure. Consistent with this theory, Michaely and Shaw (1994) and Brennan and Franks (1997) find higher underpricing for IPOs with more diverse shareholder base.

We decompose the liquidity-promotion hypothesis into three testable hypotheses:

H1. Ownership concentration decreases with initial underpricing.

H2a. More underpriced IPOs are characterised by a higher post-listing liquidity: higher trading activity and tighter spreads.

H3. IPOs with a more diffuse ownership structure have a more liquid secondary market.

1.2. The illiquidity-compensation hypothesis

In contrast with the Booth and Chua's theory, Ellul and Pagano (2006) demonstrate that initial underpricing is an increasing function of the expected post-listing illiquidity due to asymmetric information. They propose a model in which investors worry about the after-market illiquidity that may result from asymmetric information after the IPO. The less liquid the after-market is expected to be, and the less predictable its liquidity, the larger the IPO underpricing, because IPO underpricing compensates uninformed investors who participates in the issue not only for adverse selection costs borne at the IPO stage but also for the expected trading costs that they will bear by liquidating their shares in the after-market. In addition, Ellul and Pagano (2006) provide empirical evidence in support of their theory using a sample of 337 IPOs undertaken between 1998 and 2000 at the LSE, either on the Main Market or on AIM.

The illiquidity-compensation theory leads us to posit the following two hypotheses, which are the alternative hypotheses of H2a and H4.

H2b. More underpriced IPOs are characterised by a lower post-listing liquidity: lower trading activity and larger spreads in the aftermarket.

H4. Information asymmetry in the secondary market increases with initial underpricing.

1.3. Institutional settings

The above-mentioned hypotheses are tested on a sample of IPOs undertaken on Euronext Paris between 1995 and 2004. During that period, Euronext Paris was organised in three regulated market segments[1]: the *Premier Marché* (i.e. Main Market) designed for the listing of large companies, the *Second Marché* (i.e. Parallel Market) that catered to middle and small

[1] In 2005, Euronext Paris merged the *Premier Marché* and the *Second Marché* into a single segment, Eurolist, and the *Nouveau Marché* was closed and replaced by Alternext. For more institutional details, refer to Boutron *et al*. (2007)

capitalisations, and the *Nouveau Marché* (i.e. New Market) for growth companies[2]. IPOs generally take place in the *Second Marché* or the *Nouveau Marché*, and such is the case the firms of our sample.

For any new listing, the specificity of Euronext Paris' primary market is to offer and handle a panel of initial offering mechanisms[3] comprising a fixed-price offering procedure, a book-building procedure denominated *placement*, and three auction mechanisms (direct admission, minimum price offer, and open-price offer) in which Euronext is the auctioneer. Fixed-price offer and open-price offerings can be associated with a *placement*. In fact, most book-built issues are offered as a double stage issue whereby, in addition to the private book-building process, a separate mechanism offers shares to the public. The simplest and most common technique is to offer shares to the public at a fixed price which is equal to the equilibrium price set during the book-building process. An alternative method is to organise an auction in which individual investors can place limit orders. In this case, the issue price may differ for each category of subscribers. The Euronext regulation requires that the issue price paid by institutions in the book-building process should not be lower than the definitive public offer price.

Euronext's secondary markets are order-driven but they have different features according to the market segment and the liquidity of the stock traded. The Parallel Market worked very similarly to the present Eurolist market segment. For most liquid stocks, order book trading was continuous, and the trading session started and terminated with batch auctions. For less liquid securities, trading was only periodic with one or two batch auctions a day. The New Market had a structure comparable to that of Alternext today. Two batch auctions were run per day. Besides, market markets supplied liquidity on a continuous basis between auctions and actively participated in the auction procedures.

2. Sample, data, and measures

We investigate the way four categories of factors interact with each others: initial underpricing, owernship structure, post-listing liquidity, and information asymmetry. We

[2] For a detailed description of listing requirements on these segments, see Gajewski and Gresse (2006).

[3] For a detailed description of these listing mechanisms, see Gajewski and Gresse (2006).

thus need to cross three types of data: IPO data including IPO mechanism, ownership data, and stock market data. We first describe how such data have been gathered for 204 IPOs in the 1995-2004 period. Then, measures of underpricing, liquidity, ownership structure, and information asymmetry are presented.

2.1. Sample and data

This empirical study has been led by using data from four sources. First, we gathered the prospectuses available in the AMF[4] database for IPOs undertaken on Euronext Paris during the period 1995-2004. After excluding transfers and listing of foreign compagnies, we obtained a sample of 231 IPOs for which we retrieved in the prospectuses the IPO date, the subscription price, the number of shares on sale in the IPO, the number of shares outstanding after the IPO, the IPO allocation mechanism, and the percentage of shares held by the managers and members of their families before the IPO. Second, we retrieved post-IPO closing prices from Datastream for the 231 IPOs and we extracted trade and quote data from Euronext CD-Roms. The Euronext database covered 211 stocks of the initial sample. Third, information on post-IPO shareholdings could be collected from *DAFSA Liens* for 204 of these IPOs. In *DAFSA Liens*, ownership data are available on an annual frequency at the end of the year, so that the ownership structure available in *DAFSA Liens* immediately after the IPO is that observed on the 31st of December following the primary listing. Out of the 204 IPOs constituting the final sample, 112 were undertaken in the *Second Marché* and 92 took place in the *Nouveau Marché*. Thanks to this even distribution of the sample between both market segments, our findings are not dependent of the peculiarities of growth markets' structure. In terms of IPO mechanisms, 155 issues involved a book-building process, 40 were auctioned, and 9 were fixed-priced. Among the 155 book-built IPOs, 14 were exclusively book-built, 42 were associated with an auctioned public offer, and 99 were followed by a fixed-priced offering. All the auctioned and fixed-price IPOs of the sample were undertaken in the nineties while the IPOs conducted in or after 2000 all used a mixed mechanisms which associated the book-building process with either an auction or a fixed-price offer.

[4] Autorité des Marchés Financiers.

2.2. Underpricing and liquidity measures

For each stock of the sample, underpricing is measured as the return between the closing price observed 5 business days after the IPO and the IPO price, and adjusted for the SBF250 index return:

$$U = \frac{P_5}{P_0} - \frac{I_5}{I_0} \quad (1),$$

where P_5 is the closing price on the fifth business day following the IPO, P_0 is the IPO price, I_5 is the closing value of the SBF250 index on the fifth day following the IPO, and I_5 is the closing value of the index on the day of the IPO. The IPO is underpriced (overpriced) when $U > 0$ ($U < 0$).

As we test the relation between ownership structure and liquidity, we need to measure liquidity over a post-IPO period which is as close as possible to the date at which the post-listing ownership structure is observed. We choose to estimate liquidity measures on an observation period that surrounds the date at which we observe the post-listing ownership, that is over 6 months starting on the 1st of October following the IPO. For IPOs occurred five trading days prior to October 1 or later, we make the 6-month period start five trading days after the IPO date. This 5-day gap is meant to eliminate the effect of the abnormal trading activity generally observed in the first days following primary listings. Among the 204 IPOs of our sample, 87 were traded continuously within the 6-month observation period. The remaining 117 stocks were traded in batch auctions only (one or two per day).

For the whole sample, post-IPO liquidity is measured with the average daily turnover, the Amihud (2002)'s illiquidity ratio, and the zero-return ratio of Lesmond, Ogden, and Trzcinka (1999). The average daily turnover, denoted *TURN*, is the average daily volume in percentage of the number of shares sold in the IPO. The Amihud (2002)'s illiquidity ratio is an estimate of prices' sensitivity to traded quantities and is computed as follows:

$$AMIH = \frac{1}{T}\sum_{t=1}^{T}\frac{|R_t|}{V_t} \times 1{,}000 \quad (2),$$

where R_t is the stock return measured in logarithm on closing prices at date t, V_t is the trading volume on date t, and T is the number of trading days in the observation period. The Lesmond, Ogden, and Trzcinka (1999)'s measure (*L_O_T*) is the ratio of zero-return days to the total number of trading days in the observation period. The intuition behind this measure

is that no informed trading occurs when trading costs are high enough to offset trading gains, which leads to zero daily returns.

For the sub-sample of continuously-traded stocks, we compute duration-weighted average quoted spreads,

$$QS = \frac{1}{\sum_{k=1}^{K} d_k} \left(\sum_{k=1}^{K} d_k \times \frac{ask_k - bid_k}{mid_k} \right) \quad (3),$$

and average effective spreads,

$$ES = \frac{1}{N} \left(\sum_{n=1}^{N} \frac{|P_n - mid_n|}{mid_n} \right) \quad (4),$$

where bid_k, ask_k, mid_k and d_k are respectively the best bid quote, the best ask quote, the mid quote, and the duration of the best quotes observed at the time of the k^{th} quoted spread in the observation period; K is the total number of quoted spreads observed for the stock in the observation period; P_n is the transaction price for the n^{th} transaction in the observation period; mid_n is the mid-quote prevailing at the time of the n^{th} trade; and N is the total number of trades in the period.

2.3. Measures of information asymmetry

Measures of information asymmetry are derived over the same 6-month observation period as that chosen to measure liquidity. The magnitude of information asymmetry is estimated with three methodologies: the average 30-minute price impact denoted *PIMP*, the alpha coefficient of Lin, Sanger, and Booth (1995) denoted α_{lsb}, and the PIN measure denoted *PIN*.

We conduct the decomposition of the effective spread in a realized spread and a price impact within a 30-mn interval in the manner of Bessembinder and Kaufman (1997)'s approach. Price impacts at a 30-mn interval are calculated as follows:

$$PIMP = \frac{1}{N} \sum_{n=1}^{N} \frac{mid_{n+30\,\min} - mid_n}{mid_n} \quad (5),$$

where $mid_{n+30\,\min}$ is the mid price quoted 30 minutes after the n^{th} transaction of the period.

Then, the Lin, Sanger, and Booth's adverse selection component α_{lsb} is estimated for each stock as the sensitivity of mid price revisions to trade sizes with the following regression model for each stock:

$$mid_{n+1} - mid_n = \alpha_{lsb}(P_n - mid_n)Q_n + e_{n+1} \quad (6),$$

where Q_n is the sign of the n^{th} trade and mid_{n+1} is the mid quote prevailing immediately after that trade. All regressions are GMM.

Finally, we compute the PIN measure of Easley, Kiefer, O'Hara, and Paperman (1996), which is based on trade direction. The probability of observing *B* buys and *S* sells on a given day can be implemented as follows:

$$L\left((B_t, S_t)\middle|(\alpha, \delta, \mu, \varepsilon)\right) = (1-\alpha)\times e^{-2\varepsilon}\frac{(\varepsilon)^{B_t}}{B_t!}\frac{(\varepsilon)^{S_t}}{S_t!} + \alpha\delta\times e^{-(2\varepsilon+\mu)}\frac{(\varepsilon)^{B_t}}{B_t!}\frac{(\mu+\varepsilon)^{S_t}}{S_t!} + \alpha(1-\delta)\times e^{-(2\varepsilon+\mu)}\frac{(\varepsilon)^{S_t}}{S_t!}\frac{(\mu+\varepsilon)^{B_t}}{B_t!} \quad (7),$$

where α is the probability of an information event which is bad news with probability δ and good news with probability 1-δ. The arrival rate of informed trades is μ. ε is the rate of uninformed buy and sell trade arrivals. Over an observation period of *T* days, the likelihood of observing $(B_t, S_t)_{t=1}^{T}$ buys and sells corresponds to the product of the daily likelihoods:

$$L\left((B_t, S_t)_{t=1}^{T}\middle|(\alpha, \delta, \mu, \varepsilon)\right) = \prod_{t=1}^{T} L\left((B_t, S_t)\middle|(\alpha, \delta, \mu, \varepsilon)\right) \quad (8).$$

In order to estimate the (α, δ, μ, ε) parameters, we maximise the likelihood defined in equation (8), and the probability of informed trading (*PIN*) is calculated calculate as:

$$PIN = \frac{\alpha\mu}{\alpha\mu + 2\varepsilon} \quad (9).$$

2.4. Measures of ownership structure

Several variables of ownership structure have been extracted from *DAFSA Liens* to measure ownership concentration after the IPO at the date of the 31st of December just after the IPO. We extracted the percentage of shares held by the managers (*MAN*), members of their families (*FAM*), and institutional investors (*INST*). In order to estimate the ownership concentration, we identified all the blockholders who possess at least 5 percent of the firm shares and computed their total holding in percentage (*BLOCK*). We also calculated the Herfindhal index (*HERF*) by summing squared shareholdings of the five largest shareholders:

$$HERF = \sum_{i=1}^{5} s_i^2 \quad (10),$$

where s_i is the part that belongs to the i^{th} largest shareholder (i=1,…,5).

3. Test design

The relations between initial underpricing, ownership concentration, and secondary market's liquidity are analysed running a three-stage multivariate analysis that combines logistic and OLS regressions in the Heckman style to avoid endogeneity biases. The same methodology is used to test the links between initial underpricing, ownership concentration, and information asymmetry. All tests are conducted on the whole sample first. Then, they are repeated on the sub-sample of firms that went public by using a book-building procedure. This comparison will allow us to determine whether the discretion provided by the book-building mechanism in the share allocation process may result in a more effective effect of IPO underpricing on ownership structure and post-listing liquidity. In order to avoid biases due to outliers, the statistics testing the significance of the coefficients are bootstrapped in all regressions.

3.1. First-stage logistic regression: estimation of the probability of underpricing

In a first stage, the probability for an issue to be underpriced, denoted $P(U > 0)$, is modelled as a function of the pre-IPO managers' holdings and the after-market risk[5]. The proxy we use for the risk perceived at the time of the IPO is the daily closing return volatility in the post-listing observation period, denoted σ:

$$P(U > 0) = a_0 + a_1 MAN_0 + a_2 \sigma + \tilde{\varepsilon}_1 \qquad (11).$$

3.2. Second-stage OLS regressions

In a second stage, we investigate how underpricing influences post-listing ownership structure and secondary market' liquidity. In both cases, initial underpricing is the independent variable and is measured using the probability of an issue to be underpriced as estimated in the first-stage Logit analysis.

3.2.1. Post-listing liquidity and initial underpricing

For the whole sample, the average daily turnover (*TURN*), the Amihud illiquidity ratio (*AMIH*), and the zero-return ratio (*L_O_T*) are regressed on the level of underpricing

[5] Others factors comprising earnings per share, the P/E ratio, the book-to-market ratio, the age of the firm, the debt leverage, the return on assets, the IPO size measured as the number of shares on sale in the IPO multiplied by the subscription price, the post-listing market value, and the price level, have been inserted in the model, but none of them has been proved to influence the probability of underpricing.

predicted in the first-stage model, after controlling for volatility, market value, and price level:

$$TURN,\ AMIH,\ or\ L\_O\_T = b_0 + b_1\sigma + b_2 \ln MV + b_3 \ln P + b_4 \hat{P}(U>0)\times U + \tilde{\varepsilon}_2 \qquad (12),$$

where lnMV is the logarithm of the firm's market value at the IPO date, P is the average closing price during the liquidity observation period, $\hat{P}(U>0)$ is the probability of the IPO to be underpriced as predicted from model (11), and U is the underpricing calculated as in equation (1). In case of overpricing (U<0), the variable $\hat{P}(U>0)\times U$ is set to 0.

For the sub-sample of IPO stocks that were continuously traded during the observation period, we also test how initial underpricing relates to quoted (*QS*) and effective (*ES*) spreads. Control variables used are volatility, trading volumes, and price level:

$$QS\ or\ ES = c_0 + c_1\sigma + c_2 \ln V + c_3 \ln P + c_4 \hat{P}(U>0)\times U + \tilde{\varepsilon}_3 \qquad (13),$$

where ln$V$ is the logarithm of the average daily trading volume over the six-months period.

3.2.2. Ownership structure and initial underpricing

In parallel, we test whether underpricing impacts ownership structure and model the measures of ownership structure (*HERF*, *BLOCK*, and *INST*) as a function of the underpricing level predicted at the first stage in the Heckman style. Because large firms are likely to have more diffuse ownership and because family-owned companies usually have concentrated shareholding structures, we control for market size and family holdings, so that regressions are designed in the following way:

$$HERF,\ BLOCK,\ or\ INST = d_0 + d_1 SIZE + d_2 FAM + d_3 \hat{P}(U>0)\times U + \tilde{\varepsilon}_4 \qquad (14),$$

where *SIZE* is the logarithm of the issue size calculated as the number of shares on sale in the IPO multiplied by the subscription price, and *FAM* is the percentage of shares retained by the manager's family after the IPO.

3.3. Third-stage OLS regressions: liquidity and ownership structure

In the third stage, liquidity measures are regressed on ownership concentration measures and institutional holdings as predicted in the second-stage regressions (14). The same control variables as in models (12) and (13) are used:

$$TURN,\ AMIH,\ or\ L\_O\_T = e_0 + e_1\sigma + e_2 \ln MV + e_3 \ln P + e_4\left(\hat{HERF}, \hat{BLOCK},\ or\ \hat{INST}\right) + \tilde{\varepsilon}_5 \qquad (15),$$

$$QS\ or\ ES = f_0 + f_1\sigma + f_2 \ln V + f_3 \ln P + f_4\left(\hat{HERF}, \hat{BLOCK},\ or\ \hat{INST}\right) + \tilde{\varepsilon}_6 \qquad (16),$$

where $\hat{H}ERF$, $\hat{B}LOCK$, and $\hat{I}NST$ are the predicted values of *HERF*, *BLOCK*, and *INST* from models (14).

3.4. Information asymmetry, initial underpricing, and ownership structure

For continuously traded stocks, the relationship between information asymmetry, initial underpricing, and ownership concentration are tested with the same three-stage approach, the first stage being the estimation of the probability of underpricing, $P(U > 0)$, as in equation (11).

At the second-stage level, measures of information asymmetry (α_{lsb}, *PIMP*, and *PIN*) are regressed on predicted underpricing after controlling for market size, price level, insider shareholding, the market segment (Parallel or New market), the industrial sector (new technologies vs traditional industries and services):

$$IA = g_0 + g_1 \ln MV + g_2 \ln P + g_3 MAN + g_4 NM + g_5 NTIC + g_6 \hat{P}(U > 0) \times U + \tilde{\varepsilon}_7 \qquad (17),$$

with *IA* being alternatively α_{lsb}, *PIMP*, or *PIN*. *NM* is a binary variable equal to 1 if the firm is listed in the New Market, 0 otherwise, and *NTIC* is a binary variable set to 1 for new-technologies firms.

At the third-stage level, measures of information asymmetry are regressed on the ownership variables as predicted in models (14), and the same control variables as in equation (17) are used:

$$IA = i_0 + i_1 \ln MV + i_2 \ln P + i_3 MAN + i_4 NM + i_5 NTIC + i_6 (\hat{H}ERF, \hat{B}LOCK, or\ \hat{I}NST) + \tilde{\varepsilon}_8 \quad (18).$$

4. Results

Table 1 reports general statistics on initial underpricing, liquidity, risk, and ownership structure for the whole sample of IPO firms and the sample restricted to the book-built firms. Initial underpricing reaches an average level of 21.22% for the whole sample and 20.61% for the restricted sample. Statistics on ownership show that most firms are closely held by blockholders after the IPO. On average, more than 73% of shares are retained by shareholders who own more than 5% of shares after the IPO, and almost 56% of the shares are retained by the managers after the IPO. Furthermore, institutional holdings are substantial with an average share that nearly reaches 10%. Average liquidity levels are those typically observed for middle capitalisation stocks. No striking difference appears for book-built IPOs, with the exception that book-built IPO stocks are riskier.

Table 1 about here

Table 2 presents a matrix of correlations between IPO underpricing, measures of liquidity, ownership variables, and information-asymmetry measures. Three remarks can be drawn from this matrix: (1) post-listing liquidity is significantly and positively correlated to IPO underpricing whatever measure is considered; (2) two liquidity measures, the turnover and the zero-return ratio, are significantly correlated with ownership concentration, showing that higher shareholding concentration is associated with lower liquidity; (3) initial underpricing is negatively associated with all measures of information asymmetry.

Table 2 about here

The relations between initial underpricing, ownership dispersion, and liquidity are then investigated through the multivariate analysis described at Section 3. Table 3 displays the results on the 2nd-stage relation between initial underpricing and after-market liquidity in two panels. The estimations conducted over the global sample show that post-listing liquidity increases with initial underpricing. According to the bootstrapped t-statistics, the statistical significance of the underpricing variable coefficents reaches 5% for the regressions of the zero-return ratio, the Amihud ratio, and quoted spreads, and 10% for those of turnover and effective spreads. When restricting the sample to book-built IPOs, the findings hold, but the levels of statistical significance change for some liquidity variables. The significance level falls to 10% for the regression of the Amihud ratio and the relation with effective spreads is no longer significant, while in contrast, the relation with turnover and the zero-return ratio has a stronger economic and statistical significance. Those findings allow us to reject (validate) H2b (H2a) and to conclude that underpricing promotes post-listing liquidity.

Table 3 about here

Results on the relation between shareholding structure and after-market liquidity are displayed in Table 4. Panel A shows the estimates for the whole sample while Panel B is dedicated to the sub-sample of book-buildings. The results in Table 4 indicate that the liquidity effect we have evidenced is not formed through the mediation of ownership structure, converse to the findings of Pham *et al*. (2003) over an Australian sample. The first three lines of Table 4 Panel A, which report the estimations for the second-stage regressions of ownership variables on underpricing, show that ownership dispersion and institutional holdings are unrelated to initial underpricing, and this result is unchanged when the sample is reduced to book-built issues (Panel B). Therefore, as Hill (2006) for the UK, we reject

hypothesis H1[6]. The remainder of Table 4 displays the results for the third-stage regressions. Again, they indicate that ownership concentration as predicted by the second-stage regressions do not impact the liquidity in the secondary market. This leads us to reject H3. Results for the book-buildings' sub-sample, reported in Panel B of Table 4, are similar. One result appears though, for the book-buildings specifically: we find a positive link between institutional holdings and spreads which is significant at the 10% threshold.

Table 4 about here

The estimations for the regressions involving asymmetric information measures are displayed in Tables 5 and 6. As shown in Table 5, the three measures of information asymmetry negatively relate to initial underpricing with a statistical significance of 5%, for either the whole sample or the book-building sub-population, so that we reject H4. Once again, the relation is not obtained through the mediation of ownership structure, as none of our measures of information asymmetry is significantly influenced by either ownership concentration or institutional holdings (cf. Table 6).

Tables 5 and 6 about here

[6] Because no significant relation is found between ownership concentration and underpricing, we cannot support the opposite theory of Stoughton and Zechner (1998), who suggest that IPO firms underprice their stocks at issuance to create a more concentrated ownership structure.

5. Conclusion

Over a sample of Euronext IPOs between 1995 and 2004, we validate the liquidity-promotion theory according to which initial underpricing boosts post-listing liquidity, but reject the illiquidity-compensation hypothesis which views underpricing as a compensation for illiquidity costs in the secondary market. More underpriced IPO stocks are more intensively traded in the post-listing period, this effect being stronger for book-built IPOs, and spreads are also negatively correlated to initial underpricing. Further, adverse selection costs and informed trading are lower for more underpriced IPO stocks, which suggests that more public information is produced for these stocks. In contradiction with the Booth and Chua's theory, we fail to prove that these effects result from a more diffuse ownership obtained by underpricing the issue. We rather assign them to investors and media's interest in IPOs that perform well in the immediate after-market, as argued in the model of Aggarwal, Krigman, and Womack (2002). Besides, we find that spreads of book-built IPOs enlarges with institutional stockholdings. At this point, the empirical evidence we hold on this matter has a weak significance, but the topic could be better investigated in future research.

References

Aggarwal R. K., L. Krigman and K. L. Womack, 2002, "Strategic IPO Underpricing, Information Momentum, and Lockup Expiration Selling", *Journal of Financial Economics*, 66(1), 105-137.

Amihud Y., 2002, "Illiquidity and stock returns: cross-section and time-series effects", *Journal of Financial Markets*, 5, 31–56.

Amihud Y. and H. Mendelson, 1986, "Asset Pricing and the Bid-Ask Spread", *Journal of Financial Economics*, 17(2), 223-249.

Booth J.R. and L. Chua, 1996, "Ownership Dispersion, Costly Information and IPO Underpricing", *Journal of Financial Economics*, 41(2), 291-310.

Brennan M. J. and J. Franks, 1997, "Underpricing, Ownership and Control in Initial Public Offerings of Equity Securities in the UK", *Journal of Financial Economics*, 45(3), 391-413.

Brennan M. J. and A. Subrahmanyam, 1996, "Market Microstructure and Asset Pricing: On the Compensation for Illiquidity in Stock Returns", *Journal of Financial Economics*, 41(3), 441-464.

Butler A. W., G. Grullon and J. P. Weston, 2005, "Stock Market Liquidity and the Cost of Raising Capital", *Journal of Financial and Quantitative Analysis*, 40, 331-348.

Corwin S. A., J. H. Harris and M. L. Lipson, 2004, "The Development of Secondary Market Liquidity for NYSE-listed IPOs", *Journal of Finance*, 59(5), 2339-2373.

Ellul A. and M. Pagano, 2006, "IPO Underpricing and After-Market Liquidity", *Review of Financial Studies*, 19(2), 381-421.

Gajewski J.-F. and C. Gresse, 2006, "A Survey of the European IPO Market", ECMI research report.

Hanley K.W., 1993, "Underpricing of Initial Public Offerings and the Partial Adjustment Phenomenon", *Journal of Financial Economics*, 34(2), 231-250.

Hahn T. and J. A. Ligon, 2004, "Liquidity and Initial Public Offering Underpricing", University of Idaho and University of Alabama, working paper.

Hill P., 2006, “Ownership Structure and IPO Underpricing”, *Journal of Business Finance and Accounting*, 33(1) & (2), 102-126.

Huang, R. D. and H. R. Stoll, 1997, “The components of the bid-ask spread: a general approach,” *Review of Financial Studies,* 10(4), 995-1034.

Ibbotson R. G. and J. R. Ritter, 1995, “Initial Public Offerings”, in: Jarrow R.A., V. Maksimovic and W. T. Ziemba (eds.), Handbooks in Operations Research and Management Science: Finance, 9, North-Holland, Amsterdam, 993-1016.

Lesmond D. A., J. P. Ogden and C. A. Trzcinka, 1999, “A New Estimate of Transaction Costs”, *Review of Financial Studies*, 12(5), 1113-1141.

Li M., T. H. McInish and U. Wongchoti, 2005, “Asymmetric Information in the IPO Aftermarket”, *The Financial Review*, 40(2), 131-153.

Li M., S. X. Zheng and M. V. Melancon, 2005, “Underpricing, Share Retention, and the IPO Aftermarket Liquidity”, *International Journal of Managerial Finance*, 1(2), 76-94.

Lin, J.-C., G. C. Sanger and G. G. Booth, 1995, “Trade size and components of the bid-ask spread”, *Review of Financial Studies*, 8(4), 1153-1183.

Loughran T. and J.R. Ritter, 2002, “Why Don’t Issuers Get Upset about Leaving Money on the Table in IPOs?”, *Review of Financial Studies*, 15(2), 413-443.

Maug E., 1998, “Large Shareholders as Monitors: Is There a Trade-off between Liquidity and Control?, *Journal of Finance*, 53(1), 65-98.

Michaely R. and W. H. Shaw, 1994, “The pricing of Initial Public Offerings : Tests of the Adverse-Selection and Signalling Theories”, *Review of Financial Studies*, 7(2), pp 279-319.

Miller R. E. and F. K. Reilly, 1987, “An Examination of Mispricing, Returns and Uncertainty for Initial Public Offerings”, *Financial Management*, 16(2), 33-38.

Pham P. K., P. S. Kalev and A. B. Steen, 2003, “Underpricing, Stock Allocation, Ownership Structure and Post-Listing Liquidity of Newly Listed Firms”, *Journal of Banking and Finance*, 27(5), 919-947.

Reese W. A., 1998, “IPO Underpricing, Trading Volume, and Investor Interest”, working paper, Tulane University.

Ritter J. and I. Welch, 2002, “A Review of IPO Activity, Pricing, and Allocations”, Working paper, University of Yale.

Rock K., 1986, “Why New Issues are Under-priced”, *Journal of Financial Economics*, 15(1-2), 187-212.

Schultz P. H. and M. A. Zaman, 1994, “Aftermarket Support and Underpricing of Initial Public Offerings”, *Journal of Financial Economics*, 35(2), 199-219.

Stoughton N. M. and J. Zechner, 1998, “IPO-mechanisms, Monitoring and Ownership Structure”, *Journal of Financial Economics*, 49(1), 45-77.

Zheng S. X. and M. Li, 2008, “Underpricing, Ownership Dispersion, and Aftermarket Liquidity on IPO Stocks”, *Journal of Empirical Finance*, 15(3), 436-454.

Table 1. Descriptive statistics on sample firms

	All IPOs			Book-built IPOs only		
Variable	**# Obs**	**Mean**	**Standard-deviation**	**# Obs**	**Mean**	**Standard-deviation**
AGE	204	12.74	12.16	155	11.61	11.31
P_0	204	21.73	10.74	155	20.46	10.46
SIZE	204	16,582,762	19,297,239	155	20,050,633	20,889,094
U	204	21.22%	37.39%	155	20.61%	38.79%
V	204	425,590	787,065	155	462,343	860,299
TURN	204	0.1412%	0.1646%	155	0.1508%	0.1474%
σ	204	3.9176%	1.8763%	155	4.2473%	1.9385%
QS	87	2.4508%	1.1802%	77	2.5700%	1.1993%
ES	87	2.2168%	0.9695%	77	2.3177%	0.7346%
BLOCK	204	0.7281	0.1557	155	0.6994	0.1521
INST	204	0.1023	0.1652	155	0.1190	0.1728
MAN	204	0.5454	0.2937	155	0.4965	0.2771
HERF	204	0.3329	0.2160	155	0.2930	0.1956

Note: AGE is the age of the firm at the time of the IPO. P_0 is the IPO price. *SIZE* corresponds to the issue size equal to the number of shares on sale times the IPO price. For each stock of the sample, IPO underpricing is measured as the adjusted return (*U*) observed over the first five trading days. All trading measures are estimated over the six months surrounding the 31st of December that follows the IPO date. *V* is the average trading volume in € over this post-listing period. *TURN* is the average daily turnover, that is the average daily volume in percentage of the number of shares sold in the IPO. σ is the closing return volatility. We compute duration-weighted average quoted and effective spreads (*QS* and *ES*). *BLOCK* is the percentage of shares controlled by the blockholders. *INST* is the percentage of shares controlled by institutional investors. *MAN* is the percentage of shares retained by the managers. *HERF* is the Herfindhal index of ownership concentration. All ownership variables are measured after the IPO (at the end of the year following the IPO).

Table 2. Matrix of correlations between IPO underpricing, liquidity and information asymmetry

	Underpricing	*Measures of liquidity*					*Ownership structure variables*			*Information asymmetry measures*		
	U	*TURN*	*L_O_T*	*AMIH*	*QS*	*ES*	*HERF*	*BLOCK*	*INST*	α_{lsb}	*PIN*	*PIMP*
U	1	0.35588*** (<.0001) 204	-0.23284*** (0.0008) 204	-0.13637* (0.0518) 204	-0.32413*** (0.0022) 87	-0.30158*** (0.0045) 87	-0.0642 (0.3751) 204	0.02513 (0.7213) 204	-0.01468 (0.8350) 204	-0.13518 (0.2119) 87	-0.25901** (0.0154) 87	-0.24487** (0.0248) 87
TURN		1	-0.40882*** (<.0001) 204	-0.16665** (0.0172) 204	-0.39075*** (0.0002) 87	-0.39256*** (0.0002) 87	-0.19633** (0.0049) 204	-0.22069** (0.0015) 204	-0.02459 (0.7271) 204	-0.08611 (0.4277) 87	0.24025** (0.0250) 87	-0.26144** (0.0163) 87
L_O_T			1	0.24580*** (0.0004) 204	0.37119*** (0.0004) 87	0.37597*** (0.0003) 87	0.20683*** (0.0030) 204	0.16486** (0.0185) 204	-0.03221 (0.6474) 204	-0.02200 (0.8397) 87	0.04655 (0.6685) 87	0.09486 (0.3907) 87
AMIH				1	0.57198*** (<.0001) 87	0.56383*** (<.0001) 87	0.08108 (0.2489) 204	0.02797 (0.6913) 204	-0.08113 (0.2487) 204	0.08871 (0.4139) 87	0.17157 (0.1121) 87	0.46828*** (<.0001) 87
QS					1	0.97607*** (<.0001) 87	0.09378 (0.3876) 87	0.01807 (0.8680) 87	0.09264 (0.3934) 87	0.25848** (0.0156) 87	0.11941 (0.2706) 87	0.83546*** (<.0001) 87
ES						1	0.10551 (0.3308) 87	0.03632 (0.7384) 87	0.07720 (0.4772) 87	0.23167** (0.0308) 87	0.09079 (0.4030) 87	0.82743*** (<.0001) 87
HERF							1	0.62592*** (<.0001) 204	-0.39535*** (<.0001) 204	0.00316 (0.9769) 87	0.13291 (0.2197) 87	0.02586 (0.8154) 87
BLOCK								1	-0.29687*** (<.0001) 204	0.05865 (0.5894) 87	0.08600 (0.4284) 87	-0.02708 (0.8068) 87
INST									1	0.01480 (0.8918) 87	-0.06517 (0.5487) 87	0.10607 (0.3369) 87

Note: For each stock of the sample, IPO underpricing is measured as the adjusted return (*U*) observed over the first five trading days for underpriced issues and is set to 0 for others. Liquidity and information asymmetry measures are estimated over a six-month period surrounding the 31st of December that follows the IPO date. The average daily turnover (*TURN*), that is the average daily volume in percentage of the number of shares sold in the IPO, the Lesmond, Ogden, and Trczinka's zero-return ratio (*L_O_T*), and the Amihud illiquidity ratio (*AMIH*) are calculated for every stock. Duration-weighted average quoted spreads (QS) and average effective spreads (ES) are computed for continuously traded stocks. *HERF* is the Herfindhal index of ownership concentration. *BLOCK* is the percentage of shares controlled by the blockholders. *INST* is the percentage of shares controlled by institutional investors. All ownership measures are measured after the IPO (at the end of the year following the IPO). α_{lsb} , *PIN,* and *PIMP* denote the Lin, Sanger, and Booth's alpha coefficient, the average 30-minute price impact, and the PIN measure respectively. They are estimated for continuously traded stocks only. ***,**,* indicate that the coefficient is significantly positive or negative respectively at the 1%, 5%, 10% level. *P*-values are reported in brackets.

Table 3. IPO underpricing and after-market liquidity

	$P(U>0)$	All IPOs					Book-built IPOs only				
		TURN	*L_O_T*	*AMIH*	*QS*	*ES*	*TURN*	*L_O_T*	*AMIH*	*QS*	*ES*
Number of observations	204	204	204	204	87	87	155	155	155	77	77
Regression type	Probit	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
intercept	0.7404** (0.014)	0.2306 (0.346)	83.7179*** (<.0001)	11.8675*** (0.001)	9.6144*** (<.0001)	8.5561*** (<.0001)	0.1725 (0.274)	86.1932*** (<.0001)	10.9182** (0.016)	9.8968*** (<.0001)	8.7604*** (<.0001)
MAN_0	0.6841** (0.029)										
σ	-0.1309** (0.016)	0.0387*** (<.0001)	-2.3331*** (<.0001)	0.1094 (0.167)	0.1148*** (0.001)	0.1011*** (<.0001)	0.0418*** (<.0001)	-2.1836*** (<.0001)	0.1052 (0.239)	0.1232*** (0.006)	0.1080*** (0.001)
$\ln MV$		-0.0252* (0.070)	-2.9620*** (<.0001)	-0.5390*** (0.005)			-0.0216** (0.017)	-3.1987*** (<.0001)	-0.4928** (0.030)		
$\ln V$					-0.5932*** (<.0001)	-0.5430*** (<.0001)				-0.6256*** (<.0001)	-0.5662*** (<.0001)
$\ln P$		0.0604*** (<.0001)	-1.8764*** (<.0001)	-0.5750*** (<.0001)	-0.0363 (0.802)	0.0318 (0.757)	0.0543*** (<.0001)	-1.5205*** (0.003)	-0.5454*** (0.007)	-0.0107 (0.942)	0.0472 (0.673)
$\hat{P}(U>0)\times U$		$8.4.10^{-4}$* (0.072)	-0.0431** (0.025)	-0.0106** (0.031)	-0.0047** (0.024)	-0.0030* (0.081)	0.0011** (0.038)	-0.0579*** (0.003)	-0.0099* (0.058)	-0.0046** (0.041)	-0.0027 (0.15)
Cox-Snell R^2	8.70%										
Adjusted R^2		37.11%	37.02%	10.58%	63.45%	67.52%	59.55%	40.40%	8.45%	61.16%	65.08%

Note: The second column of the table reports the results of the first stage Logit regression in which the dependent variable is a dummy equal to 1 if the issue is underpriced, 0 otherwise. The probability of an issue to be underpriced is modelled as a function of the pre-IPO managers' shareholdings (MAN_0)and the risk of the stock proxied byσ, the closing return volatility over the six-month post-listing observation period. The rest of the table reports the results of the 2-stage least square regressions of liquidity measures onto the initial underpricing predicted in the Heckman style, i.e. calculated as $\hat{P}(U>0)$, the predicted probability of being underpriced, multiplied by *U*, the actual level of underpricing. $\hat{P}(U>0)\times U$ is set to 0 for overpriced issues. Liquidity variables are measured on a six-month observation period surrounding the 31st of December that follows the IPO date. The average daily turnover (*TURN*), i.e. the average daily volume in percentage of the number of shares sold in the IPO, the Lesmond, Ogden, and Trczinka's zero-return ratio (*L_O_T*), and the Amihud illiquidity ratio (*AMIH*) are calculated for all stocks. The duration-weighted average quoted (*QS*) and the average effective spread (*ES*) are computed for continuously traded stocks. ln*P* is the average closing price in logarithm over the six-month observation period. ln*MV* is the market value in logarithm. ln*V* represents the logarithm of the average daily trading volume in euros. P_0 is the IPO price. Bootstrapped *P*-values are in parentheses. *, **, *** denote significance at 10, 5, and 1% levels respectively.

Table 4. Ownership structure and after-market liquidity

Panel A – All sample

	Intercept	*SIZE*	*FAM*	$\hat{P}(U>0)\times U$	σ	ln*MV*	ln*V*	ln *P*	*ĤERF*	*B̂LOCK*	*ÎNST*	# obs.	Adj. R²
HERF	1.3370*** (<.0001)	-0.0658*** (<.0001)	0.2565*** (<.0001)	-0.0007 (0.182)								204	27.96%
BLOCK	1.2372*** (<.0001)	-0.0347*** (0.001)	0.1778*** (<.0001)	0.0002 (0.616)								204	22.56%
INST	-0.6577*** (<.0001)	0.0492*** (<.0001)	-0.1188*** 0.0001	-0.0002 (0.635)								204	15.22%
TURN	0.5272 (0.188)				0.0360*** (<.0001)	-0.0376* (0.055)		0.0646*** (<.0001)	-0.1998 (0.161)			204	37.29%
TURN	0.4875 (0.272)				0.0376*** (<.0001)	-0.0322* (0.068)		0.0662*** (<.0001)		-0.1837 (0.335)		204	36.40%
TURN	0.5381 (0.196)				0.0357*** (<.0001)	-0.0446* (0.070)		0.0661*** (<.0001)			0.4200 (0.184)	204	37.60%
L_O_T	72.7876*** (<.0001)				-2.2511*** (<.0001)	-2.4935*** (<.0001)		-2.1201*** (<.0001)	7.1552 (0.163)			204	36.56%
L_O_T	75.2375*** (<.0001)				-2.3156*** (<.0001)	-2.7100*** (<.0001)		-2.1801*** (<.0001)		5.7811 (0.451)		204	36.16%
L_O_T	73.3779*** (<.0001)				-2.2537*** (<.0001)	-2.3033*** (0.005)		-2.1753*** (<.0001)			-13.6070 (0.171)	204	36.55%
AMIH	10.6904** (0.012)				0.1102 (0.141)	-0.4823** (0.016)		-0.6458*** (<.0001)	0.6682 (0.709)			204	9.65%
AMIH	11.5048** (0.016)				0.0992 (0.166)	-0.5157*** (0.008)		-0.6524*** (<.0001)		0.0857 (0.972)		204	9.57%
AMIH	11.1384*** (0.009)				0.1047 (0.150)	-0.4887** (0.034)		-0.6517*** (<.0001)			-0.6968 (0.838)	204	9.59%
QS	10.1442*** (<.0001)				0.1007*** (0.004)		-0.6208*** (<.0001)	-0.0457 (0.742)	-0.6148 (0.410)			87	62.75%
QS	10.7256*** (<.0001)				0.1002** (0.005)		-0.6179*** (<.0001)	-0.0451 (0.744)		-1.1263 (0.317)		87	62.91%
QS	9.8510***				0.0988**		-0.6367***	-0.0207			1.7659	87	63.25%

	(<.0001)				(0.005)		(<.0001)	(0.883)			(0.227)		
ES	8.9663*** (<.0001)				0.0906*** (<.0001)		-0.5637*** (<.0001)	0.0288 (0.768)	-0.5231 (0.384)			87	67.26%
ES	9.3941*** (<.0001)				0.0907*** (<.0001)		-0.5603*** (<.0001)	0.0284 (0.779)		-0.8776 (0.302)		87	67.36%
ES	8.7136*** (<.0001)				0.0895*** (<.0001)		-0.5755*** (<.0001)	0.0480 (0.638)			1.4030 (0.167)	87	67.70%

Panel B – Book-built IPOs only

	Intercept	*SIZE*	*FAM*	$\hat{P}(U>0)\times U$	σ	ln*MV*	ln*V*	ln P	*ĤERF*	*B̂LOCK*	*ÎNST*	*# obs.*	*Adj. R²*
HERF	0.9832*** (<.0001)	-0.0444*** (0.002)	0.2455*** (<.0001)	-0.0009** (0.034)								155	18.66%
BLOCK	0.9992*** (<.0001)	-0.0204 (0.145)	0.1736*** (<.0001)	-0.0001 (0.762)								155	12.62%
INST	-0.7353*** (0.003)	0.0540*** (<.0001)	-0.1478*** (<.0001)	-0.0001 (0.900)								155	12.49%
TURN	0.2450 (0.190)				0.0430*** (<.0001)	-0.0251** (0.011)		0.0606*** (<.0001)	-0.0620 (0.449)			155	56.80%
TURN	0.1340 (0.505)				0.0438*** (<.0001)	-0.0215** (0.017)		0.0614*** (<.0001)		0.0317 (0.796)		155	56.68%
TURN	0.1944 (0.302)				0.0434*** (<.0001)	-0.0238** (0.031)		0.0611*** (<.0001)			0.0416 (0.810)	155	56.68%
L_O_T	73.7238*** (<.0001)				-2.1756*** (<.0001)	-2.6865*** (<.0001)		-1.7577*** (0.001)	10.4781 (0.112)			155	39.41%
L_O_T	76.2087*** (<.0001)				-2.2317*** (<.0001)	-2.9664*** (<.0001)		-1.8472*** (<.0001)		8.7445 (0.350)		155	38.73%
L_O_T	76.5367*** (<.0001)				-2.2003*** (<.0001)	-2.5318*** (0.002)		-1.8302*** (0.001)			-17.0455 (0.191)	155	39.08%
AMIH	12.4253*** (0.0038)				0.0771 (0.350)	-0.5446* (0.055)		-0.6211*** (0.007)	-1.2431 (0.370)			155	7.79%
AMIH	14.1441** (0.029)				0.0748 (0.348)	-0.5515** (0.040)		-0.6170*** (0.004)		-2.7841 (0.172)		155	8.08%
AMIH	12.8752**				0.0739	-0.6140*		-0.6165***			3.3916	155	7.98%

	(0.036)		(0.361)	(0.063)		(0.006)			(0.262)		
QS	10.9008*** (<.0001)		0.1137*** (0.008)		-0.6865 (<.0001)	0.002 (0.989)	-1.1933 (0.240)			77	61.05%
QS	11.8614*** (<.0001)		0.1152*** (0.004)		-0.6798*** (<.0001)	0.0009 (0.995)		-1.9713 (0.186)		77	61.29%
QS	10.4467*** (<.0001)		0.1210*** (0.003)		-0.7307*** (<.0001)	0.0535 (0.729)			3.2771* (0.083)	77	62.09%
ES	9.6005*** (<.0001)		0.1023*** (0.001)		-0.6171*** (<.0001)	0.0643 (0.563)	-1.0463 (0.176)			77	65.55%
ES	10.3243*** (<.0001)		0.1035*** (0.001)		-0.6084*** (<.0001)	0.0612 (0.559)		-1.6005 (0.160)		77	65.64%
ES	9.1795*** (<.0001)		0.1084*** (<.0001)		-0.6506*** (<.0001)	0.1047 (0.360)			2.6909* (0.057)	77	66.47%

Note: The first three lines of each panel report the estimations for the second-stage lest square regressions of ownership variables on underpricing. The remainder of each panel displays the results of the third-stage regressions of liquidity measures onto ownership variables. *HERF* is the Herfindhal index of ownership concentration. *BLOCK* is the percentage of shares controlled by the blockholders. *INST* is the percentage of shares controlled by institutional investors. All ownership measures are measured after the IPO (at the end of the year following the IPO). Liquidity measures are computed over a six-month period surrounding the end of the IPO year. Liquidity is measured by the average daily turnover (*TURN*), the Lesmond, Ogden, and Trczinka's zero-return ratio (*L_O_T*), and the Amihud illiquidity ratio (*AMIH*) for all stocks. Duration-weighted average quoted spreads (*QS*) and average effective spreads (*ES*) are calculated for continuously traded stocks. $\hat{HERF}$, $\hat{BLOCK}$, and $\hat{INST}$ are the respective value of *HERF*, *BLOCK*, and *INST* as predicted by the second-stage models. σ and *P* are respectively the closing return volatility and the average closing price over the six-month observation period. ln*MV* is the market value in logarithm. ln*V* represents the logarithm of the average daily trading volume in euros. Bootstrapped *P*-values are in parentheses. *, **, *** denote significance at 10, 5, and 1% levels respectively.

Table 5. After-market information asymmetry and underpricing

	All IPOs			Book-built IPOS only		
	α_{lsb}	*PIMP*	*PIN*	α_{lsb}	*PIMP*	*PIN*
intercept	2.6031*** (<.0001)	1.6940*** (0.004)	0.7681* (0.068)	3.0267*** (<.0001)	2.0582*** (0.005)	0.3883 (0.150)
$\ln MV$	-0.0936*** (0.003)	-0.0440 (0.142)	-0.0257 (0.257)	-0.1159*** (0.001)	-0.0617 (0.101)	-0.0056 (0.705)
$\ln P$	-0.1339*** (<.0001)	-0.1206*** (<.0001)	0.0027 (0.789)	-0.1340*** (<.0001)	-0.1281*** (<.0001)	0.0033 (0.733)
MAN	-0.0718 (0.274)	-0.0647 (0.385)	0.0685* (0.084)	-0.0569 (0.419)	-0.0726 (0.384)	0.0658 (0.151)
NM	0.0456 (0.290)	0.0101 (0.870)	0.0116 (0.502)	0.0221 (0.618)	0.0065 (0.917)	0.0052 (0.775)
NTIC	0.0917** (0.047)	0.1787*** (0.005)	-0.0423** (0.041)	0.0952** (0.048)	0.1590** (0.010)	-0.0263 (0.179)
$\hat{P}(U>0)\times U$	-0.0018*** (0.005)	-0.0020** (0.013)	-0.0012*** (0.002)	-0.0016** (0.014)	-0.0015** (0.025)	-0.0012*** (0.003)
Number of observations	87	87	87	77	77	77
Adjusted R^2	44.34%	36.83%	10.47%	44.21%	37.01%	7.66%

Note: This table displays the estimations for the second-stage regressions of information asymmetry measures on initial underpricing. Dependant variables are the alpha coefficient of Lin, Sanger, and Booth (1995), the average 30-minute price impact, and the PIN measure, denoted α_{lsb}, *PIMP*, and *PIN* respectively. The dependent variable $\hat{P}(U>0)\times U$ is the probability for an issue to be underpriced as predicted in the first-stage logit regression multiplied by the actual level of underpricing. It is set to 0 for overpriced IPOs. Control variables comprise the market value in logarithm ($\ln MV$), the average post-listing closing price in logarithm ($\ln P$), the managers' holdings after the IPO (*MAN*), a binary variable equal to 1 for New Market issues (*NM*), a binary variable equal to 1 for new technologies firms (*NTIC*). ***,**,* indicate that the coefficient is significantly positive or negative respectively at the 1%, 5%, 10% levels. Bootstrapped *P*-values are reported in brackets.

Table 6. After-market information asymmetry and ownership structure

		All IPOs			Book-built IPOs only		
		α_{lsb}	*PIMP*	*PIN*	α_{lsb}	*PIMP*	*PIN*
Number of observations		87	87	87	77	77	77
$\hat{HERF}$	coefficient	-0.0735	-0.0103	-0.1127	-0.1238	-0.133	0.1768
	P-value	(0.801)	(0.974)	(0.616)	(0.696)	(0.710)	(0.423)
	Adj. R²	41.22%	33.27%	4.01%	41.59%	35.06%	0.03%
$\hat{BLOCK}$	coefficient	-0.3927	-0.3268	-0.3049	-0.4970	-0.4861	0.0630
	P-value	(0.343)	(0.497)	(0.320)	(0.287)	(0.351)	(0.839)
	Adj. R²	41.90%	33.71%	5.59%	42.42%	35.76%	-1.39%
$\hat{INST}$	coefficient	0.3289	0.2745	0.4691	0.5039	0.4911	-0.0705
	P-value	(0.535)	(0.645)	(0.260)	(0.420)	(0.498)	(0.865)
	Adj. R²	41.49%	33.47%	6.74%	42.05%	35.43%	-1.42%

Note: This table reports the results of third-stage regressions, in which measures of information asymmetry (α_{lsb}, *PIMP*, and *PIN*) are regressed on the predicted values of the ownership variables $\hat{HERF}$, $\hat{BLOCK}$, and $\hat{INST}$ alternatively. For each regression, the table provides the coefficient of the ownership variable used, the *P*-value associated, and the adjusted R² of the regression. Control variables included in the regressions comprise market value, price level, insiders' holdings, market segment (traditional or new market), and industrial sector (new technologies vs traditional industries and services). ***,**,* indicate that the coefficient is significantly positive or negative respectively at the 1%, 5%, 10% levels. Bootstrapped *P*-values are reported in brackets.