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ABSTRACT

The Seven Per Cent Solution? An International Perspective On Underwriting Spreads*

Non-US firms frequently pay a substantial premium to have a US bank lead their initial public offering of equity, even when the issuing firm is not seeking a listing on a US exchange. We provide evidence that this decision reflects an expectation that US banks deliver a higher quality bundle of underwriting services. Specifically, a non-US issuing firm that includes a US bank in its underwriting syndicate can expect to have its offering underpriced by 17.7% less than had it not included a US bank in the syndicate. Failure to account for the endogeneity of the decision to hire a US bank vastly understates the magnitude of the effect. This finding has direct implications for the claim that US bank spreads for domestic IPOs are above competitive levels.

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Keywords: initial public offerings, investment banking, underwriting spreads

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NON-TECHNICAL SUMMARY

In an article entitled 'The Seven Percent Solution' published in the *Journal of Finance*, Chen and Ritter (1999) publicize the fact that underwriting fees ('gross spreads') for the vast majority of US initial public stock offerings raising $20 million to $80 million are exactly 7.0% of proceeds. Observing that spreads tend to be lower outside the US and arguing that spreads are not determined primarily by costs, the authors conclude that the US IPO market structure is 'conducive to an equilibrium in which fees are high'. Shortly after the release of Chen and Ritter's paper to the business press, a lawsuit alleging that 27 securities firms conspired to 'fix and maintain' the share of IPO proceeds that go to underwriters (*The Wall Street Journal*, November 5, 1998) was filed in Manhattan federal court.

As Chen and Ritter emphasize, the pervasiveness of the 7.0% spread in the US is a fact. Their evidence does not, however, conclusively prove that prices for underwriting services are above competitive levels, nor does it allow the conclusion that there is indeed collusive behaviour, implicit or otherwise. One reason Chen and Ritter offer for concluding that spreads on most deals above $20 million are above competitive levels is that spreads are much lower outside the US. This is also a fact. But it raises two obvious questions: why are US firms not flocking to these alternative markets? And why are non-US firms flocking to the US markets?

In this Paper, we attempt to shed further light on the nature of investment banking services delivered by US banks by examining an unexplored but extremely rich source of international underwriting data, covering 2,055 IPOs in 61 countries during the period January 1992/July 1999. We confirm the claim that spreads for non-US IPOs are lower than US IPO spreads. But we also show that this blanket statement masks several important features of the international marketplace that might help us better understand the pricing of investment banking services by US banks.

First, although spreads for non-US IPOs are lower regardless of the lead bank's country of origin, many issuing firms willingly pay a premium to have a US bank lead their offering. In some cases, these firms are seeking access to the US marketplace either through a US listing or to market their offering to US investors. Controlling for US listings, we find that US banks command an average premium of 103 basis points over what the issuer would expect to pay a non-US bank to lead its offering. Even when the issuing firm does not seek a US listing, US banks command an average premium of about 68 basis points. This is true in spite of the fact that US bank-led offerings are larger on average, which, given economies of scale, should make them cheaper.

The fact that US banks charge a greater premium when the issuing firm seeks a US listing could be interpreted as evidence of US banks maintaining market

power in the US capital markets. It is also consistent, however, with issuing firms paying a premium in precisely those cases where the US bank's investor network contributes most to pricing and distribution. Measuring the relative influence on this premium of market power and the quality of services rendered is difficult. It is possible, however, to compare US and non-US banks on at least one quality dimension. Specifically, it is well known that IPOs are subject on average to large price increases during initial trading. There is also considerable theory and evidence supporting the idea that banks are capable of and expected to control this – often substantial – cost of issuance. If the US bank spread premium reflects the expectation of higher quality service in this dimension, we should observe a negative correlation between gross spreads and underpricing, induced by the presence of US banks, all things being equal.

We find that when a US bank is a senior member of the syndicate for a non-US IPO, the percentage return from the offer price to the closing price after one week of trading is diminished by up to 17.7%. These are very large reductions in the indirect costs of going public. We show that this is not a US listing effect: the reduction in underpricing is even greater where US banks lead-manage IPOs which are not due to list on a US market. In deriving these results, we control for the fact that the presence of a US syndicate bank is a matter of choice and therefore endogenous: given that US banks charge more for their services, issuing firms presumably trade off the greater underwriting cost and the expected benefit of lower underpricing when deciding whether to hire a US bank.

Our finding that US banks are associated with much lower underpricing certainly does not allow us to rule out the possibility that market power contributes to the US bank spread premium, internationally or in the US. On the other hand, it begs for further investigation of, at a minimum, the relationship between spreads and underpricing in the US before concluding that the quality and price of underwriting services are unrelated.

In conclusion, our international evidence leads us to believe that there is little merit in concluding that US spreads are 'too high' merely on the grounds that they exceed spreads outside the US. We see that many non-US firms are willing to pay the premium price charged by US banks. Moreover, the international data provide strong evidence of a trade-off between the magnitude of the gross spread and at least one dimension of the quality of underwriting services, pricing accuracy. Still, the question remains why US spreads cluster around 7% but spreads for non-US IPOs do not. One explanation for clustering in the US that has received relatively little consideration is the possibility that fixing spreads at 7% simplifies bargaining in a setting that involves multiple dimensions of service and quality, where time pressure is immense, and failure to reach agreement is extremely costly. The final terms of the contract between the issuing firm and its lead bank, including the pricing and size of the offering, are negotiated in the hours

preceding the opening of trading in the firm's shares. Reducing the complexity of bargaining by 'fixing' the spread at 7% certainly has benefits in this setting. Considering that issuing firms still influence both the offer price and the size of the offering, not to mention the possibility of past or future cross subsidies, the loss of contracting flexibility may be of little consequence.

1. Introduction

In *The Seven Percent Solution*, Chen and Ritter (1999) publicize the fact that gross spreads for the vast majority of U.S. initial public offerings raising $20 million to $80 million are exactly 7.0 percent.[1] Observing that spreads tend to be lower outside the U.S. and arguing that spreads are not determined primarily by costs, the authors conclude that the U.S. IPO market structure is "conducive to an equilibrium in which fees are high" (p. 8). The remainder of their paper offers a variety of explanations for "high spreads" and concludes by favoring "a strategic pricing explanation for the patterns" documented.[2] The authors suggest similarities with the avoidance of odd-eighth quotes by NASDAQ market makers prior to this practice being publicized by Christie and Schultz (1994). Among the similarities not highlighted is a lawsuit alleging that 27 securities firms conspired to "fix and maintain" the share of IPO proceeds that go to underwriters (*The Wall Street Journal*, November 5, 1998) filed in Manhattan federal court shortly after the release of Chen and Ritter's paper to the business press.

As Chen and Ritter emphasize, the pervasiveness of the 7.0 percent spread in the U.S. is a fact. An interesting question which this finding raises is whether prices for underwriting services are above competitive levels, and if so, whether this is due to collusive behavior, implicit or otherwise. Note that imperfect competition within the U.S. investment banking industry might contribute to the

[1] The clustering of gross spreads around 7.0 percent was recognized within the Securities and Exchange Commission (SEC) prior to the release of the July 24, 1996 Report of the Advisory Committee on the Capital Formation and Regulatory Processes (http://www.sec.gov/news/studies/capform.htm). Table 1 on page 4 of Appendix A documents a median underwriting spread of 7.0 percent for initial public offerings of common stock between 1993 and 1995. In a November 24, 1998 draft of their paper, Chen and Ritter cite the June 15, 1995 minutes of the Advisory Committee.

[2] The term "strategic pricing" is used in lieu of the more common "implicit collusion" to refer to sellers keeping prices above competitive levels without explicitly colluding.

vibrancy of the U.S. capital markets.[3] But presumably, it is this vibrancy that draws non-U.S. firms to the U.S. capital markets. And yet one reason Chen and Ritter offer for concluding that spreads on most deals above $20 million are above competitive levels is that spreads are much lower outside the U.S. This raises two questions. Why aren't U.S. firms flocking to these alternative markets? And why are non-U.S. firms flocking to the U.S. markets?

In this paper, we attempt to shed further light on the nature of investment banking services delivered by U.S. banks by examining an unexplored but extremely rich source of international underwriting data, covering 2,055 IPOs in 61 countries during the January 1992 – July 1999 period. We confirm the claim that spreads for non-U.S. IPOs are lower than U.S. IPO spreads. But we also show that this blanket statement masks several important features of the international marketplace that might help us better understand the pricing of investment banking services by U.S. banks.

First, although spreads for non-U.S. IPOs are lower regardless of the lead bank's country of origin, many issuing firms willingly pay a premium to have a U.S. bank lead their offering. In some cases, these firms are seeking access to the U.S. marketplace either through a U.S. listing or to market their offering to U.S. investors. Controlling for U.S. listings, we find that U.S. banks command an average premium of 103 basis points over what the issuer would expect to pay a non-U.S. bank to lead its offering. Even when the issuing firm does not seek a U.S. listing, U.S. banks command an average premium of about 68 basis points. This is true in spite of the fact that U.S.-bank led offerings are larger on average,[4] and is all the more noteworthy considering that U.S. banks were not only just entering many of these markets during our sample period but also introducing a

[3] There is a growing literature that suggests that weak property rights over the information and relationships at the core of production in the investment banking industry dictate against a perfectly competitive industry structure. Anand and Galetovic (1998) develop the general theoretical argument. Tufano (1989) provides evidence of weak property rights over financial innovation and Persons and Warther (1997) show that under such circumstances, Pareto improvements are achieved when investment banks maintain some degree of market power. Benveniste, Busaba, and Wilhelm (1999) extend this line of reasoning to information production in the primary equity markets. Pichler and Wilhelm (1999) also show how, despite supporting higher underwriting spreads, barriers to entry associated with underwriting syndicates can increase the expected net benefits realized by issuing firms.

new production technology, bookbuilding, that often ran afoul of existing domestic practice and regulations that favored fixed-price offerings.[5] Under such circumstances, the relatively high U.S. bank fees might still plausibly have been below long-run equilibrium levels.[6]

The fact that U.S. banks charge a greater premium when the issuing firm seeks a U.S. listing could be interpreted as evidence of U.S. banks maintaining market power in the U.S. capital markets. However, it is also consistent with issuing firms paying a premium in precisely those cases where the U.S. bank's investor network contributes most to pricing and distribution. Measuring the relative influence on this premium of market power and the quality of services rendered is difficult. However, it is possible to compare U.S. and non-U.S. banks on at least one quality dimension. Specifically, it is well known that IPOs are subject on average to large price increases during initial trading. There is also considerable theory and evidence supporting the idea that banks are capable of and expected to control this often-substantial cost of issuance.[7] If the U.S. bank spread premium reflects the expectation of higher quality service in this dimension, we should observe a negative correlation between gross spreads and underpricing, induced by the presence of U.S. banks, other things equal.

Chen and Ritter mention undocumented tests that find nothing more than a weak relationship between spreads and underpricing in their U.S. sample. In contrast, we find that when a U.S. bank is a senior member of the syndicate for a non-U.S. IPO, the percentage return from the offer price to the closing price after one week of trading is diminished by up to 17.7 *percentage points*. This is not

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[4] Mean (median) gross proceeds for U.S.-bank led offerings are $415 million ($137 million) versus $43 million ($21 million) for non-U.S.-bank led offerings.
[5] For further background, see "Selling the World," The Economist, May 8, 1993.
[6] In the presence of relationship-specific or other sunk start-up costs, Farrell and Shapiro (1989) and DeAngelo (1981) show that producers optimally price their service below marginal cost for an initial transaction and then increase price, leading to quasi-rents in subsequent transactions.

due to a U.S. listing effect: the reduction in underpricing is even greater where U.S. banks lead-manage IPOs which are not due to list on a U.S. market. In deriving these results, we control for the endogeneity of the presence of a U.S. syndicate bank: given that U.S. banks charge more for their services, issuing firms presumably trade-off the greater underwriting cost and the expected benefit of lower underpricing when deciding whether to hire a U.S. bank. Such trade-offs are modeled and confirmed for U.S. issuing firms by Habib and Ljungqvist (1998). Our evidence suggests a similar trade-off amongst non-U.S. issuing firms.

Importantly, the reduction in underpricing is quite sensitive to whether the decision to include a U.S. bank in the syndicate is treated as endogenous. Failure to do so yields a much smaller, but still statistically significant, benefit. Unless one believes that U.S. issuing-firm management teams are not similarly rational in their selection of a lead bank, our results cast doubt on existing studies of the link between the price and quality of underwriting services that do not treat the issuing firm's actions as endogenous. Having said this, the finding that U.S. banks are associated with much lower underpricing certainly does not allow us to rule out the possibility that market power contributes to the U.S. bank spread premium, internationally or in the U.S. On the other hand, it begs for further investigation of, at minimum, the relation between spreads and underpricing in the U.S. before concluding that the quality and price of underwriting services are unrelated.

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[7] Benveniste and Spindt (1989), Benveniste and Wilhelm (1990), Benveniste, Busaba, and Wilhelm (1996), Benveniste and Busaba (1997), Stoughton and Zechner (1998), Sherman and Titman (1999), Maksimovic and Pichler (1999), Biais *et al.* (1999) and others present models in which the bank takes an active and strategic role in controlling the magnitude of the underpricing discount. Hanley (1993), Hanley and Wilhelm (1995), Nanda and Yun (1997), Benveniste, Erdal, and Wilhelm (1998), and Dunbar (1999) provide evidence that is either consistent with these models or with the broader notion that failure to control underpricing is damaging to the bank's reputation.

2. Sample and data

2.1 Data sources and coverage

The sample is derived from Equityware, a database of international IPOs compiled by a subsidiary of Euromoney Publications plc. The July 1999 CD-ROM contains a total of 3,165 equity offerings from January 1992 to July 1999. Since we focus on the behavior of issuers based outside the U.S., we exclude 665 international offerings by U.S.-based issuers. We exclude 51 reported offerings that were cancelled and 3 offerings that were postponed. Of the remaining 2,446 IPOs, twenty-one are not bona fide IPOs (having been listed previously, sometimes in another country), 174 are investment trusts, 193 lack after-market trading prices and three lack an offer price. After excluding these offerings, the final sample consists of 2,055 IPOs by issuers from 61 countries.

There are three types of offerings in the sample: companies going public on a domestic stock exchange only (1,526 companies, 74.2% of the sample); companies going public on a domestic and a foreign stock exchange (254 companies, 12.4%); and companies going public on a foreign stock exchange only (275, 13.4%). Companies in the second category most often list at home and in the U.S. (181 of the 254 companies). Amongst the 275 companies that do not go public in their domestic market, 166 companies list only in the U.S., 26 list in the U.S. and on another foreign market, and 83 list only on a non-U.S. foreign exchange, such as EASDAQ or Germany's Neuer Markt.

In the early sample years, foreign-only and domestic-and-foreign listings predominate. This is a result of Equityware's origins as a database of cross-border IPOs. Coverage has subsequently been extended to domestic-only offerings country-by-country, beginning with East and West European and Latin American markets, Hong Kong and Singapore (1993/4 onwards) and currently encompassing other Asian and African markets (1997 onwards). Comprehensive coverage of

Japanese domestic IPOs begins in 1998. As a consequence, IPOs in the early sample years are likely to be larger than the local average in many sample countries.[8]

Coverage of Australian domestic IPOs is scant, and domestic IPOs in some large markets (e.g. India, Israel, Taiwan, Korea) are not yet covered at all. To see how comprehensive Equityware's coverage is in countries for which Equityware claims coverage, we look in detail at three markets: Germany, Singapore and the U.K. German coverage is extremely comprehensive from 1994 onwards, with only the occasional small IPO on a regional OTC market missing. In Singapore, we find only three out of 69 IPOs missing, when comparing Equityware to a list of IPOs provided by the Singapore Stock Exchange. U.K. coverage is similarly good, compared to a list of IPOs provided by the London Stock Exchange.[9]

Secondary market prices are drawn primarily from Equityware and Datastream. Initial returns are measured over the first week of trading in part because Equityware's coverage of seven-day prices is far more comprehensive than its coverage of one-day or thirty-day prices, and in part because some countries impose restrictions on daily price fluctuations which delay the emergence of an equilibrium price. The latter is true of France, for instance, where IPO prices may not change by more than 10% per day. When seven-day prices are not available through Equityware, secondary market prices are collected from Datastream or, in a few cases, a Nexis news search. Where neither Datastream nor Equityware nor a news source reports a seven-day price, we use either the one-day or the thirty-day price reported in Equityware (37 cases). We exclude 193 IPOs for which no secondary-market price information is available.

[8] We have investigated the robustness of our results to excluding the early sample years and found that they remained qualitatively unchanged.

[9] We also compare Equityware's coverage to that provided by the Securities Data Company's Global New Issues database. By comparison, SDC's coverage is substantially less comprehensive than Equityware's in the European markets, even the larger ones like the U.K. and Germany, though SDC's coverage of Asian domestic-IPO markets appears to begin earlier than Equityware's.

All Equityware-generated initial returns in excess of ±30% were checked manually using Datastream and various online information and news services as well as information provided by national stock exchanges. In 12 cases there was clear evidence of reporting error in the Equityware trading price data. Equityware errors were typically the result of offer prices and seven-day prices being recorded for a different number of shares (in instances where ADS or units contain more than 1 share each) or being recorded in different currencies. These errors were corrected. Datastream-generated initial returns in excess of ±30% were also checked against news sources. Most large returns can be traced to currency differences between the offer price in Equityware and the secondary market price in Datastream. In these cases, the Equityware and Datastream prices were converted to a common currency. Other sources of errors included partial-paids or misplaced decimal points (e.g. in the U.K., IPO offer prices are typically quoted in pence, but Datastream's after-market trading prices are reported in pounds).

Equityware also reports the underwriter's gross spread as a percentage of the offer price. Since Equityware reports cross-sectional information for each tranche of a multi-tranche offering separately, the spread information for multi-tranche offerings is manually consolidated. To illustrate, where U.K. issuers combine a private placement with a public offering, spreads are calculated as the weighted-average of the placement and public-offer spreads. Spread information is consolidated similarly for companies with domestic tranches and an S.E.C.-registered U.S. tranche.

Spread information for all European and Asian IPOs and for all IPOs due to list in the U.S. is checked for accuracy against SDC's Global New Issues and U.S. New Issues databases. In the few instances where discrepancies arose, a Nexis search was used to correct any errors. In a few cases, SDC information is used to fill gaps in Equityware's spread information. Where Equityware reports a total-fee figure the gross spread is calculated as total-fee/gross proceeds. In cases where Equityware reports that spreads were not disclosed (particularly prevalent in Germany and France),

accuracy is checked against the issuing firm's prospectus. In thirteen cases, the information was available in the prospectus. In total, we have spread information for 1,535 of the sample 2,055 IPOs. Our results could conceivably be spuriously driven by an unobserved but nonrandom selection criterion which determines whether or not we observe spread information for a particular IPO. It is possible, for instance, that we are systematically less likely to observe the spreads of very small IPOs underwritten by non-U.S. banks, which in turn could bias the results from OLS regressions. Therefore, we will test the robustness of our results to nonrandom selection.

Finally, Equityware reports the composition of the entire underwriting syndicate and the capacity in which each participating bank serves. This enables us to investigate the contribution of U.S. banks in finer detail than would be possible using SDC information: SDC only names the lead and co-managing banks. We define 'U.S. banks' as U.S. investment banks such as Goldman, Sachs and Morgan Stanley & Co and any of their overseas offices, excluding the Wall Street offshoots of non-U.S. banks such as CIBC Wood Gundy Securities Inc and Deutsche Securities Inc. We classify Credit Suisse First Boston as a U.S. bank given its long Wall Street presence, despite its Swiss parentage. We distinguish between cases where a U.S. bank serves in a senior syndicate position, which we define as global coordinator, bookrunner, or (co-) lead manager, and cases where a U.S. bank serves at most in a junior syndicate position.

2.2 Sample descriptive statistics

Table 1 reports descriptive statistics for the 1,535 IPOs with spread information sorted by geographic region (Europe, North and South America, Asia-Pacific, Africa and the Middle East). Ranked by the number of offerings for which spread information was available, four countries (U.K., Germany, Hong Kong, and China) account for about 48% of the sample. Offerings for which spread

information is available are distributed broadly uniformly throughout the sample, though France, with only 48 of its total of 222 offerings disclosing spread information, stands out.

For the sample at large, median gross proceeds are about $44 million, with a substantially higher mean of $202 million (we convert all currency amounts into U.S. dollars using exchange rates on the pricing day). Among countries with relatively high IPO volume, mean gross proceeds range from $32 million in Israel, where the sample firms are typically venture-capital backed startups, to about $732 million in France, where privatizations of large industrial firms account for 25% of the sample firms for which we have spread information.[10] The mean gross spread of 3.645% confirms Chen and Ritter's claim that spreads are generally lower outside the United States. But variation across countries is substantial, with mean gross spreads among countries with relatively high IPO volume ranging from a low of 1.48% in Malaysia to a high of 7.27% in Israel.

The exchange(s) on which the issuing firm lists its equity is a key decision variable and, because most non-domestic listings include a U.S. listing, is inversely related to the presence and status of U.S. banks in the underwriting syndicate. For example, in Israel, where not a single sample IPO is exclusively domestically listed, 90% of the underwriting syndicates include a U.S. bank as global coordinator, bookrunner, or (co-) lead manager, our definition of senior syndicate positions. Similarly, U.S. banks lead 65% of French (sample) IPOs only 50% of which are exclusively domestically listed. By contrast, 88% of German IPOs list only domestically and 22% are led by U.S. banks. The inverse relationship is even more extreme in the U.K. where only 15% of the sample IPOs are led by U.S. banks and 89% list only in the U.K. This general pattern is present in each of the four geographic regions reported in Table 1.

It is apparent that where the issuing firm's home market has relatively well developed capital markets, as in Europe and Asia/Pacific, the relative frequency of a U.S. listing is lower. On the other

hand, Table 1 also indicates that firms frequently market their offerings in the U.S. even when they are not seeking a U.S. listing. In the European subsample, only 18.7% of the sample firms seek a U.S. listing, but 34.7% include the U.S. as part of their target market. Likewise, although only 13% of issuing firms in the Asia/Pacific subsample seek a U.S. listing, 34% target U.S. investors. Thus, even if an issuing firm is not seeking a U.S. listing, including a U.S. bank in the underwriting syndicate will be beneficial if it improves access to the U.S. (institutional) investor community.

In contrast to the high level of variation in gross spreads across countries, Table 2 illustrates that there is relatively low variation in spreads across industry segments. The maximum (4.6% for computers and software) and minimum (2.6% for construction) are fairly tightly clustered around the gross mean spread of 3.6%. Similarly, with the exception of telecoms, financial services, oil, coal & gas, and energy & utilities, the fraction of issuers placing a U.S. bank in a leadership position is either significantly less than or tightly clustered around the sample mean of 37.1%. The four industries that are more nearly dominated by U.S. banks also involve the largest IPOs and are the most frequently subject to privatization.

Finally, partitioning the sample by year of issuance in Table 3 reveals that the leadership role of U.S. banks has actually declined over time within the sample. U.S. listings by sample firms decline from 52.5% in 1992 to 13.9% of the 1999 offerings brought to market through the end of July. Similarly, issuing firms targeted U.S. investors in 72.5% of the sample offerings in 1992 but only 34.7% of the time in 1999. Corresponding with this relative decline in emphasis on listing and marketing in the U.S., the fraction of offerings for which a U.S. bank was included in the underwriting syndicate declined from 72.5% in 1992 to 38.1% in 1999.[11]

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[10] In the full sample of 222 French IPOs, only 12 (or 5.4%) are privatisations. All 12 privatisations are among the 48 firms for which we have spread information.

[11] There is also a pronounced decline over time in the frequency of privatisations which, in turn, has much to do with the decline in gross proceeds per offering. This is likely a consequence of both sampling bias associated with Equityware's overrepresentation of privatisations during the early part of the sample period and a time trend in the rate of privatisations.

3. Empirical Results

3.1 Gross spreads

Tables 4 and 5 report the results of a univariate analysis of gross spreads. The international perspective on gross spreads reported in Table 4 shows that U.S. banks charge a premium of approximately 160 basis points in Europe, 100 basis points in North and South America, 120 basis points in the Asia/Pacific region and 450 basis points in Africa/Middle East region. *t*-tests indicate that the U.S. bank premium is statistically significant and more so when the U.S. bank is in a senior syndicate position. In general, the results are more pronounced in Anglo capital markets, where fixed-price offerings predominate and domestic banks charge mean gross spreads ranging from 1.4% in Malaysia to 2.1% in the U.K.

Japan and Germany provide noteworthy exceptions to the general conclusion that U.S. banks charge higher spreads. In the case of Japan, U.S. banks actually charge significantly lower gross spreads than the competition (4.95% vs. 5.54%). Returning to Table 1, we see, however, that 98% of Japanese IPOs and 88% of German IPOs were listed exclusively in their home country. Table 5 controls for this listing effect by excluding IPOs listed in the U.S. This allows us to explore whether U.S. banks engage in fee competition in cases where they are less obviously the gatekeepers to the marketplace. In general, U.S. banks continue to charge a statistically significant premium of about 70 basis points over their domestic counterparts (3.55% vs. 2.88%). However, there is considerable variation at the level of individual countries. Excluding the Anglo capital markets, where fixed-price offerings remained prevalent, the U.S. bank premium becomes a discount of 27 basis points (*p*-value = 1.8%). This apparent discount is, however, driven by Germany where U.S. banks appeared to compete quite aggressively on fees. If we exclude offerings by both Anglo and German issuing

firms, there is no statistical difference between the fees charged by U.S. and non-U.S. banks in the remaining countries for non-U.S. listings.

3.2 Determinants of the gross spread

The univariate analysis suggests gross spreads are influenced by a variety of factors including a U.S. listing effect, the presence of a U.S. bank, and country-specific regulatory and competitive circumstances, but it does not shed light on their marginal contributions to the spread. We provide a more detailed characterization of the determinants of gross spreads by regressing the gross spread on a dummy variable indicating whether the issue is listed in the U.S.; a dummy variable indicating whether a U.S. bank serves in a senior syndicate position; a dummy variable indicating whether a U.S. bank serves at most in a junior syndicate position; a set of country, year and industry dummy variables; and a measure of the size of the offering (the level and log of gross proceeds in U.S. dollars). The offer size variables are included to control for the possibility that substantial fixed costs in securities underwriting result in economies of scale. Like Dunbar (1999), we include both the level and the natural log of gross proceeds to allow for non-linearities in the relationship between spread and size.

The regression results are reported in Table 6. Regression R1, which includes the full set of control variables, exhibits considerable explanatory power with an adjusted R^2 of 62.3%. The negative coefficients estimated for the level and log of proceeds are statistically significant at the 0.1% level and are consistent with the presence of convex scale economies in IPO underwriting. The U.S. listing coefficient is positive and statistically significant ($p < 0.1\%$) and indicates that a U.S. listing increases the spread by 172 basis points. The marginal cost of engaging a U.S. bank in a senior capacity is about 103 basis points and again is statistically significant ($p < 0.1\%$). In other words, part of the explanation for the U.S. bank premium we documented in our univariate analysis

is that they underwrite offerings listed in the U.S. However, the additional premium of 103 basis points must be explained by something else. It seems unlikely that the explanation is market power: after all, issuing firms have plenty of domestic and foreign investment banks to choose from, especially if they do not intend to list in the U.S. A more likely explanation, which we will investigate in the next subsection, is that issuers expect to derive some tangible benefit in return for the higher fees they pay U.S. banks. Furthermore, we see a statistically significant, but smaller, marginal premium of 59 basis points when a U.S. bank is engaged in a more junior capacity. The difference in premia associated with U.S. banks engaged in senior and junior capacity is statistically significant ($p < 0.1\%$), which may indicate that the greatest tangible benefit is derived where U.S. banks lead the syndicate.

Industry dummy variable coefficients generally are statistically significant. This may be an indication of industry-specific differences in underwriting risk. Consistent with this interpretation, biotechnology and computer/software IPOs have higher-than-average spreads while construction IPOs have lower than average spreads. There is also a negative time trend in gross spreads since the early 1990s, as evidenced by statistically significant positive coefficients for the year dummy variables in 1992 and 1993 followed by negative (but generally insignificant) coefficients for the remainder of the sample years. Coefficients estimated for the country dummy variables for Anglo capital markets (i.e., U.K., Hong Kong, Singapore, Malaysia, the rest of Asia, and South Africa) are significant and negative.[12] In contrast, the coefficients are significant and positive for Germany, Sweden, Italy, Japan, Canada, and Israel.

Exclusion of the industry, year, and country controls in regression R2 suggests that the regression fit is not spurious. Although the adjusted R^2 declines to 36.2%, the remaining coefficient estimates are quite stable. Specifically, cross-sectional variation in gross spreads still shows evidence

of scale economies in underwriting, and the premia for a U.S. listing (now 204 basis points), engaging a U.S. bank in a senior capacity (111 basis points), and engaging a U.S. bank in a junior capacity (104 basis points) all remain highly significant.

We investigate the possibility that our results are spuriously driven by an unobserved but nonrandom selection criterion which determines whether spread information is observed for a particular IPO and which might bias the coefficients reported in Table 6. To test (and if necessary correct) for selection bias, we estimate a maximum-likelihood version of Heckman's (1979) selection model of regression R1, where the spread is observed if $\gamma Z + u_2 > 0$ and Z is a matrix of variables which determines whether the spread is observed, γ is a vector of coefficients to be estimated, and $u_2 \sim N(0,1)$ will be correlated with the error of regression R1 if selection is nonrandom. Given the country distribution of spread availability in Table 1, we include country dummies alongside the following Z variables in the selection equation: the level and natural log of gross proceeds, a dummy for IPOs listed in the U.S., and a dummy for IPOs marketed in the U.S. The results, reported in column R3, indicate that selection is indeed nonrandom: we reject the null hypothesis that the spread regression R1 and the selection equation are uncorrelated at $p < 0.1\%$. Specifically, the unreported γ coefficients show we are significantly more likely to observe the spread if the issuing firm lists or markets its shares in the U.S. and if the firm is domiciled in an Anglo market (indicating systematic differences in disclosure requirements), and significantly less likely if the issuer is French or Swedish. There is also an inverse U-shaped size effect: up to an offer size of $1.3 billion we are more likely to know the spread, the larger the offer size; beyond that (affecting 2.2% of the sample), greater offer size decreases the probability. However, nonrandom selection hardly biases our coefficients of interest in the original R1 regression: we still find scale economies in underwriting, and the premia for a U.S. listing (now 203 basis points), engaging a U.S.

[12] Instead of using dummies for all the 61 countries in the sample, some of which have extremely few IPOs, we use

bank in a senior capacity (102 basis points), and engaging a U.S. bank in a junior capacity (60 basis points) are virtually unchanged.

Finally, we examine the relative cost functions of U.S. and non-U.S. banks by estimating regression R1 separately for U.S. bank led IPOs (regression R4) and non-U.S. bank led IPOs (regression R5). U.S. bank spreads exhibit a higher base level and suggest greater and more convex economies of scale. These differences are statistically significant at the 0.1% level. Moreover, we see that issuing firms pay a spread premium when seeking a U.S. listing only when their offerings are led by a U.S. bank.

3.3 Underpricing

The gross spread evidence suggests that despite the ready availability of lower cost alternatives, non-U.S. issuing firms willingly bear the higher cost of engaging a U.S. bank. Presumably, this reflects an expectation that U.S. banks deliver a higher-quality bundle of services. In this section, we examine one quality dimension of this bundle, the pricing of the offering, for evidence of a price-quality tradeoff.

Regardless of their country of origin, IPOs are underpriced on average, in the sense that they exhibit substantial price runups in the early stages of secondary market trading. Our sample is not exceptional in this regard. Table 7 reports underpricing (measured as the return from the offer price to the trading price at the end of one week of trade) by region and country for the sample of 1,535 firms for which gross spread information is available. The sample mean is about 18% and country means vary from 5.6% in Malaysia to 53.9% in Japan. Table 7 also illustrates that this cost of issuance is lower on average when a U.S. bank is engaged in any capacity. Mean underpricing for U.S.-bank led offerings is 13.5% in contrast to the 21.3% mean for the subsample of firms not using

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dummies for only the 20 individual countries and groups of countries listed in Table 1.

U.S. banks. *t*-tests reported in the last three columns of the table indicate that this difference is statistically significant.

Of course, this simple comparison of means fails to control for myriad other factors that might influence the initial price runup. Among other things, Hanley (1993) finds evidence of a partial adjustment phenomenon consistent with Benveniste and Spindt's (1989) prediction that expected underpricing, in a world of asymmetric information, is minimized when discounts are concentrated in states where investors provide strong indications of interest during the bank's marketing effort. Following Hanley, we proxy for offerings drawing strong (weak) interest by forming a dummy variable D_ABOVE (D_BELOW) that takes the value of 1.0 when the offering is priced above (below) the upper (lower) bound of the initial price range.[13]

The existing literature also suggests that underpricing runups are directly related to uncertainty (or the value of information in the Benveniste-Spindt framework). The size and breadth of our database coupled with the relatively weak reporting standards maintained in many sample countries limit our ability to control for uncertainty as fully as we might like. However, if ex ante valuation uncertainty is similar within industries, industry dummy variables provide some control for cross-sectional variation in ex ante uncertainty. Country dummies can serve a similar function by controlling for differences in 'IPO microstructure' such as differences in the pricing mechanism (bookbuilding vs. fixed-price) or the degree of informational asymmetries between different groups of IPO investors. Finally, year dummies can control for the well-known, but largely unexplained, time variation in underpricing.

This discussion suggests a multivariate regression of the following form:

$$\text{UNDERPRICING} = \beta_0 + \beta_1\,\text{D\_ABOVE} + \beta_2\,\text{D\_BELOW} + \beta_3\,\text{D\_USBANK} + \text{country/industry/year controls} + \varepsilon \quad (1)$$

Estimation of equation (1) is complicated by the endogeneity of the issuing firm's selection of the type of bank (U.S. or non-U.S.) that will lead its offering.[14] Ordinary least squares estimation of a bank-choice dummy captures both the underpricing differential between U.S. and non-U.S. banks and (roughly speaking) the probability of selecting a U.S. bank.[15] One solution to this problem, initially proposed by Heckman (1979), is to estimate an auxiliary probability model of the issuing firm's bank choice and then include this probability (the inverse Mill's ratio) in the original regression model. Doing so permits consistent estimation of β_3, the underpricing differential between U.S. and non-U.S. banks.[16]

The issuing firm's bank choice is directly related to the perceived (net) benefit of the services rendered by the bank. This benefit, in turn, should be reflected in the price, or gross spread, paid for those services. Thus, the probability model for selecting a U.S. bank should be similar to the gross spread model developed in the preceding section. Panel A of Table 8 reports the results from estimating a probit model of the decision to include a U.S. bank in the underwriting syndicate in any capacity.[17] Following the structure of the gross spread model reported in Table 6, we include as explanatory variables gross proceeds, the natural log of gross proceeds, and a dummy variable indicating whether the issuing firm sought a U.S. listing. The full-sample probit regression indicates that the probability of selecting a U.S. bank is increasing in both the issuing firm's decision to seek a U.S. listing and the size of the offering. The size relationship is consistent with Habib and

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[13] This assumes that offer prices are conditional on investor indications of interest and that this conditioning is reflected in revisions to the (unconditional) suggested price (range) reported in the issuing firm's preliminary prospectus.

[14] We cast the exposition in demand terms. Alternatively, we could think of banks choosing whether or not to manage an IPO given their unobserved information about the quality of the issuer. However, this does not alter the econometrics, which conditions on the reduced-form outcome instead of the structural demand and supply conditions in the IPO underwriting market.

[15] See Greene (1997, pp. 981-2) for a general characterization of this omitted variable problem and details of the two-stage estimation solution.

[16] Note that here, Heckman's two-step procedure solves the problem of an endogenous binary right-hand-side variable, as opposed to the problem of nonrandom sample selection in the previous subsection. Our results are robust to controlling for both types of problems using *two* selection equations. These latter estimates are not reported.

[17] Similar results are obtained when the issuing firm's choice is treated as whether or not it engages a U.S. bank in a senior syndicate position.

Ljungqvist's (1998) claim that issuers take costly actions which reduce underpricing (here: hire a U.S. bank) only to the extent that they care about pricing accuracy, which in turn depends on the size of their offerings: hiring a more expensive U.S. bank makes most sense in larger issues where underpricing translates into larger reductions in issuers' wealth. McFadden's pseudo-R^2 of 53.2% suggests that our parsimonious probit model explains a considerable amount of the cross-sectional variation in the decision to include a U.S. bank in the underwriting syndicate.

Panel B of Table 8 reports results from both OLS estimation of equation (1) (regression R1) and consistent estimates obtained from Heckman's two-stage approach that includes the inverse Mill's ratio (λ) as an explanatory variable in equation (1) (regression R2), in both cases adjusting standard errors for heteroskedasticity using White's (1980) consistent covariance matrix. The positive and statistically significant coefficient estimated for λ indicates that the omitted variable problem associated with the endogeneity of bank choice is indeed of consequence. Relative to previous attempts to explain cross-sectional variation in initial returns, the pseudo-R^2 of 13.3% for regression R2 indicates a good fit. Consistent with our priors, the industry dummy variables appear to filter some variation in ex ante uncertainty by virtue of the fact that construction and mining companies are significantly less underpriced than average whereas computer/software, media/publishing and telecoms are significantly more underpriced than average. The year and country dummy variables also account for a statistically significant fraction of the cross-sectional variation in underpricing. Consistent with Hanley's (1993) findings and the Benveniste-Spindt (1989) hypothesis, underpricing is more pronounced among firms subject to substantial positive price revisions in the aftermath of the bank's marketing effort.

As the univariate statistics suggested, the decision to include a U.S. bank in the underwriting syndicate is associated with less underpricing. The coefficient estimated for bank choice in the two-step regression R2 indicates that by including a U.S. bank in its underwriting syndicate, an issuing

firm can expect to have its offering underpriced by 17.7 *percentage points* less than had it not included a U.S. bank. The 7.2 percentage point benefit estimated in the OLS regression R1 indicates that failure to account for bank choice endogeneity substantially understates this effect.[18]

One might argue that this result is a *listing effect* driven by the fact that many U.S.-bank led offerings are placed in the relatively efficient (by international standards) U.S. equity markets. To address this concern, we explore whether the apparent benefit of including a U.S. bank in the syndicate exists for offerings not listed in the U.S. OLS and two-stage estimation of equation (1) for this subsample are reported in the third and fourth columns of Table 8. The two-stage bank-choice coefficient estimated in regression R4 suggests that, if anything, the (25 percentage point) reduction in underpricing associated with including a U.S. bank in the underwriting syndicate is even greater when the issuing firm is not seeking a U.S. listing.

One plausible explanation for this rather striking result follows from the coefficients estimated for the dummy variables indicating that a deal was priced outside the price range reported in the preliminary prospectus. As we described earlier, the Benveniste and Spindt model of strategic allocation of underpriced shares in exchange for investor cooperation in the bookbuilding effort calls for concentration of underpricing discounts in states where interest among investors is uniformly strong. This is consistent with the partial adjustment effect observed in regression R2, which included IPOs listed in the U.S. Moreover, Benveniste and Spindt point out that if a bank can implicitly bundle a series of deals for presentation to a common pool of investors, further efficiency gains result from “overpricing” in states where investor interest is uniformly weak. This is consistent with the negative sign on the regression R2 coefficient estimated for deals priced below the initial price range.

In contrast to these results, regression R4 suggests that, if anything, non-U.S. listed deals drawing weak interest are more heavily underpriced while those drawing strong interest are less underpriced. This difference is noteworthy for two reasons. First, because virtually all U.S.-listed deals include a U.S. bank in the syndicate, the primary difference between the subsample of non-U.S. listings and the full sample is that the former has a much larger fraction of deals led by non-U.S. banks. Moreover, as we noted earlier, the bookbuilding method became an increasingly dominant mechanism for marketing IPOs during the sample period. If one interprets bookbuilding as a strategic mechanism for gauging market demand conditions prior to setting the offer price for a deal, the subsample results suggest that non-U.S. banks were inefficient in its implementation during the sample period.

Jenkinson, Ljungqvist, and Wilhelm (1999) explore this possibility for a similar sample of issuing firms and find little evidence of learning occurring during bookbuilding efforts led by non-U.S. banks by comparison to efforts led by their U.S. counterparts. Perhaps this is not surprising if there is a learning curve in the implementation of bookbuilding and considering the dependence of bookbuilding methods on the development and maintenance of (institutional) investor networks of the sort that did not exist outside the U.S. On the other hand, it may shed considerable light on the apparent benefit to engaging a U.S. bank during the sample period.

4. Conclusion

Our findings can be summarized as follows. Underwriting spreads for IPOs by non-U.S. firms are indeed lower than spreads paid by U.S. issuing firms. However, non-U.S. firms frequently pay a premium to include a U.S. bank in their underwriting syndicate. The decision to do so is

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[18] The simple OLS estimate of the bank choice coefficient is equal to the two-stage estimate plus $(\rho\sigma)\lambda$, where ρ is the correlation between the error terms in equation (1) and the U.S. bank probability model, σ is the standard deviation of the

associated with a 17.7% percentage point reduction in underpricing on average. This rather striking result is consistent with (and sensitive to) the bank-choice decision being (treated as) endogenous.

At the outset of this article, we suggested that something might be learned about the U.S. primary markets from this exercise. If nothing else, the international evidence leads us to believe that there is little merit in concluding that U.S. spreads are 'too high' merely on the grounds that they exceed spreads outside the U.S. We see that many non-U.S. firms are willing to pay the premium price charged by U.S. banks. The opportunity cost of this decision for non-U.S. (and for that matter, U.S.) firms has risen as non-U.S. secondary markets have become more liquid and non-U.S. banks have become more sophisticated members of the increasingly less segmented global capital markets. Moreover, the international data provide strong evidence of a tradeoff between the magnitude of the gross spread and at least one dimension of the quality of underwriting services, pricing accuracy.

The question remains why U.S. spreads cluster around 7 percent but spreads for non-U.S. IPOs do not. One explanation for clustering in the U.S. that has received relatively little consideration is the possibility that fixing spreads at 7 percent simplifies bargaining in a setting that involves multiple dimensions of service and quality, where time pressure is immense, and failure to reach agreement is extremely costly. The final terms of the contract between the issuing firm and its lead bank, including the pricing and size of the offering, are negotiated in the hours preceding the opening of trading in the firm's shares. Reducing the complexity of bargaining by "fixing" the spread at 7 percent certainly has benefits in this setting. Considering that issuing firms still influence both the offer price and the size of the offering, not to mention the possibility of past or future cross subsidies, is the loss of contracting flexibility of consequence?[19]

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error under OLS estimation of equation (1), and λ is the inverse Mill's ratio. The coefficient reported for λ in Table 8 equals ($\rho\sigma$).

[19] Habib and Ljungqvist (1998) provide evidence that U.S. issuing firms respond rationally to such tradeoffs.

But then one might ask why is clustering not observed elsewhere. We conjecture that U.S. banks were indeed competing on spreads outside the U.S. during our sample period. The gross spread is certainly the most visible dimension on which competition might occur and focusing on this dimension (as opposed to underpricing) would make sense if U.S. banks were attempting to establish a presence in markets where their reputations did not so fully precede them. But the consequent discount does not imply that the price of underwriting services faced by U.S. firms is above competitive levels.

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Table 1.
Descriptive statistics: Country distribution.
The 2,055 sample companies went public between January 1992 and July 1999. Spread information is available for 1,535 of these. U.S. banks are U.S. investment banks such as Goldman, Sachs and Morgan Stanley & Co and any of their overseas offices, excluding the Wall Street offshoots of non-U.S. banks such as CIBC Wood Gundy Securities Inc and Deutsche Securities Inc. We classify Credit Suisse First Boston as a U.S. bank given its long Wall Street presence, despite its Swiss parentage. 'Fraction using a senior U.S. bank' refers to the presence of a U.S. bank in a senior syndicate position, i.e. global co-ordinator, bookrunner or (co-) lead manager. 'Fraction using a junior U.S. bank' refers to the presence of a U.S. bank in a junior syndicate position. Underpricing is the percentage return from the (institutional) offer price to the trading price one week after the IPO.

		IPOs with spread information available											
			Gross proceeds (USD m)		Privati-zation	Listing and marketing (fraction %)				Syndicate (fraction %)			
	total nobs	nobs w/ spread info	mean	median	fraction (%)	... listed domestic ally only	... listings include U.S.	... target market includes U.S.	... marketed abroad	... using a senior U.S. bank	... using a junior U.S. bank	gross spread (mean %)	under pricing (mean %)
Europe	**1,386**	**926**	**213.067**	**44.784**	**8.1**	**73.5**	**18.7**	**34.7**	**60.0**	**32.4**	**2.8**	**3.572**	**17.5**
France	222	48	673.991	90.185	25.0	50.0	35.4	64.6	95.8	64.6	4.2	4.252	12.6
Germany	237	148	203.881	44.896	2.0	87.8	8.8	29.1	82.4	21.6	6.1	4.521	39.7
Italy	61	53	373.510	98.942	13.2	58.5	30.2	50.9	98.1	45.3	1.9	4.286	7.6
Netherlands	73	58	279.641	77.271	5.2	50.0	39.7	58.6	98.3	62.1	3.4	4.716	13.2
Sweden	70	27	295.752	132.964	14.8	55.6	29.6	70.4	100.0	48.1	0.0	4.340	7.5
United Kingdom	424	390	95.071	18.405	0.5	89.0	9.0	16.4	19.2	15.4	0.3	2.534	14.8
rest of W Europe	258	170	282.222	78.867	16.5	57.6	26.5	50.0	85.9	50.6	3.5	4.107	12.1
rest of E Europe	41	32	178.692	87.310	50.0	21.9	50.0	56.3	96.9	56.3	15.6	4.067	15.9
North & South America	**113**	**109**	**244.860**	**136.905**	**8.3**	**10.1**	**83.5**	**93.6**	**98.2**	**85.3**	**7.3**	**5.183**	**6.3**
Canada	28	28	216.072	79.152	3.6	25.0	71.4	85.7	100.0	82.1	14.3	5.999	7.9
Mexico	26	24	204.995	143.611	0.0	0.0	91.7	100.0	100.0	87.5	0.0	4.755	5.7
rest of N/S America	59	57	275.787	138.000	14.0	7.0	86.0	94.7	96.5	86.0	7.0	4.963	5.8
Asia Pacific	**469**	**430**	**186.442**	**26.656**	**16.0**	**76.3**	**13.0**	**34.0**	**52.1**	**29.3**	**10.5**	**3.090**	**23.0**
China	92	81	143.794	68.000	60.5	35.8	18.5	50.6	100.0	40.7	13.6	3.707	31.2
Hong Kong	115	114	88.881	18.274	3.5	86.0	10.5	28.1	41.2	23.7	12.3	2.935	13.9
Japan	42	40	536.856	8.193	0.0	97.5	2.5	12.5	12.5	12.5	22.5	5.329	53.9
Malaysia	43	43	89.412	3.294	4.7	100.0	0.0	7.0	9.3	7.0	2.3	1.481	5.6
Singapore	66	59	43.347	8.886	1.7	94.9	5.1	8.5	16.9	10.2	1.7	1.809	27.8
rest of Asia/Pacific	111	93	328.104	128.274	14.0	67.7	26.9	64.5	82.8	55.9	9.7	3.336	18.9
Africa/Middle East	**87**	**70**	**59.054**	**27.393**	**2.9**	**22.9**	**68.6**	**78.6**	**85.7**	**71.4**	**5.7**	**5.638**	**12.3**
Israel	46	41	32.897	27.169	0.0	0.0	92.7	95.1	100.0	90.2	2.4	7.270	11.0
South Africa	19	13	82.003	2.432	0.0	76.9	15.4	23.1	23.1	15.4	0.0	2.077	23.3
rest of Africa/Middle East	22	16	107.437	63.122	12.5	37.5	50.0	81.3	100.0	68.8	18.8	4.349	6.5
Total sample	**2,055**	**1,535**	**200.843**	**43.892**	**10.1**	**67.5**	**24.0**	**40.7**	**61.7**	**37.1**	**5.4**	**3.645**	**18.0**

Notes

Rest of W Europe: Austria (28), Belgium (53), Denmark (27), Finland (25), Greece (12), Ireland (15), Luxembourg (4), Malta (1), Norway (13), Portugal (14), Spain (27), Switzerland (39).
Rest of E Europe: Estonia (1), Hungary (20), Poland (16), Romania (1), Russia (3).
Rest of N/S America: Argentina (14), Bermuda (17), Brazil (6), British Virgin Islands (3), Cayman Islands (7), Chile (4), Colombia (1), Dominican Republic (1) Netherlands Antilles (3), Panama (1), Puerto Rico (1), Venezuela (1).
Rest of Asia/Pacific: Australia (21), Indonesia (24), Kazakhstan (1), South Korea (1), New Zealand (6), Pakistan (1), Papua New Guinea (2), the Philippines (24), Taiwan (12), Thailand (19).
Rest of Africa/Middle East: Bahrain (1), Cyprus (1), Egypt (2), Ghana (1), Lebanon (1), Liberia (3), Turkey (13).

Table 2.
Descriptive statistics: Industry distribution.
IPOs are classified by the primary industry code assigned by Equityware. Equityware uses a total of 43 industry codes. This table shows the same information as Table 1 individually for the 20 industries with the most observations, and for the remaining firms as a group.

		IPOs with spread information available											
			Gross proceeds (USD m)		Privati-zation	Listing and marketing (fraction %)				Syndicate (fraction %)			
	total nobs	nobs w/ spread info	mean	median	fraction (%)	... listed domestic ally only	... listings include U.S.	... target market includes U.S.	... marketed abroad	... using a senior U.S. bank	... using a junior U.S. bank	gross spread (mean %)	under pricing (mean %)
Industry													
Computers/Software	291	195	52.079	27.977	0.0	67.7	27.2	35.9	63.1	33.8	3.1	4.609	29.7
Retailing/Consumer Goods	142	113	107.857	32.725	3.5	81.4	15.0	31.9	46.0	31.9	8.8	3.161	15.9
Electronics/Electrical	138	100	53.303	23.816	2.0	76.0	19.0	29.0	53.0	28.0	1.0	3.896	16.7
Telecoms	124	104	983.256	185.481	19.2	30.8	60.6	77.9	87.5	76.9	2.9	4.101	22.2
Manufacturing	117	83	64.586	30.800	9.6	73.5	18.1	28.9	60.2	22.9	4.8	3.593	19.8
Food & Drink	96	66	81.451	41.994	4.5	80.3	12.1	34.8	69.7	31.8	12.1	3.467	15.8
Healthcare/Pharmaceuticals	90	61	78.970	33.444	3.3	59.0	34.4	45.9	60.7	37.7	6.6	4.505	12.0
Consultancies/Services	80	53	48.709	14.955	0.0	88.7	7.5	13.2	32.1	11.3	0.0	2.810	15.1
Banking & Financial Svcs	78	60	408.028	139.478	28.3	61.7	21.7	45.0	70.0	50.0	6.7	3.182	18.2
Media & Publishing	78	58	156.963	36.748	3.4	69.0	24.1	36.2	56.9	37.9	1.7	3.600	26.7
Hotels & Leisure	76	57	103.396	20.523	1.8	94.7	3.5	10.5	33.3	12.3	0.0	3.065	34.6
Real Estate	74	53	119.852	81.137	5.7	81.1	9.4	45.3	58.5	30.2	11.3	2.874	6.6
Engineering	72	57	167.576	55.261	15.8	57.9	28.1	45.6	66.7	35.1	5.3	3.626	16.9
Construction	64	54	121.857	21.546	7.4	79.6	13.0	33.3	44.4	25.9	11.1	2.548	2.7
Automotive	49	39	181.096	35.184	7.7	71.8	15.4	33.3	61.5	23.1	5.1	3.331	11.3
Oil, Coal & Gas	48	37	399.189	121.550	24.3	45.9	51.4	67.6	78.4	59.5	0.0	4.116	12.3
Transport & Shipping	47	39	60.399	32.972	12.8	64.1	20.5	38.5	59.0	30.8	10.3	3.478	19.2
Textiles & Clothing	39	29	56.384	27.616	6.9	69.0	10.3	31.0	62.1	27.6	13.8	3.236	12.8
Forest Products/Packaging	35	27	89.785	44.517	3.7	70.4	22.2	37.0	59.3	37.0	3.7	3.409	18.5
Energy & Utilities	32	27	437.997	207.600	51.9	48.1	33.3	70.4	88.9	70.4	3.7	3.547	19.3
other (23 classifications)	285	223	260.937	86.504	20.6	60.5	26.9	50.7	70.4	45.3	6.7	3.599	12.5
Total sample	**2,055**	**1,535**	**200.843**	**43.892**	**10.1**	**67.5**	**24.0**	**40.7**	**61.7**	**37.1**	**5.4**	**3.645**	**18.0**

Notes

Other industries are: Insurance (26), Chemicals (22), Rubber & Plastics (19), Industrials & Conglomerates (19), Biotechnology (18), Iron & Steel (16), Metals & Ores (15), Airlines (14), Glass & Ceramics (11), Mining (11), Luxury goods (8), Financial corporate (7), Agribusiness (6), Railways (6), Public Works/Public Services (6), Aerospace (5), Leasing companies (4), Tobacco (3), Education (2), Investment Companies (2), Building Societies (1), Local authority (1), and Financial Trading & Dealing (1).

Table 3.
Descriptive statistics: Year distribution.

		IPOs with spread information available											
			Gross proceeds (USD m)		Privati-zation	Listing and marketing (fraction %)				Syndicate (fraction %)			
	total nobs	nobs w/ spread info	mean	median	fraction (%)	... listed domestic ally only	... listings include U.S.	... target market includes U.S.	... marketed abroad	... using a senior U.S. bank	... using a junior U.S. bank	gross spread (mean %)	under pricing (mean %)
Year													
1992	44	40	212.537	61.024	35.0	37.5	52.5	72.5	100.0	60.0	12.5	5.285	21.6
1993	81	74	270.436	102.901	29.7	29.7	56.8	75.7	100.0	68.9	16.2	4.936	32.5
1994	205	158	230.649	73.575	18.4	55.7	34.8	52.5	65.8	48.1	8.2	3.398	6.8
1995	164	137	250.201	71.037	13.9	54.0	32.8	54.0	70.1	46.7	10.2	3.854	10.0
1996	291	245	186.520	44.800	5.3	67.8	25.3	41.2	53.5	37.6	4.1	3.455	12.1
1997	458	350	184.850	34.320	8.9	70.9	20.0	35.1	52.0	32.3	2.9	3.162	15.0
1998	503	329	185.937	26.659	5.2	79.9	13.7	26.7	55.3	24.3	3.3	3.601	19.9
1999 (Jan. to July)	309	202	185.600	42.580	5.0	79.2	13.9	34.7	68.3	34.2	4.0	4.040	35.6
Total sample	**2,055**	**1,535**	**200.843**	**43.892**	**10.1**	**67.5**	**24.0**	**40.7**	**61.7**	**37.1**	**5.4**	**3.645**	**18.0**

Table 4.
Gross spreads by region and country.
'Any U.S. banks' refers to the presence of U.S. bank in any syndicate position, whilst 'U.S. banks senior' refers to the presence of a U.S. bank in a senior syndicate position, i.e. global co-ordinator, bookrunner or (co-) lead manager. The *t*-tests allow for unequal variances in the two sub-samples.

	all IPOs with spread info								***t-tests***		
	all IPOs		no U.S. banks		any U.S. banks		U.S. banks senior		*no U.S. banks vs.*		*junior vs.*
	no.	mean	no.	mean	no.	mean	no.	mean	*any U.S. bank*	*U.S. bank senior*	*senior U.S. bank*
Europe	**926**	**3.572**	**600**	**3.029**	**326**	**4.571**	**300**	**4.595**	***13.224******	***12.967******	***0.879***
France	48	4.252	15	3.811	33	4.452	31	4.442	*1.248*	*1.210*	
Germany	148	4.521	107	4.567	41	4.399	32	4.343	*–0.820*	*–0.996*	
Italy	53	4.286	28	4.092	25	4.504	24	4.525	*1.519*	*1.568*	
Netherlands	58	4.716	20	3.623	38	5.292	36	5.274	*4.195****	*4.070****	
Sweden	27	4.340	14	3.819	13	4.902	13	4.902	*2.395**	*2.395**	
United Kingdom	390	2.534	329	2.099	61	4.879	60	4.861	*12.813****	*12.630****	
rest of W Europe	170	4.107	78	3.860	92	4.316	86	4.375	*1.872*†	*2.058***	
rest of E Europe	32	4.067	9	4.402	23	3.936	18	3.978	*–0.803*	*–0.647*	
North & South America	**109**	**5.183**	**8**	**4.281**	**101**	**5.255**	**93**	**5.276**	***1.739***†	***1.721***†	***0.512***
Canada	28	5.999	1	9.000	27	5.888	23	5.988	*n.a.*	*n.a.*	
Mexico	24	4.755	3	4.665	21	4.768	21	4.768	*0.200*	*0.200*	
rest of N/S America	57	4.963	4	2.813	53	5.125	49	5.160	*3.206***	*3.171****	
Asia Pacific	**430**	**3.090**	**259**	**2.597**	**171**	**3.836**	**126**	**4.017**	***8.224******	***8.437******	***2.345****
China	81	3.707	37	3.463	44	3.911	33	4.170	*1.309*	*1.891*†	
Hong Kong	114	2.935	73	2.525	41	3.663	27	4.267	*4.540****	*6.128****	
Japan	40	5.329	26	5.536	14	4.945	5	4.246	*–2.729***	*–4.409****	
Malaysia	43	1.481	39	1.428	4	2.000	3	1.667	*2.044**	*0.785*	
Singapore	59	1.809	52	1.533	7	3.865	6	4.255	*5.752****	*6.587****	
rest of Asia/Pacific	93	3.336	32	2.527	61	3.760	52	3.877	*4.457****	*4.597****	
Africa/Middle East	**70**	**5.638**	**16**	**2.202**	**54**	**6.656**	**50**	**6.859**	***7.840******	***8.515******	***2.655*****
Israel	41	7.270	3	4.079	38	7.522	37	7.536	*3.646****	*3.615****	
South Africa	13	2.077	11	1.500	2	5.249	2	5.249	*4.353****	*4.353****	
rest of Africa/Middle East	16	4.349	2	3.250	14	4.506	11	4.871	*0.928*	*1.136*	
Total sample	**1,535**	**3.645**	**883**	**2.899**	**652**	**4.657**	**569**	**4.777**	***19.656******	***20.076******	***4.410******

Notes
***, **, * = significant at 0.1%, 1%, and 5% (two-sided), respectively.
† = significant at 10% (two-sided).

Table 5.
Gross spreads by region and country, excluding IPOs to be listed in the U.S.

	IPOs without listings in the U.S.								*t-tests*		
	all IPOs		no U.S. banks		any U.S. banks		U.S. banks senior		*no U.S. banks vs.*		*junior vs.*
	no.	mean	no.	mean	no.	mean	no.	mean	*any U.S. bank*	*U.S. bank senior*	*senior U.S. bank*
Europe	**753**	**3.180**	**595**	**3.016**	**158**	**3.796**	**133**	**3.705**	***5.433****	***4.446****	***–2.178****
France	31	3.636	15	3.811	16	3.472	14	3.311	*–0.785*	*–1.181*	
Germany	135	4.487	106	4.535	29	4.314	20	4.185	*–0.999*	*–1.363*	
Italy	37	4.002	28	4.092	9	3.722	8	3.688	*–1.250*	*–1.290*	
Netherlands	35	3.858	20	3.623	15	4.172	13	3.948	*1.515*	*0.918*	
Sweden	19	3.906	14	3.819	5	4.150	5	4.150	*0.690*	*0.690*	
United Kingdom	355	2.181	329	2.099	26	3.219	25	3.108	*3.801****	*3.376****	
rest of W Europe	125	3.832	77	3.884	48	3.749	42	3.790	*–0.555*	*–0.363*	
rest of E Europe	16	4.099	6	4.486	10	3.867	6	4.042	*–0.718*	*–0.393*	
North & South America	**18**	**4.278**	**3**	**2.333**	**15**	**4.667**	**9**	**4.528**	***4.113****	***3.475****	***–0.780***
Canada	8	5.062			8	5.062	5	4.850	*n.a.*	*n.a.*	
Mexico	2	4.500			2	4.500	2	4.500	*n.a.*	*n.a.*	
rest of N/S America	8	3.438	3	2.333	5	4.100	2	3.750	*2.183*†	*1.072*	
Asia Pacific	**374**	**2.749**	**259**	**2.597**	**115**	**3.090**	**71**	**2.942**	***3.400****	***1.980****	***–1.975***†
China	66	3.267	37	3.463	29	3.016	18	2.942	*–1.497*	*–1.465*	
Hong Kong	102	2.528	73	2.525	29	2.535	15	2.567	*0.139*	*0.455*	
Japan	39	5.396	26	5.536	13	5.115	4	4.625	*–2.278**	*–3.269***	
Malaysia	43	1.481	39	1.428	4	2.000	3	1.667	*2.044**	*0.785*	
Singapore	56	1.540	52	1.533	4	1.632	3	1.667	*0.420*	*0.493*	
rest of Asia/Pacific	68	2.857	32	2.527	36	3.151	28	3.176	*3.049****	*2.831***	
Africa/Middle East	**22**	**2.481**	**16**	**2.202**	**6**	**3.225**	**3**	**3.283**	***1.525***	***1.134***	***0.585***
Israel	3	4.079	3	4.079					*n.a.*	*n.a.*	
South Africa	11	1.500	11	1.500					*n.a.*	*n.a.*	
rest of Africa/Middle East	8	3.231	2	3.250	6	3.225	3	3.283	*0.121*	*0.143*	
Total sample	**1,167**	**3.046**	**873**	**2.875**	**294**	**3.553**	**216**	**3.483**	***6.605****	***5.199****	***–1.676***†

Notes
***, **, * = significant at 0.1%, 1%, and 5% (two-sided), respectively.
† = significant at 10% (two-sided).

Table 6.
The determinants of the gross spread.

The dependent variable is the gross spread, in %. Proceeds are converted into US dollar using exchange rates on the offer date. 'Listed in the U.S.' refers to IPOs by non-U.S. companies which involve a listing in the U.S., either exclusively or in addition to a home-country or other foreign listing. All regressions except R3 are estimated using OLS. Regression R3 allows for nonrandom sample selection and possible resulting bias in the coefficients estimated in regressions R1 and R2, by estimating R1 conditional on a selection probability model (Heckman 1979) using maximum likelihood. The selection probability model (results not shown) relates the probability of spread information being available for a particular sample IPO to its country of origin, the size of the offering (level and log), and dummies for U.S. listings and IPOs targeting U.S. investors. White (1980) heteroskedasticity-consistent standard errors are in italics under coefficient estimates. The industry dummies are based on the 43 industry classifications used by Equityware. Most of these are significant, perhaps indicating industry-specific differences in underwriting risk. For instance, biotechnology and computer/software IPOs face higher-than-average spreads, construction companies lower ones. The year dummies for 1992 and 1993 are positive (significant for 1992) and are followed by negative (but generally insignificant) year dummies, indicating a downward time trend in gross spreads since the early 1990s. The country dummies for Anglo capital markets (the UK, Hong Kong, Singapore, Malaysia, rest of Asia, South Africa) are significant and negative. They are significant and positive for Germany, Sweden, Italy, Japan, Canada, and Israel. The *F*-test of "Senior" = "Junior" tests whether the increase in gross spread is the same whether a U.S. bank serves in a senior or a junior syndicate position.

	Dependent variable: gross spread (%)				
	Whole sample			U.S. bank led	No U.S. bank
	R1: OLS	R2: OLS	R3: Heckman	(R4)	(R5)
Constant	4.383***	3.354***	3.476***	5.649***	4.738***
	0.386	*0.107*	*0.387*	*0.510*	*0.560*
Proceeds (in USD m)	–0.0002***	–0.0003***	–0.0003***	–0.000077*	0.0008
	0.00005	*0.0001*	*0.00004*	*0.000037*	*0.0008*
Log proceeds (in USD m)	–0.307***	–0.159***	–0.225***	–0.520***	–0.313***
	0.038	*0.039*	*0.040*	*0.067*	*0.059*
Dummy: listed in the U.S.	1.721***	2.043***	2.032***	1.518***	0.320
	0.126	*0.109*	*0.136*	*0.125*	*0.916*
Dummy: U.S. bank in senior position	1.030***	1.112***	1.018***	0.521**	
	0.119	*0.126*	*0.115*	*0.166*	
Dummy: U.S. bank in junior position	0.591***	1.038***	0.602***		
	0.132	*0.157*	*0.126*		
Country dummies	✓	–	✓	✓	✓
Year dummies	✓	–	✓	✓	✓
Industry dummies	✓	–	✓	✓	✓
Observations	1,535	1,535	2,055	652	883
Adjusted/pseudo R^2	60.7 %	36.2 %	19.6 %	63.7 %	36.2 %
Wald test of indep. eqns. ($\rho = 0$)	–	–	42.36***	–	–
F-test: all coefficients = 0	164.3***	159.4***	–	50.0***	380.9***
F-test: "Senior" = "Junior"	10.07***	0.20	10.01***	–	–
F-test: all coefficients pairwise equal	–	–	–	1,455.8***	
F-test: constant, proceeds and log proceeds equal	–	–	–	15.0***	

Notes
***, **, * = significant at 0.1%, 1%, and 5% (two-sided for coefficient estimates), respectively.

Table 7.
Underpricing by region and country.
Underpricing is the percentage return from the (institutional) offer price to the trading price one week after the IPO.

	all IPOs with spread information								*t-tests*		
	all IPOs		no U.S. banks		any U.S. banks		U.S. banks senior		*no U.S. banks vs.*		*junior vs.*
	no.	mean	no.	mean	no.	mean	no.	mean	*any U.S. bank*	*U.S. bank senior*	*senior U.S. bank*
Europe	**926**	**17.50**	**600**	**20.54**	**326**	**11.90**	**300**	**11.39**	***2.937*** **	***3.005*** **	***1.486***
France	48	12.61	15	20.13	33	9.19	31	9.55	*1.500*	*1.408*	
Germany	148	39.69	107	45.29	41	25.07	32	24.42	*1.326*	*1.218*	
Italy	53	7.59	28	4.49	25	11.06	24	10.40	*–1.729* †	*–1.544*	
Netherlands	58	13.23	20	18.36	38	10.53	36	9.49	*1.039*	*1.189*	
Sweden	27	7.50	14	9.96	13	4.85	13	4.85	*1.172*	*1.172*	
United Kingdom	390	14.85	329	16.45	61	6.24	60	6.05	*2.200* *	*2.221* *	
rest of W Europe	170	12.08	78	12.88	92	11.41	86	11.81	*0.478*	*0.338*	
rest of E Europe	32	15.92	9	14.33	23	16.54	18	16.98	*–0.333*	*–0.358*	
North & South America	**109**	**6.33**	**8**	**0.86**	**101**	**6.77**	**93**	**7.28**	***–1.037***	***–1.097***	***–1.139***
Canada	28	7.91	1	15.60	27	7.63	23	8.90	*n.a.*	*n.a.*	
Mexico	24	5.72	3	–3.63	21	7.06	21	7.06	*–1.546*	*–1.546*	
rest of N/S America	57	5.81	4	0.55	53	6.21	49	6.63	*–0.671*	*–0.698*	
Asia Pacific	**430**	**23.03**	**259**	**23.61**	**171**	**22.16**	**126**	**15.32**	***0.256***	***1.430***	***2.673*** **
China	81	31.18	37	59.95	44	6.99	33	–2.05	*3.367* ***	*3.626* ***	
Hong Kong	114	13.87	73	7.73	41	24.81	27	25.10	*–1.849* †	*–1.654*	
Japan	40	53.89	26	44.70	14	70.96	5	8.50	*–0.829*	*1.037*	
Malaysia	43	5.63	39	5.47	4	7.23	3	8.33	*–0.145*	*–0.205*	
Singapore	59	27.76	52	26.55	7	36.74	6	27.95	*–0.557*	*–0.072*	
rest of Asia/Pacific	93	18.93	32	18.00	61	19.42	52	20.86	*–0.164*	*–0.310*	
Africa/Middle East	**70**	**12.25**	**16**	**25.11**	**54**	**8.44**	**50**	**8.50**	***1.423***	***1.365***	***–0.089***
Israel	41	10.99	3	12.03	38	10.91	37	10.63	*0.097*	*0.119*	
South Africa	13	23.33	11	27.07	2	2.75	2	2.75	*0.337*	*0.337*	
rest of Africa/Middle East	16	6.48	2	33.90	14	2.56	11	2.37	*3.285* **	*2.973* *	
Total sample	**1,535**	**18.02**	**883**	**21.34**	**652**	**13.51**	**569**	**11.33**	***3.287*** ***	***4.160*** ***	***4.315*** ***

Notes
***, **, * = significant at 0.1%, 1%, and 5% (two-sided), respectively.
† = significant at 10% (two-sided).

Table 8.
The effect of U.S. banks on underpricing.
The dependent variable is underpricing, the percentage return from the (institutional) offer price to the trading price one week after the IPO. Priced above (below) range defined as offer price strictly above (below) the high (low) point of the initial indicative price range. This table allows for the possible endogeneity of U.S. bank-backing using the two-step methodology of Heckman (1979) to obtain consistent estimates. The first step estimates a probit of the likelihood of U.S. bank-backing (in any syndicate position; similar results are obtained using U.S. banks in senior syndicate positions only). The explanatory variables are the level and natural log of gross proceeds (in million US$) and a dummy equal to one if the issue is to be listed in the U.S. (dropped in regression R4). From this we obtain estimates of the inverse Mill's ratio, lambda. The second stage estimates an ordinary least-squares equation for underpricing, including lambda, allowing for heteroskedasticity using White's (1980) adjustment. We estimate the model both for the sample as a whole, and for non-U.S. listings only. For comparison, in Panel B we show the inconsistent least-squares estimates (R1 and R3) alongside the consistent Heckman estimates (R2 and R4). The industry dummies are based on the 43 industry classifications used by Equityware. These are significant for Construction (–), Computers/Software (+), Media/Publishing (+), Mining (–), and Telecoms (+). The year dummies are generally significant in 1994–1998. The country dummies for Germany, China, Singapore, and Japan are significant and positive.

	Whole sample		Non-U.S. listings	
	OLS	Heckman	OLS	Heckman
	(R1)	(R2)	(R3)	(R4)
Panel A: First-stage probit				
Constant		–2.955***		–3.225***
		0.203		*0.227*
Proceeds		0.0006		0.0004
		0.0004		*0.0004*
Log proceeds		0.575***		0.647***
		0.057		*0.063*
Dummy: list in the U.S.		2.549***		
		0.160		
McFadden's Pseudo-R^2		53.2 %		33.6 %
Panel B: Second-stage OLS				
Constant	0.337***	0.400***	0.499***	0.516***
	0.086	*0.091*	*0.140*	*0.190*
Dummy: priced above range	0.074†	0.111**	–0.059	–0.006
	0.041	*0.041*	*0.105*	*0.179*
Dummy: priced below range	–0.014	0.019	0.236	0.290†
	0.070	*0.071*	*0.346*	*0.149*
Dummy: U.S. bank in any position	–0.072*	–0.177***	–0.065†	–0.250***
	0.032	*0.043*	*0.039*	*0.067*
lambda		0.106***		0.150***
		0.030		*0.044*
Country dummies	✓	✓	✓	✓
Year dummies	✓	✓	✓	✓
Industry dummies	✓	✓	✓	✓
Observations	1,535	1,535	1,167	1,167
Adjusted R^2 / Pseudo-R^2	6.7 %	13.3 %	7.3 %	8.1 %
F-test: all coefficients = 0	3.8***	2.7***	9.6***	2.4***

Notes
***, **, * = significant at 0.1%, 1%, and 5% (two-sided for coefficient estimates), respectively.
† = significant at 10% (two-sided).