Has the introduction of bookbuilding increased the efficiency of international IPOs?[*]

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Abstract

By 1999, close to 80% of non-U.S. IPOs were marketed using bookbuilding methods. We study whether the recent introduction of this technology by U.S. banks and their inclusion in non-U.S. IPO syndicates has promoted efficiency in primary equity markets. We analyze both direct and indirect costs (associated with underpricing) using a unique dataset containing information on 2,051 initial public offerings in 61 non-U.S. markets during the period 1992-1999. The direct costs of bookbuilding are typically twice as large as direct costs for fixed-price offers. However, bookbuilding leads to substantially less underpricing. This benefit is more pronounced when the target market includes U.S. investors, when U.S. listing is sought and when U.S. banks are part of the syndicate.

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Broadly speaking, equity offerings are brought to market in one of two ways. In fixed-price offerings, shares are priced and then put up for subscription. Alternatively, there are a variety of practices that seek to assess market conditions before pricing. The bookbuilding approach long used by U.S. banks is the most prominent example of the latter. Although bookbuilding methods have the obvious attraction of conditioning the final issue price on market demand conditions, fixed-price methods were predominant outside the U.S. before the 1990s.[1] Over the last decade bookbuilding has been introduced around the world and indeed, in many countries, is now established as the default mechanism for conducting an IPO. By July 1999 we estimate that about 80% of non-U.S. offerings were brought to market using bookbuilding methods or some hybrid.

There have been various catalysts for this change, including the worldwide privatization movement, and the increased integration of global equity markets. The use of bookbuilding may have started in privatizations but quickly spread to private-sector issues. U.S. investment banks were, unsurprisingly, the early pioneers of bookbuilding and used their experience of bookbuilding to compete against domestic banks outside the U.S., as the following news report confirms:

> "Salomon [Brothers'] staff numbers [in Hong Kong] have risen to 200 from 65 a year ago. It recently announced the formation of a Hong Kong 'syndicate desk' which will be responsible for Asian equity transactions. The arrival of the Americans has had a large impact on Hong Kong's financial markets. The U.S. houses have kindled U.S. investors' interest in Hong Kong equities but, more than that, they have pushed aside the traditional British brokers […]. U.S. securities houses are at the forefront of market innovations (for Hong Kong at least) such as 'bookbuilding' for a new issue."

In contrast to their enthusiastic reception abroad, U.S. banks face increasing criticism at home for discriminatory tactics that favor institutional investors over retail investors and for the apparent impunity with which they fix fees for their services at 7% of gross proceeds; fees that some observers assert exceed competitive levels.[2] Against this backdrop, we pose the following question: has the worldwide diffusion of

[1] In a few countries, such as France, the U.K. and the Netherlands, auction-like tender offers were sometimes used.
[2] See Chen and Ritter (2000).

bookbuilding methods and the associated penetration of U.S. banks into underwriting syndicates outside the U.S. promoted efficiency in international primary equity markets?

Addressing this question requires consideration of both the direct costs of conducting IPOs and the indirect costs associated with underpricing. We employ a unique dataset containing 2,051 initial public offerings in 61 non-U.S. markets during the period January 1992 - July 1999. The data set includes detailed information on underwriting fees, initial returns, syndicate membership, and the markets in which shares are sold and listed. The data permit a detailed examination of the relative direct costs of offerings carried out by bookbuilding and fixed-price methods. We also examine whether cost differences are related to the presence of U.S. banks in the underwriting syndicates or differences in services offered (such as marketing to U.S. investors or listing in the U.S.).

On both direct costs and pricing accuracy we find a number of interesting results. The direct costs of bookbuildings are, in our sample, around twice as high as in fixed-price offerings. U.S. banks very rarely participate in fixed-price offerings. In bookbuildings, they charge a premium of 82 basis points over local banks. This is true in spite of the fact that U.S. bank-led IPOs are many times larger than those led by domestic banks. Once we control for economies of scale in underwriting, we find that U.S. banks charge premia for helping firms list in the U.S. but not for marketing to U.S. investors. They also charge premia, averaging 43 basis points, for IPOs that are neither listed nor marketed in the U.S. This raises the question why issuers, who clearly have a choice between U.S. banks and local banks, should choose a more expensive service. We investigate the hypothesis that higher direct costs reflect higher quality services. One dimension of this is the accuracy with which IPOs are priced.

We begin our analysis of the indirect costs associated with underpricing by comparing initial returns for offerings carried out by bookbuilding and fixed-price methods. The average underpricing associated with these methods is remarkably similar, at around 20%. However, simple averages do not control for many possible influences on underpricing, including fixed country effects associated with the regulatory and institutional framework, hot/cold issue markets, privatization effects, or valuation uncertainty. For

example, suppose IPOs in certain sectors (such as IT/software) are particularly difficult to value. The design of the IPO is likely to reflect this uncertainty. Bookbuilding, with the ability to condition the final price on revealed demand, may be relatively attractive in such cases, and there may be additional benefits from marketing to U.S. investors, who may be better at valuing such companies. Therefore, it is likely that the choice of IPO strategy is not random but endogenous. This makes simple comparisons of the underpricing associated with fixed-price offers and bookbuildings hazardous and requires an econometric analysis that gives explicit attention to the endogeneity of these choices.

We estimate a number of models that allow in various ways for endogeneity. Our results suggest that bookbuilding does, generally, lead to more accurate pricing, but that the greatest (and most significant) improvements in pricing accuracy occur when U.S. investors are included in the target market. We link this result to the execution of bookbuilding efforts where the initial price range is essentially an unconditional expectation of the issuing firm's per share value. The offer price is then set conditional on feedback obtained from investors during the bookbuilding process.[3] In the U.S., it is quite common for revisions to expectations to be so large as to push the offer price beyond the boundaries of the (unconditional) range. In contrast, we find that outside the U.S. bookbuilding efforts are far less likely to conclude with the offer price being set outside the range. Instead, it is frequently the case that the offer price is set at either the upper or lower bound of the range. This apparent aversion to pricing outside the suggested range is costly to issuing firms in the sense that it is correlated with higher levels of underpricing. It also, clearly, undermines one of the main advantages of bookbuilding. In our sample, price revisions are significantly more likely when U.S. investors form part of the target market and the issuing firms suffer less underpricing as a result.

The inclusion of U.S. banks in senior syndicate positions generally reinforces this willingness to price outside the range. Clearly the decision to hire a U.S. bank will be highly dependent upon whether U.S. investors are included in the target market. Estimating the effects of these choices on underpricing

[3] For further detail on the mechanics of bookbuilding, see Cornelli and Goldreich (1999).

requires techniques that allow for their interdependence. For the sample of bookbuildings, therefore, we estimate a bivariate probit two-stage least squares regression that confirms significant reductions in underpricing when the issue is marketed to U.S. investors by syndicates including U.S. banks. The results are only partly driven by the greater willingness of U.S. banks to price outside the range. The pricing benefits we estimate are quite large compared to the additional direct cost premium noted above.

Finally, we investigate whether issuers' actual choices were optimal. Our results suggest that a switch towards a cheaper IPO strategy (replacing U.S. banks and not marketing to U.S. investors) would have made 90% of issuers worse off, in the sense that the additional underpricing cost would have exceeded the savings on the spread. A switch towards a more expensive IPO strategy (including U.S. banks in bookbuildings not already managed by U.S. banks) would have made 59% of issuers better off. These are concentrated in France and Germany, the two European countries where U.S. banks have made the least inroads so far.

The remainder of the paper is organized as follows. In the following section, we begin by describing the data in some detail and explain how we distinguish between fixed-price offers and bookbuilding efforts. In section II we consider the evidence on direct costs. We then focus on underpricing in section III and investigate whether syndicate composition influences the way prices are set. In section IV we allow for the endogeneity and inter-dependence of the choices facing the firm – in particular, where to market the issue and whether to include a U.S. bank – to establish estimates of the impact of these choices on underpricing. We also estimate a switching model to evaluate whether issuers' chosen IPO strategies were optimal. Section V contains our conclusions.

I. Sample and data

A. Data sources

Our sample of IPOs is derived from Equityware, a database of international IPOs compiled by a subsidiary of Euromoney Publications plc. As we are not aware of any other academic papers that have used this dataset, we will describe it in some detail.

The July 1999 CD-ROM contains a total of 3,165 equity offerings from Jan. 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 also exclude 51 offerings that were cancelled and 3 offerings that were postponed. Of the remaining 2,446 IPOs, 25 are not bona fide IPOs (having been listed previously, sometimes in another country), 174 are investment trusts, 193 lack after-market trading prices and 3 lack an offer price. After excluding these offerings, the final sample consists of 2,051 IPOs by issuers from 61 countries.

There are three types of offerings in the sample: companies going public on a domestic stock exchange only (1,523 companies, 74.3% of the sample); companies going public on a domestic and a foreign stock exchange (253 companies, 12.3% of the sample); and companies going public on a foreign stock exchange only (275 companies, 13.4% of the sample). Companies in the second category most often list at home and in the U.S. (181 of the 253 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 (1992-3), the sample consists entirely of foreign-only and domestic-and-foreign listings. This is a result of Equityware's origins as a database of cross-border IPOs. Panel A of Table I reports Equityware's coverage by country and year. Beginning in 1994, coverage was extended to domestic-only offerings, beginning with East and West European and Latin American markets, Hong Kong and Singapore and currently encompassing other Asian and African markets (1997 onwards). Comprehensive coverage of Japanese domestic IPOs begins in 1998. Coverage of domestic IPOs in some countries remains scant (for example Australia) or is non-existent (for example, India, Israel, Taiwan and

Korea). As a consequence of Equityware's coverage criteria, IPOs in the early sample years are likely to be larger than the local average in many sample countries.[4] Panel B of Table I confirms this: the median offer size drops from US$61 million in 1992 to US$32.6 million in 1999 (we convert all currency amounts into U.S. dollars using exchange rates on the pricing day).

We examine how comprehensive Equityware's coverage is in countries for which it claims coverage, by studying three markets in detail: Germany, Singapore and the U.K. German coverage is extremely thorough from 1994 onwards, with only the occasional small IPO on a regional over-the-counter market missing. In Singapore, we find only three out of 68 IPOs missing, when comparing Equityware to a list of IPOs provided by the Singapore Stock Exchange. U.K. coverage is similarly strong, compared to a list of IPOs provided by the London Stock Exchange.[5]

A particularly valuable feature of the database is that it reports the countries where an IPO was marketed and the exchanges on which it was listed. We define IPOs as being marketed in the U.S. when they are either S.E.C. registered, mention eligibility under Rule 144A, have a tranche labeled 'U.S. tranche', or when they are listed on a U.S. exchange. Equityware also reports the composition of the 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 other sources of data.[6] Panel B of Table I provides a year-by-year description of this feature of the database and reveals that the leadership role of U.S. banks has actually declined over time within the sample: the fraction of offerings in which a U.S. bank served as global coordinator, bookrunner, or (co-) lead manager (our definition of 'senior' syndicate positions) fell from 54.5% in 1992 to 24.9% of the 1999 offerings brought to market through the end of July. Mirroring this decline, the rate of listings in the U.S. by sample firms

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

[5] We also compared 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 in 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.

[6] SDC, for example, lists only the lead and co-managing banks.

fell from 47.7% in 1992 to 9.4% in 1999 while the fraction of sample IPOs which were marketed to U.S. investors fell from 65.9% to 25.6%.[7]

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 'circuit-breakers' prevent post-IPO prices rising by more than a certain percentage 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. We take special care to ensure that prices taken from Datastream are reported in the same currency as Equityware's offer prices. 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). As noted above, we excluded 193 IPOs for which secondary-market price information was unavailable.

We cross-checked all initial returns in excess of ±30% manually using Datastream and various online information and news services as well as data provided by national stock exchanges. In 12 cases Equityware's data was clearly wrong, typically as a result of offer prices and seven-day prices being recorded for a different number of shares (for example where an ADS contains more than 1 share) or being recorded in different currencies. A small number of the Datastream-generated initial returns turned out to be wrong as a result of partial-paid shares or misplaced decimal points.

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

[7] 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.

placement and public-offer spreads. Spread information is consolidated similarly for companies with domestic tranches and an S.E.C.-registered U.S. tranche. Where Equityware reports a total-fee figure or a combination of a fixed and a variable fee (often used in the U.K.), the gross spread is calculated as total-fee paid/gross proceeds.

Spread information for all European and Asian IPOs and for all IPOs due to list in the U.S. was checked for accuracy against SDC's Global New Issues and Domestic 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 was used to fill gaps in Equityware's spread information. In cases where Equityware reports that spreads were not disclosed (particularly prevalent in Germany and France), accuracy was checked against the issuing firm's prospectus. In nineteen cases, the information was available in the (final) prospectus. In total, we have spread information for 1,540 of the sample 2,051 IPOs. It is conceivable that an unobserved but nonrandom selection criterion determines whether spread information is provided for an IPO. Suppose, for instance, that we are systematically less likely to observe the spreads of very small IPOs underwritten by non-U.S. banks. Because this would bias certain of our regression analyses, we test the robustness of our results to nonrandom selection.

B. Identifying bookbuildings

Equityware does not explicitly flag IPOs that used bookbuilding methods, so we used a number of filters to distinguish these from fixed-price offerings. The most important filter is the existence of an indicative price range, which is virtually always associated with bookbuilding.[8] Equityware reports price ranges for 904 of the 2,051 sample IPOs.[9]

[8] By indicative price range, we mean a range set by the syndicate banks and disclosed in regulatory filings, preliminary prospectuses, or investor marketing documents. This excludes price indications released by unaffiliated investment banks and quoted in the business press, and press reports of the range of amounts ("$20m to $25m") the issuer plans to raise.

[9] We checked price ranges for accuracy against prospectus information, data from national stock exchanges, news sources, and the SDC databases. Only 5 price ranges required correction, partly as a result of differences in currencies being used.

However, there is clearly the possibility that Equityware failed to report a price range for some *bona fide* bookbuilding efforts. We searched for such 'false negatives' by performing two types of checks on issues without price ranges.[10] First, we checked all IPOs that were listed or marketed in the U.S. as well as every IPO from France, Germany, Italy, Japan and the U.K. (which together account for 72% of the sample). We checked whether these 636 potential 'false negatives' were in fact bookbuildings using information from national stock markets, Nexis and Dow Jones News Retrieval, the SDC Global and Domestic New Issues databases, and IPO prospectuses contained in Disclosure's Global Access service and Ljungqvist's (1997) database of German IPOs. [11] Second, we used Disclosure's Global Access prospectus service and various news sources to check IPOs in the remaining countries, concentrating on those that Equityware defines as having 'open pricing' (as opposed to 'fixed pricing').[12] These two checks identified 221 additional definite bookbuilding efforts, 187 with price ranges and 34 without.[13] In addition we identified 28 IPOs from various countries that were priced in an auction/tender offering. We classify these as bookbuilding efforts, since offer prices were conditioned on market demand information.[14]

This gives a sample of 1,090 IPOs with a price range and 62 without, producing a total of 1,152 IPOs which we classify as *bona fide* bookbuildings. There is inevitably an element of judgment in our classification procedure, and even in defining what constitutes a bookbuilding effort. Our classification so far is conservative, because it depends on the presence of an indicative price range or clear evidence that a bookbuilding stage took place. To guard against possible bias, we widen our definition of bookbuilding by including the 156 issues flagged as 'open price' but for which our data checks found neither a price range

[10] To guard against the possibility that Equityware may have reported a price range for some issues that did not involve bookbuilding, we also checked for 'false positives'. Reassuringly, we could find only one IPO with a price range in Equityware that was demonstrably a fixed-price offering.

[11] We are grateful to François Derrien for checking our French sample, which resulted in an additional 32 IPOs being classified as bookbuildings. In addition, we found price ranges for 7 more using IPO prospectuses.

[12] According to Equityware, 'fixed pricing' involves setting a price at launch of issue, whereas 'open pricing' involves setting the price after launch of issue, presumably following bookbuilding.

[13] We had particular difficulty finding price ranges for Japanese bookbuildings, which account for 25 of the 34 IPOs with missing price ranges.

[14] 21 of these are French 'Offres à prix minimal', which Biais and Fauzeron-Crouzet (1999) show are analytically equivalent to the Benveniste-Spindt (1989) bookbuilding mechanism.

nor definitive reference to the use of bookbuilding.[15] 'Open pricing' is highly correlated with the existence of a price range, and with the use of bookbuilding methods: using the more conservative bookbuilding definition, only 13 of the 1,152 IPOs are flagged as 'fixed-price' offerings.[16] The empirical results we report in the following sections will use this broader classification, giving 1,308 bookbuildings. Our results are generally robust to using the more conservative classification.[17]

Figure 1 uses the broader classification to illustrate how the migration from fixed-price methods has developed. Taking 1994 as perhaps the first representative year, 52% of the IPOs were conducted via bookbuilding methods or some hybrid. This proportion had risen to 80% during the first seven months of 1999. It should be noted that this pattern is largely a European phenomenon: there, the proportion rose from 34% in 1994 to 90% in 1999. In Asia, by contrast, fixed-price methods remain dominant, especially outside Japan.

C. Sample descriptive statistics

Table II reports descriptive statistics for the 2,051 IPOs sorted by geographic region (Europe, Asia-Pacific, North and South America, Africa and the Middle East). European IPOs comprise two-thirds of the sample, with U.K., German and French issues being the most frequent. The other countries that contribute a large number of IPOs are Hong Kong and China, with Asia-Pacific as a whole comprising nearly one-quarter of the sample.

For the sample as a whole, median gross proceeds are about US$33 million, with a substantially higher mean of US$162 million. The large difference between the median and mean gross proceeds reflects, amongst other things, the importance of privatization IPOs, which are often extremely large and constitute

[15] Seven countries account for nearly half the 156 IPOs: China (22), Turkey (11), the U.K. (10), the Philippines (8), Hungary (8), Thailand (7), and Poland (7).

[16] The 'open pricing' flag also appears to be very reliable: we found only one fixed-price offering which was incorrectly flagged as 'open', namely the 'false positive' referred to in footnote 10.

[17] Though standard errors increase, sometimes substantially, reflecting perhaps the measurement error associated with misclassifying (some of) the 156 'open priced' IPOs as non-bookbuildings.

9% of our sample. Among countries with relatively high IPO volume, median gross proceeds range from below US$10 million in Japan, Malaysia and Singapore to more than US$80 million in Italy and Mexico.

The mean gross spread of 3.66% confirms Chen and Ritter's (2000) claim that spreads are generally lower outside the U.S. 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. This variation is correlated with variation in the frequency with which bookbuilding methods are used. Amongst the countries with active primary equity markets, Germany is noteworthy for using bookbuilding in over 90% of IPOs, whereas over 80% of U.K. offerings use fixed-price methods.

The exchange(s) on which the issuing firm lists its shares is a key decision variable and, because most non-domestic listings include a U.S. listing, is closely related to the presence (and status) of U.S. banks in the underwriting syndicates. For example, in Israel, where not a single IPO in our sample is exclusively domestically listed, 83% of the underwriting syndicates include a U.S. bank in a senior position. By contrast, around 90% of French, German, and U.K. IPOs are only listed domestically, and less than 20% are led by U.S. banks. This inverse relationship is present in each of the four geographic regions reported in Table II. It is apparent that where the issuing firm's home market has relatively well developed capital markets, as in the U.K., Japan or Singapore, the relative frequency of a U.S. listing is lower. On the other hand, Table II 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 sub-sample, only 12.5% of the sample firms seek a U.S. listing, but 24.4% include the U.S. as part of their target market. Likewise, although only 12.6% of issuing firms in the Asia/Pacific subsample seek a U.S. listing, 33% 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.

Finally, we report the average underpricing of IPOs observed in each country. Particularly high levels of underpricing are observed in Germany, China and Japan, and over the sample as a whole underpricing averages 20%.

Table III reports the sample distribution by industry. The largest sector in our sample is computers and software, accounting for around 14% of the IPOs. The remainder of the sample is spread widely across a range of industries. Privatizations are concentrated in four sectors: energy/utilities, oil, coal & gas, banking & financial services, and telecoms. Bookbuilding efforts are most common amongst companies in the computers/software, telecoms, and energy/utilities sectors, and least common amongst construction, real estate, and transport & shipping companies. To the extent that valuation is more uncertain in the computing industry than in construction, the patterns in bookbuilding use are to be expected. The most 'domestic' industries, in terms of both listings and marketing and inclusion of U.S. banks in senior syndicate functions, are hotels & leisure, consultancies, retailers, and manufacturing companies, whilst the sectors dominated by privatizations are the most likely to involve foreign listings or marketing drives and to hire U.S. banks. Underpricing, shown in the last column, varies considerably by industry, with industries that are likely to be characterized by greater valuation uncertainty (computers/software, media & publishing) prone to much greater underpricing than more stable and mature industries (construction, real estate).

D. Syndicate composition

After consolidating the regional and overseas offices of each bank and taking into account name changes, there are 588 different banks in the sample, 547 of which serve at least once in a senior syndicate capacity. Table IV ranks the 25 most active banks in our sample, judged by their involvement in a senior capacity in IPO syndicates. We also summarize the frequency with which each bank, as a senior syndicate member, marketed an offering to U.S. investors, used bookbuilding methods, or was involved with a privatization. Between them, the top 25 banks are involved in a senior syndicate capacity in half of the IPOs.[18] The next 25 most-active banks (not shown) account for another 255 IPOs. The remaining 777 IPOs involve 348 other banks, which are involved in a senior capacity in between 1 and 18 deals.

The top 25 banks account for 82.6% of all sample IPOs that are marketed to U.S. investors – so the ability to 'talk to U.S. investors' is concentrated amongst a small number of banks. Interestingly, only 7 (11) of the top 25 (50) banks are American. Early use of bookbuilding methods was clearly driven by U.S. banks. In 1994, 40% of issuing firms using bookbuilding methods retained a U.S. bank in a senior syndicate position. However, by 1999 only 25% of the issuing firms retained a U.S. bank in a senior syndicate position suggesting more widespread adoption of bookbuilding methods. This does not imply, however, that non-U.S. banks have overcome the historically strong relationships between U.S. banks and their (U.S.) institutional investors. In fact, U.S. banks are usually involved in IPOs marketed to U.S. investors, serving alongside a non-U.S. bank in a senior capacity. There are only 112 cases (out of 542) where non-U.S. banks in our top 25 market to U.S. investors without a U.S. banks in a senior position. In 33 of these 112 cases, there is a U.S. bank working in a junior capacity, so its role may be to look after U.S. marketing. Amongst the 79 remaining cases Deutsche Morgan Grenfell and Warburg Dillon Read are active in 37 deals – and both have a strong Wall Street presence. The remainder are ING Barings (which acquired Furman Selz), ABN Amro (which acquired First Chicago), Credit Lyonnais, Nomura Securities, and UBS Securities. Again, these are all active members of the Wall Street banking community.

Further, the top 25 banks almost always use bookbuilding methods, irrespective of their nationality. In fact, the top 25 banks account for 65% of the IPOs brought to market via bookbuilding methods and the top 50 banks account for 75%. In other words, bookbuilding technology remains concentrated amongst a relatively small number of banks. Of the 588 different banks in the sample, only 41 have served 20 or more times in a senior syndicate capacity in a bookbuilding effort. Those involved in fewer than 20 bookbuilding efforts are either U.S. banks such as Prudential Securities, which are active domestically but rarely internationally, or local banks in countries where bookbuilding methods have been adopted on a large scale (e.g. Germany).

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[18] They are involved in a junior capacity in 567 deals, or after stripping out deals in which another top 25 banks is senior, an additional 124 deals. Hence, at least one top 25 bank serves in a senior or junior capacity in 1,143 (55.7%)

II. Direct Costs

A. Fixed-price versus bookbuilding methods

Table V reports on a country-by-country basis the average direct cost, or gross spread, incurred by issuing firms using either fixed-price or bookbuilding methods. We focus on the direct costs associated with employing the investment banking syndicate rather than the total IPO costs incurred by the issuing firm, as it is difficult to obtain consistent information on other IPO expenses (such as the costs of conducting a road show, advertising, or management time). With few exceptions, fixed-price IPOs carry lower direct costs for the issuing firm. For the whole sample, bookbuilding efforts carry a mean gross spread of 4.5% of proceeds while for fixed-price efforts the mean gross spread is 2.3%. Of course, these figures are simple averages and do not control for the economies of scale associated with conducting an IPO. We estimate such cost functions below, where the general conclusion that bookbuildings involve higher gross spreads is confirmed. This result is neither surprising nor new. What is perhaps surprising is that the vast majority of fixed-price offerings in our sample took place either in the U.K. or in the larger Asian-Pacific markets (with the exception of Japan). The common denominator among these markets is their longstanding adherence to the tenets of British Company Law (for details, see Koh and Walter, 1989 or Sherman, 1999).

The sample of companies for which we have gross spread information includes 155 privatizations. These are typically very large issues (and therefore experience the greatest economies of scale) and the vast majority (133) were bookbuilt. Hence the difference between the direct costs of fixed-price issues and bookbuildings widens still further when we exclude privatizations: private-sector bookbuildings have an average spread of 4.7% compared to 2.2% for fixed-price offerings.

B. How expensive are U.S. banks?

As a general rule, U.S. banks are not active in (cheaper) fixed-price offers – the sample for which we have spread data contains only 21 such cases – so to see whether they charge more than non-U.S. banks we

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of our sample of IPOs.

should focus on bookbuilt IPOs. Table VI reports the results of three univariate analyses of gross spreads for bookbuilding efforts. The first block of the table splits the sample according to whether a U.S. bank served in a senior syndicate position. Syndicates led by U.S. banks generally charge higher spreads than syndicates led by non-U.S. banks. The premia charged average 82 basis points (4.86% – 4.04%) for the sample as a whole which is significant at the 0.1% level. In European countries, premia average 59 basis points, ranging from 232 basis points in the U.K. to –30 basis points in Germany. For Asian-Pacific, North/South American, and African/Middle Eastern countries average premia are 32 basis points, 72 basis points, and 276 basis points, respectively. At first sight, therefore, U.S. banks appear to charge higher fees even when we filter out the effects of fixed-price offerings.

There are several possible, not necessarily mutually exclusive explanations for the premia charged by U.S.-led syndicates. First, because U.S. banks lead-managed all but 17 of the 373 IPOs which listed in the U.S., the premia could reflect the greater complexity of listing in the U.S. Second, U.S. banks might charge issuers for access to their established networks of U.S. (institutional) investors whose information might be valuable in determining the offer price via bookbuilding. Third, U.S. banks might possess superior valuation technology (in the form of sectoral expertise or analysts). The second and third blocks in Table VI look at particular sub-samples of the data in an attempt to discriminate between these hypotheses.

The second block concentrates on the 595 IPOs which were marketed to U.S. investors and for which we have spread information. The majority of these – 488 – were led by U.S. banks. Splitting these into the 350 IPOs which were to be listed in the U.S. and the 138 which were only marketed in the U.S. reveals a substantial cost increase of 210 basis points (5.59% – 3.49%) associated with U.S. listings. This difference is highly statistically significant for the sample as a whole and in every region bar North/South America (*t*-tests not shown). This is consistent with the hypothesis that U.S. banks charge a premium for facilitating access to U.S. capital markets.

Do they charge an independent premium for access to their U.S. investor networks? Comparing the average spread U.S. banks charge in the 138 issues which are marketed but not listed in the U.S. to the average spread charged in the 107 IPOs marketed in the U.S. by non-U.S. banks, the answer appears to be 'no': on the contrary, U.S. bank-led IPOs are 47 basis points (3.96% – 3.49%) *cheaper* on average which is significant at the 1% level. However, this is a fragile result which is driven by Germany, where U.S. banks appear to have competed aggressively on fees and which is also the one country in which domestic banks have retained the largest share of U.S. marketed IPOs. Excluding Germany, average spreads cease to be different across banks, so U.S. banks do not appear to charge a premium for access to their investor networks. As we argued in section I.D, most of the non-U.S. banks which market IPOs to U.S. investors do have an established Wall Street presence. It is perhaps not surprising, therefore, that these 'international' investment banks have similar fee structures as U.S. banks; they may even have just as valuable investor networks and may thus be close substitutes for U.S. bank.

To see whether U.S. banks charge premia based on the perception that they might possess superior valuation technology, the third block of Table VI concentrates on the 365 IPOs which weren't marketed in the U.S. (most of which were sold domestically only). Only 56 of these were led by U.S. banks. Overall, syndicates not led by U.S. banks charged an average spread of 407 basis points. Syndicates with U.S. banks in a senior position charged 30 basis points *less* on average, a discount which is marginally significant (p=10%). However, our simple comparison of means fails to control for differences in size. The 56 'domestic' IPOs lead-managed by U.S. banks are six times larger (averaging US$365 million) than IPOs led by non-U.S. banks (averaging US$61 million). Given economies of scale in underwriting, it is unclear whether U.S. banks charge less or more in deals not marketed to U.S. investors. We will return to this question below when we estimate cost regressions which control explicitly for offer size.

A quick comparison of the numbers in the second and third block of Table VI suggests that marketing to U.S. investors is substantially more expensive than a domestic deal. The 595 IPOs which were

marketed in the U.S. paid average spreads of 4.81% compared to 4.02% in 'domestic' deals. In section IV, we will ask whether these extra costs were worth incurring.

Do U.S. banks charge less for their services outside the U.S. than they do in domestic U.S. IPOs? The average gross spread of 5% charged in international IPOs marketed to U.S. investors certainly *appears* considerably lower than the average 7% spread most medium-sized U.S. IPOs pay (see Chen and Ritter, 2000). However, international IPOs led by U.S. banks are not medium-sized: the average issue size is US$481.5m. If we concentrate on the 102 IPOs in our sample which fulfil Chen and Ritter's size criterion (US$20 million – US$80 million), we find that U.S. banks charge 6.5% on average in U.S. marketed deals, with a median of 7% and a proportion of issuers paying exactly 7% of 62 percent. These results look similar to Chen and Ritter's and raise the interesting question why foreign companies apparently voluntarily pay U.S. banks what Chen and Ritter argue are inflated fees.

To summarize our univariate analysis of direct costs, U.S. banks charge considerably more in bookbuilding efforts than do non-U.S. banks. U.S. banks are most active in IPOs which are marketed and/or listed in the U.S. Much of the premium they demand can be traced back to U.S. listings; there is no evidence that U.S. banks charge a premium for access to their U.S. investor networks: non-U.S. banks charge just as much when marketing to U.S. investors. When the target market does not include U.S. investors, U.S. banks are rarely given senior syndicate positions, and they charge fees that are similar to domestic banks. IPOs which are marketed in the U.S. face higher fees than 'domestic' deals, irrespective of syndicate composition. Compared to fees charged in domestic U.S. IPOs, international IPOs led by U.S. banks do not appear to be any cheaper.

C. Cost functions for bookbuilding and fixed-price efforts

The univariate analysis suggests gross spreads are influenced by a variety of factors including the use of bookbuilding, the cost of listing and marketing in the U.S., possibly the presence of a U.S. bank, and country-specific regulatory and competitive circumstances. It does not, however, shed light on their

marginal contributions to the spread. We provide a more detailed characterization of the determinants of gross spreads by regressing spreads on a dummy variable indicating whether a U.S. bank serves in a senior syndicate position; a dummy for bookbuildings; a dummy variable indicating whether the issue is marketed to U.S. investors; a dummy for companies that are to be listed on a U.S. market; a set of country, year and industry dummy variables; and a measure of the size of the offering, to control for the possibility that substantial fixed costs in securities underwriting result in economies of scale. Like Dunbar (2000), we include both the level and the natural log of gross proceeds (in million U.S. dollars) to allow for non-linearities in the relationship between spread and size.

The regression results are reported in Table VII (standard errors, adjusted for heteroskedasticity using White's (1980) correction, are reported underneath the coefficient estimates). Regression R1, which includes the full set of control variables, is estimated over the sample as a whole and thus assumes that U.S. and non-U.S. banks have the same cost (or at least pricing) functions. The regression exhibits considerable explanatory power with an R^2 of 66.5%. The negative coefficients estimated for the level and log of proceeds are consistent with the presence of convex scale economies in IPO underwriting. Controlling for offer size, the marginal cost of engaging a U.S. bank in a senior capacity is about 59 basis points and is statistically significant (p<0.1%). Bookbuilding costs an estimated 116 basis points more than a fixed-price offering (p<0.1%). The U.S. marketing and U.S. listing coefficients are both positive and statistically significant (p<0.1%). Since all offerings listed in the U.S. are also marketed to U.S. investors, the two coefficients have to be interpreted jointly. Listing in the U.S. increases the spread by 144 basis points for the listing itself (perhaps reflecting the banks' greater costs involved in due diligence and S.E.C. registration) and another 47 basis points for marketing to U.S. investors. This implies that listing in the U.S. costs an additional 191 basis points on average, compared to listing domestically (or in another non-U.S. market). Offerings marketed to U.S. investors without also being listed in the U.S. are charged only the extra 47 basis points. These results are consistent with our earlier univariate findings. In

particular, they support our conclusion that U.S. banks charge higher fees in part because they often lead-manage a different type of IPO – those that seek a U.S. stock market listing.

One interpretation for the premium paid for marketing in the U.S. is that U.S. institutional investors, by virtue of their influential position in world capital markets, wield greater influence over the issuing firm's share price in the secondary market. Thus their opinions are quite valuable on the margin when determining the offer price. An alternative, but not mutually exclusive explanation is that raising capital in non-domestic, and particularly in the U.S., capital markets enhances liquidity (by both broadening ownership and perhaps by listing on a more liquid exchange) and improves corporate governance.[19]

Industry dummy variable coefficients are generally statistically significant. This may be an indication of industry-specific differences in underwriting risk or valuation uncertainty. Consistent with this interpretation, biotechnology and computer/software IPOs have higher-than-average spreads while IPOs by banks, construction companies or retailers 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 (the U.K., Singapore, Malaysia, and South Africa) are significant and negative.[20] In contrast, the coefficients are significant and positive for Germany, Sweden, Italy, Japan, Canada, and Israel.[21]

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 VII. To test (and if necessary correct) for selection

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[19] Stulz (1999) provides a comprehensive survey of the literature bearing on this point.

[20] Instead of using dummies for all the 61 countries in the sample, some of which have extremely few IPOs, we use dummies for only the 20 individual countries and groups of countries listed in Table I.

[21] Exclusion of the industry, year, and country controls (not reported) suggests that the regression fit is not spurious. Although R^2 declines to 54%, the remaining coefficient estimates are quite stable (although the estimate of the marginal cost of bookbuilding rises to 221 basis points). Specifically, cross-sectional variation in gross spreads still shows evidence of scale economies in underwriting, and the premia for marketing to U.S. investors, listing in the U.S., and engaging a U.S. bank in a senior capacity remain highly significant.

bias, we estimate a maximum-likelihood version of Heckman's (1979) selection model of regression R1, where the spread is observed if $\gamma\mathbf{Z} + u_2 > 0$. **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. We use all right-hand side variables from regression R1 to form **Z**. To ensure the model is identified, we also include a dummy equaling one where the IPO consists purely of primary (new) shares.

The results, reported in column R2, 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 markets or lists its shares in the U.S., uses a U.S. bank, or conducts bookbuilding and if the firm is domiciled in the U.K., Canada, Hong Kong, Singapore, or Malaysia, and significantly less likely if the issuer is Continental European or African/Middle Eastern. The country effects point to systematic differences in reporting and disclosure requirements. There is also an inverse U-shaped size effect: up to an offer size of US$666 million we are more likely to know the spread, the larger the offer size; beyond that (affecting less than 5% 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 engaging a U.S. bank in a senior capacity (now 73 basis points), bookbuilding (102 basis points), marketing to U.S. investors (66 basis points) and listing in the U.S. (154 basis points) are very similar to previous estimates, and indeed not significantly different at the 5% level.

Regression R1 showed that U.S. banks charge a premium of 59 basis points compared to syndicates led by non-U.S. banks. To see what drives this premium, we replace the dummy for IPOs led by U.S. banks in R1 with two interaction variables: the first equals one if a U.S. bank markets an IPO to U.S. investors, the second equals one if a U.S. bank conducts a bookbuilding. These interaction terms provide estimates of the premium over non-U.S. banks that U.S. banks charge for marketing in the U.S. and for bookbuilding.

The results for regression R3 are in Table VII. The coefficients estimated for the two interaction terms show that the average U.S. bank premium of 59 basis points is not driven by a U.S. marketing effect: U.S. banks charge only an insignificant 7 basis points more than non-U.S. banks when marketing in the U.S., consistent with our univariate results in Table VI. But U.S. banks charge 43 basis points more for bookbuilding than non-U.S. banks, a premium which is significant at the 0.1% level.[22]

Note that the regression controls for scale economies[23] and cost differences associated with marketing and listing in the U.S. It therefore qualifies our earlier finding in Table VI that U.S. banks appear not to charge more than non-U.S. banks in bookbuildings which are not marketed to U.S. investors. Whilst U.S. banks charge average spreads of 3.73% compared to the non-U.S. banks' 4.07% (see Table VI), the apparent discount turns into a 43 basis point premium when controlling for differences in offer size as in regression R3. To confirm this, we run a simple version of regression R1 in the subsample of bookbuildings not marketed in the U.S. (this corresponds to the last block of Table VI). The estimate for the U.S. bank dummy in this regression R4 indicates U.S. banks charge 41 basis points more than non-U.S. banks *even when the U.S. banks do not provide access to U.S. capital markets or U.S. investors*. This raises the question why companies *choose* to hire more expensive U.S. banks in what are effectively domestic offerings. A possible answer is that U.S. banks possess superior valuation technology, in which case their pricing accuracy should be higher in domestic deals.

III. Pricing

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

[22] The two estimates sum only to 43 + 7 = 50 basis points, short of the 59 basis point premium U.S. banks charge on average. The discrepancy arises because regression R3 does not separately control for the (rare) fixed-price offerings in which U.S. banks are involved.

[23] Albeit assuming identical cost functions for U.S. and non-U.S. banks. We estimated (but do not report) separate cost functions for U.S. and non-U.S. bank led offerings. We found evidence of greater economies of scale in spreads charged by U.S. banks, largely because U.S. banks tend to underwrite the larger offerings in our sample. All other inferences reported in this section were unaffected.

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. A widely cited benefit of bookbuilding is that it allows the offer price to be conditioned on information about market demand conditions, and hence should result in more accurate pricing. So we begin by comparing the pricing accuracy of bookbuilt and fixed-price offers. We then consider whether the way bookbuilding efforts are carried out differs according to the composition of the syndicate. In particular, does the presence of a U.S. bank in the syndicate influence pricing decisions and pricing accuracy?

A. Underpricing in fixed-price and bookbuilding efforts

As noted earlier, we classify 743 of the 2,051 IPOs in our sample as fixed-price issues and 1,308 as bookbuilding efforts. The average underpricing of the fixed-price issues is 20.5% although there is some significant variation across the various geographical regions. European fixed-price offers experienced average underpricing of 15.7%, whilst the underpricing of Asian and African fixed-price offers averaged 28.3% and 37.0% respectively. In the case of bookbuilding efforts, the average underpricing is almost identical to that of fixed-price offers, at 20.1%. Again, there are large geographical differences. European bookbuilding efforts – with average underpricing of 21.3% –are somewhat less accurately priced on average than fixed-price offers. On the other hand the Asian and especially African/Middle Eastern bookbuildings are more accurately priced with average underpricing of 26.1% and 9.5% respectively.

It is more difficult to compare fixed-price offerings and bookbuilding efforts on a country-by-country basis, as fixed-price offerings have virtually disappeared in some countries in recent years. It is also important to control for other possible influences on underpricing, such as the effect of ‘hot’ and ‘cold’ issue markets and privatizations. Consequently we leave a detailed analysis of the relative underpricing of bookbuildings until section IV where we estimate an econometric model of the factors that influence the choice of issue method, and the impact of those choices on underpricing.

B. How does demand influence prices in bookbuilding efforts?

Pricing an IPO via bookbuilding involves two stages. In the first stage an indicative price range is set based upon the syndicate's estimates of the likely value of the company. In our sample the width of these price ranges averages 16% (measured relative to the middle of the range). For comparison, we compile a sample of all 3,480 IPOs by U.S.-based issuers between January 1992 and July 1999.[24] Summary information on this sample is presented in Table VIII. The average width of their price ranges is virtually identical at 16.2%. Once a range has been set, indications of interest from investors are solicited. These indications are essentially non-binding bids that take a variety of forms. At one extreme, investors can bid their demand curve, with specific price/quantity combinations. At the other extreme, investors can simply put in a bid for a fixed quantity, irrespective of price. In the second stage the final price is set, which can be either within the initial range or outside. In the case of U.S. IPOs, nearly one-half of all offers have final prices set outside the indicative range.

The first question we address is whether the same pattern is observed in IPOs outside the U.S. Table VIII shows how the final price relates to the initial price range in the sample of 1,090 bookbuildings with initial price ranges, by country (Panel A), target market (Panel B), and year (Panel C). A number of interesting facts emerge.

At first sight, pricing strategy appears to be heavily influenced by whether the syndicates involve U.S. banks in a senior position. Over the whole sample, syndicates involving U.S. banks priced outside the initial range in 28% of IPOs, compared with 4% when no U.S. bank was involved.[25] The differences across countries are also marked. In a number of countries, such as Italy and the Netherlands, the only cases of pricing outside the range in our sample involved U.S. banks. At the other extreme, U.K. IPOs not involving U.S. banks were priced outside the range a little more frequently (32% of IPOs) than when the

[24] U.S. IPO data is taken from SDC and excludes non-U.S. issuers, non-original IPOs, unit offerings, and investment trusts.

[25] It could of course be that U.S. banks set narrower price ranges than non-U.S. banks and are therefore more likely to have to move outside the range. However, the opposite appears to be the case in our data. Price ranges set by U.S. banks are almost 46 basis points wider, though this difference is not significant (p=27.7%). It could also be the case

syndicate involved a U.S. bank in a senior capacity (28% of IPOs). It is noteworthy, however, that a large proportion of cases in the U.K. involved the final price being set below the initial price range.

To investigate this issue further we analyze whether there are fundamental differences in the way U.S. banks execute bookbuildings, or whether there are other factors that need to be controlled for. One such factor is whether the investor base influences the pricing strategy. In particular, as we have noted, pricing outside the initial range is a familiar act to U.S. investors. 'Domestic' investors in non-U.S. IPOs, however, are possibly much less familiar with this phenomenon, and it may be that all banks – U.S. or others – are less likely to price outside the initial range when the issue is only marketed to domestic investors. To investigate this we split the sample of bookbuilding efforts in Table VIII according to whether they are marketed in the U.S. (see Panel B). There are roughly equal numbers of IPOs in each category. U.S. banks are involved in a senior syndicate position in 83% of issues that are marketed to U.S. investors, but only 10% of issues that are not marketed in the U.S. Where syndicates are led by U.S. banks, over 30% of the issues that are marketed to U.S. investors are priced outside the initial range, compared to only 7% of those not marketed in the U.S. In syndicates not led by U.S. banks there is again greater willingness to price outside the range when the issue is marketed to U.S. investors, although the incidence is considerably lower – at just under 9% – than when U.S. banks are involved.

Therefore, we find two important influences on pricing strategy. First, all syndicates are more likely to price outside the range if U.S. investors are part of the target market. Second, syndicates containing U.S. banks in a senior position are more likely to price outside the initial range. It is difficult to disentangle the relative influences of the syndicate composition and investor base without controlling for the other factors that influence IPO choices. This requires an econometric model of underpricing, to which we turn in section IV.

A second interesting feature, which is linked to the previous point, is that we observe that a large proportion of bookbuilding efforts (52% in the sample as whole) not involving U.S. banks are priced right

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that U.S. banks just happened to lead-manage offerings which turned out to be 'hot'. By controlling for hot issue periods and industry effects our regressions in Section IV will show that this does not appear to be the case.

at the top of the indicative price range. In contrast, when U.S. banks are involved this proportion drops to 29%. Not surprisingly, the incidence of pricing at the top of the price range tends to be greater in those countries where pricing outside the range is rarely observed. The extreme example of this is Germany where three-quarters of IPOs not involving U.S. banks are priced at the top of the price range, but no issues in our sample (of 186 such IPOs) were priced above the price range. One of the major potential benefits of bookbuilding is the ability to raise the price if demand is unexpectedly strong. Such unwillingness to raise the price, therefore, warrants further investigation.

There are various possible explanations for this general reluctance to price outside the range. One obvious hypothesis is that local regulations prevent banks from doing so. However, we observe pricing outside the range in 36 of the 54 countries where a price range is available for at least one company, which together account for over 95% of the 1,090 bookbuilding IPOs with price ranges.[26] If we exclude IPOs to be listed in the U.S., to which local laws and regulations may not apply, we continue to observe pricing outside the range in most countries, accounting for 84% of the 745 non-U.S.-listed bookbuilding IPOs with price ranges.[27]

We sampled prospectuses from different countries in search of evidence of restrictive regulations, but found none. On the contrary: French prospectuses, for instance, state explicitly that the range is indicative, whilst Belgian prospectuses give a range and state by how much it may be exceeded. In Germany, prospectuses don't generally state that the offer price may be set outside the indicative range but order forms completed by retail investors do. In some cases, such as Deutsche Telekom's forthcoming spin-out of T-Online, issuing firms formally announce that they will relinquish the option to price outside the indicative range. We have spoken to investment bankers from a variety of European countries none of whom believed pricing outside the range was so rare due to restrictive regulations. However, the absence

[26] The only 'large-volume' countries without *any* pricing outside the range are Portugal (12 firms), Hungary (9), and Poland (8).

[27] Austria (16), Denmark (15), Finland (16), and Italy (39) join the large-volume countries without pricing outside the range mentioned in the previous footnote.

of explicit rules prohibiting pricing outside the range obviously does not rule out *implicit* agreements in certain local markets that could tie local banks' hands.

Whilst we could find no legal or regulatory impediments to revising prices, it could be that revisions to the price range impose costs or encounter practical difficulties in certain countries. In particular, setting a price outside the initial range would, in many countries, require a re-filing of listing particulars, and announcements to all investors. For example, in the U.K. the London Stock Exchange requires supplementary listing particulars to be published if the price is fixed outside the initial range. Although this might typically be only a 2-3 page document, it would have to be circulated to all people who originally received the prospectus. There is, therefore, a modest direct cost but also a practical limit on how late in the issue process a change could be announced. In the U.K. the interpretation of the listing rules by the London Stock Exchange is evolving, and some recent issues have been allowed to announce revisions via the internet, which largely overcomes such problems. Nonetheless, our discussions with bankers and issuing firm managers suggest that in some countries such practical considerations may partly explain the reluctance to price outside the initial range. On the other hand, at least in the case of the U.K., such practical constraints appear no more severe than what exists in the U.S. [28] But where they are, such frictions should also reduce the attractiveness of bookbuilding in the first place.

An alternative explanation could be the lack of sophistication and/or the market power of domestic investors. For example, it could be that institutional investors (and issuers) in countries outside the U.S. have not yet learned how bookbuilding is supposed to operate.[29] However, bookbuilding has been around for nearly a decade now in many countries and it is notable that this greater reluctance to price outside the initial range is not diminishing over time. As can be seen in Panel C of Table VIII, there is no trend

[28] See Boehmer and Fishe (2000) for a detailed account of the potential complications arising in the U.S.

[29] Consider, for example, this news report about a Dutch IPO: "Investors subscribing to the bourse launch of […] Baan on the Amsterdam Stock Exchange and New York's Nasdaq have been asked to re-subscribe at a higher indicative price […]. The Amsterdam Stock Exchange initially reacted with puzzlement at the news […]. Baan's launch announcement states explicitly that the introductory price may lie 'within or outside the indicative band width' of $11-13." Likewise, we spoke to the finance director for a German issuer whose IPO had an initial return in excess of 300% who was not aware that the offering could, in fact, have been priced outside the indicative range and claimed that it had not crossed management's minds to inquire.

towards greater willingness to price outside the range for those IPOs not involving U.S. banks. Another possible explanation may be that domestic investors have considerable market power, which manifests itself in an unwillingness on the part of syndicates to revise the price upwards even in the event of excess demand.

What effect does willingness to price outside the initial range have on pricing accuracy? The observation that few final prices are set outside the initial range does not necessarily imply that such issues are less accurately priced: it could be that the initial price range set by such syndicates is simply more accurate. To investigate this we compare, in Table IX, the mean underpricing in cases when the final price is set within the initial range, at the range limits, and outside the range.

Probably the most interesting comparison is between those issues priced at the limits of the initial price range and those priced outside the range. In the case of issues priced at the top of the initial range, presumably the bookbuilding process had revealed that demand was stronger than expected. The choice facing the syndicate and firm at this stage is whether to increase the price to ration demand more severely. Hence, we might expect the underpricing observed in these cases to be significantly lower than for those issues whose price appears to have been constrained, to some extent, by the initial price range. This is indeed what we find: issues priced above the range are subject to average underpricing of 28.5%, whereas those priced at the top of the range are underpriced by 36.4% on average (though the difference is not statistically significant).

At the other extreme, we also find a difference between IPOs priced at the bottom of the range and those priced below the initial range. As might be expected, the result here is that those whose prices are revised downwards are subject to relatively low levels of underpricing (6.5% on average), whereas those priced exactly at the bottom of the range are overpriced by 1.1% on average. Again, the bookbuilding process presumably revealed weaker demand than originally anticipated, and the reaction of those syndicates that did not feel constrained by the initial price range was to revise the price downwards so that initial investors obtained some premium. The ability of the syndicate to ‘reward’ investors who played a

part in revealing (costly) information about the value of the company is crucial in various models of the bookbuilding process (see, for example, Benveniste and Spindt, 1989; Benveniste and Wilhelm, 1990). The apparent unwillingness of some syndicates to set a price outside the initial range undermines one of the major potential advantages of bookbuilding over fixed-price offerings.

IV. IPO strategies

In the previous sections we have identified a number of possible influences on the efficiency of the IPO process: in particular whether to use a bookbuilding, whether to employ U.S. banks, and where to market the shares. Clearly these decisions are highly inter-related. For example, whether to use a U.S. bank will depend in part upon whether the shares are to be marketed or listed in the U.S., and may well be influenced by whether the bookbuilding approach is adopted. The choice regarding bookbuilding is likely to be influenced, in part, by the size of the issue given the shapes of the cost functions we have identified. In other words, the main decision variables are endogenous, and in this section we take account of this endogeneity when analyzing the performance of different IPO strategies. We begin, however, with a simple OLS model of underpricing.

A. A simple model of underpricing

The univariate comparisons of average underpricing in the previous section failed to control for myriad other factors that might influence the initial price run-up. 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 computing the price revision between the midpoint of the initial price range and the offer price. To capture possible asymmetries in the relationship between the price revision and the initial return, we also include price

revision^{+} which equals price revision when it is positive, and zero otherwise. Jones, Megginson, Nash and Netter (1999) show that privatization IPOs are considerably more underpriced than private-sector IPOs, so we include a dummy for privatizations. The existing literature also suggests that underpricing run-ups 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' 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:[30]

$$\begin{aligned} \text{UNDERPRICING} = \; & \beta_0 + \beta_1 \text{ D\_Bookbuilding} + \beta_2 \text{ D\_USbank} + \beta_3 \text{ D\_MarketUS} \\ & + \beta_4 \text{ D\_privatization} + \beta_5 \text{ price revision} + \beta_6 \text{ price revision}^{+} \\ & + \text{country/industry/year controls} + \varepsilon \end{aligned} \qquad (1)$$

Table X shows the results of a least-squares estimation of Model 1 (all standard errors are adjusted for heteroskedasticity using White's (1980) correction). Relative to previous attempts to explain cross-sectional variation in initial returns, the R^2 of 15.7% for the regression indicates a good fit. The negative coefficients estimated for the three choice dummies indicate that underpricing is reduced by 6.5 percentage points when switching from fixed-price to bookbuilding (p=7.5%), by 4.5 percentage points when employing a U.S. bank in a senior syndicate position (p=5%), and 13.5 percentage points when marketing to U.S. investors (p<0.1%). These results largely confirm our univariate discussion. The control variables indicate that privatizations are significantly more underpriced, by about 9 percentage points

[30] We do not include a dummy for listings in the U.S. In the simple OLS model discussed here, U.S. listings were not associated with lower underpricing. This changes when the choice of U.S. listings is treated as endogenous.

(p=3.3%), perhaps reflecting political motives (see Guney and Perotti, 1993). Consistent with Hanley's (1993) findings, underpricing is more pronounced among firms subject to substantial positive price revisions in the aftermath of the bank's marketing effort. Interestingly, the relation between underpricing and price revision is not symmetric, since only the coefficient on price revision^{+} is significant (p<0.1%): revising the price downward has no effect on underpricing, whilst revising it upward significantly increases underpricing. This is consistent with the optimal underpricing strategy suggested by Benveniste and Spindt (1989). The size of the partial adjustment effect in our international data is similar to that found by Lowry and Schwert (2000) in U.S. data, though our degree of asymmetry appears greater. This may be due to the apparently lower willingness to price outside the range which we documented in Table VIII.

Consistent with our priors, the industry dummy variables appear to filter some variation in *ex ante* uncertainty by virtue of the fact that construction companies are significantly less underpriced than average whereas media and publishing companies 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.

Model 1 treats the three choice variables separately and thus ignores the fact that issuers can choose between different combinations of bookbuilding, U.S. bank involvement, and marketing to U.S. investors. In Model 2, we use four interaction terms and the regression constant to allow issuers to choose between five alternative IPO strategies: bookbuildings involving i) neither a U.S. bank nor U.S. investors, ii) a U.S. bank but no U.S. investors, iii) U.S. investors but no U.S. bank, and iv) both a U.S. bank and U.S. investors; or v) a fixed-price offering (captured via the constant).[31] All other regressors are as in Model 1. The least-squares regression results, reported in column 2 of Table X, show that only certain combinations of the three choice variables have any effect on underpricing. Bookbuildings which involve neither a U.S. bank nor market to U.S. investors do not significantly reduce underpricing (relative to fixed-price

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However, U.S. listings experience extremely similar reductions in underpricing as IPOs marketed in the U.S. by U.S. banks, so to avoid clutter we do not distinguish between them.

[31] As noted earlier, fixed-price offers rarely employ a U.S. bank and are equally rarely marketed in the U.S. Hence, they can be thought of as a 'plain vanilla' benchmark against which the other IPO strategies can be judged.

offerings). Bookbuildings which either use a U.S. bank, or market to U.S. investors, or both are all associated with significantly lower underpricing, and the effects are large: they range from reductions of 15.9 percentage points when using a U.S. bank to 22.6 percentage points when marketing to U.S. investors (though these are not significantly different from each other).

B. Controlling for endogeneity

Both Model 1 and Model 2 are estimated on the implicit assumption that the three choice variables are exogenous. However, this is unlikely to be the case. Habib and Ljungqvist (1999) model issuers' marketing choices assuming they aim to maximize net IPO proceeds. Using U.S. data they show that issuers spend more on promoting their IPOs when the marginal benefit of more accurate pricing is large; moreover, they document that failing to account for the endogeneity of promotion and underpricing leads to spurious empirical results (such as the spurious finding that higher-quality banks appear to underprice *more* during the 1990s). In our context, least-squares estimates of coefficients for the potentially endogenous choice dummies are likely to be inconsistent and may overstate or understate the effect on underpricing of bookbuilding, choice of U.S. bank, and marketing to U.S. investors.

To derive consistent estimates of the effect of the choice variables we employ a two-stage least-squares model (Model 3). The first stage estimates a multinomial logit of the probability of a firm choosing any of alternatives i)-iv) rather than a fixed-price offering. The second stage will use the predicted probabilities from the first stage to instrument the endogenous choice variables. Following Habib and Ljungqvist (1999), we assume in the first stage that issuers aim to minimize underpricing subject to the constraint that doing so is costly. For instance, say U.S. banks are better at pricing IPOs but also charge more for their services. Then we expect only those issuers to hire U.S. banks for whom the reduction in underpricing outweighs the extra banking fees. The same applies to the choice whether to market to U.S. investors, which may also entail greater costs. The marginal benefit of these choices depends on the size of the offering: hiring a more expensive U.S. bank makes most sense in larger issues where underpricing

translates into larger reductions in issuers' wealth. Issuers who float little equity stand to gain very little from more accurate pricing and should thus be less inclined to spend much when going public; issuers who float a lot stand to gain much more. Therefore, a key determinant of the IPO choices we investigate is offer size.[32] We capture this by including the level and natural log of gross proceeds (in million US$) in the first-stage multinomial logit. We also separately control for privatizations, given that political or domestic considerations may cause their objective function to differ from that of private-sector issuers. Finally, we include a full set of country, year and industry dummies.[33]

The multinomial logit estimates are reported in the upper half of Table X. As the pseudo-R^2 of 46.6% and the significant likelihood-ratio test indicate, the model has high explanatory power. The coefficients for the log of gross proceeds are consistently positive, indicating that larger issuers are less likely to use fixed-price offerings. Comparing the size coefficients across the four bookbuilding choices, we find that as issues become larger, they are incrementally more likely to add a U.S. bank or marketing to U.S. investors to their bookbuilding (compared to domestic bookbuildings with domestic banks, the size coefficients are significantly larger when involving either U.S. banks or U.S. investors, or both). These results confirm our predictions. The insignificant coefficient of –0.432 indicates that privatizations are as likely to use fixed-price as bookbuilding efforts without U.S. banks and U.S. investors. They are, however, significantly less likely to use bookbuilding led by U.S. banks (p=9.9%) and involving both U.S. banks and U.S. investors (p=0.2%), after controlling for size. Consistent with the hypothesis that more risky companies, or those whose value is more difficult to determine, tend to choose the more expensive marketing techniques, the industry dummies (not reported) show that companies in the IT, media, drugs

[32] Clearly issue size is not exogenous in the strict sense, as it is itself determined by factors such as financing constraints and the desire to diversify the portfolios of the existing owners. However, in the context of the models we construct, it can reasonably be regarded as exogenous with respect to pricing accuracy.

[33] Country dummies help control for local conditions. For instance, there might be regulatory or other constraints on choices, such as in Japan where bookbuildings or hybrids have become compulsory. Time dummies help control for the evolution of choice over time. For instance, in the early years of our sample hiring a U.S. bank was not always possible in all countries. Industry dummies help control for valuation uncertainty if uncertainty over the 'true' value of companies differs systematically across industries. The option value of employing 'superior' issue methods, which should result in a more accurate price, would clearly increase in uncertainty. For instance, biotech companies have more to gain from information-production.

and telecoms industries are significantly more likely to be bookbuilt, and are incrementally more likely to employ a U.S. bank in a senior syndicate role and/or to market to U.S. investors, whilst the reverse is true for banks and real estate companies.

The second stage of Model 3 uses the predicted probabilities from the first stage as instrumental variables for alternatives i)-iv) in a least-squares regression with underpricing as the dependent variable. Comparison of the least-squares estimates in Model 2 and the 2SLS estimates in Model 3 reveals that endogenizing the choice variables changes some of the coefficients. Bookbuilding without U.S. banks or investors continues to exert little influence on underpricing (indeed, the coefficient even becomes positive). Bookbuilding efforts led by U.S. banks but not marketed in the U.S. still reduce underpricing but the standard error quintuples causing significance to be lost. However, as we mentioned earlier, it is rare for U.S. banks not to market to U.S. investors, so this combination has a low probability of being chosen anyway. The reduction in underpricing from marketing to U.S. investors in the absence of a U.S. bank almost doubles. However, bearing in mind that this is another low-probability choice, the economic magnitude of the effect is more moderate: an increase in the likelihood of this choice from the 1st quartile to the 3rd quartile reduces underpricing from 22.9% to 19%, holding all other covariates at their sample means. Finally, using a U.S. bank to market the offering to U.S. investors continues to reduce underpricing significantly (p<0.1%), by 28 percentage points compared to a fixed-price offering. The change in this coefficient compared to Model 2 is not significant.

The greatest change compared to Model 2 is in the coefficient of the price revision, which increases substantially in size and becomes significant. Interpreted together with the coefficient for price revision^{+}, we find that underpricing is reduced by .35% for every 1% reduction in the offer price compared to the midpoint of the filing range (p=1.9%) – previously, this effect was statistically zero. The effect on underpricing of revising the price upwards by 1%, at 1.475% (=0.35% + 1.125%), is little changed compared to Models 1 or 2. These results provide further support for the Benveniste and Spindt (1989) perspective because they suggest overpricing of ‘cold’ deals as well as underpricing of ‘hot’ deals. If

investors treat transactions as independent events, overpricing should not occur because it violates investors' participation constraint. But this constraint is relaxed if investors approach individual transactions as one of many conducted with the bank. Overpriced cold deals can then be offset with the expectation that exceptionally hot deals will be further discounted. This lends greater asymmetry to the expected payoffs to providing weak and strong indications of interest and thereby strengthens the incentive for investors to be forthright with strong indications.

C. Underpricing in bookbuilding efforts

In this section, we concentrate on companies which have chosen to conduct a bookbuilding and model the effect on underpricing of their remaining two choices: whether to hire a U.S. bank and/or market to U.S. investors. Model 4 re-estimates Model 2 in the subsample of bookbuildings, including interaction terms for choices ii)-iv) above; choice i), bookbuildings without U.S. banks and investors, is captured in the regression constant. Model 4 makes no attempt to endogenize the choice variables. As in Model 2, the interaction terms are all negative and significant, indicating that issuers can reduce underpricing in bookbuildings by hiring a U.S. bank, marketing to U.S. investors, or both. This is consistent with our previous finding that U.S. banks are more likely to price above the range (which reduces underpricing) when marketing to U.S. investors. But given that U.S. banks are *not* more likely to price outside the range than are domestic banks when not marketing in the U.S., it is interesting that the U.S. banks still reduce underpricing. This might indicate that U.S. banks are better at pricing *per se* (even when they don't involve their U.S. investor networks) and not just more willing to price outside the range. We investigate this issue more formally below.

As before, the binary variables – if endogenous – will be inconsistently estimated by OLS. To correct for this, we use probit two-stage least squares (see Maddala, 1983, p. 240). Specifically, we estimate a first-stage probit, which models the two choices whether to hire a U.S. bank and whether to market to U.S. investors as functions of offer size, a dummy for privatizations, and a set of country, industry and year

dummies. The second-stage underpricing regressions use the predicted probabilities from the first stage as instruments for the observed dummies. We use a bivariate probit in the first stage rather than a multivariate logit, because the former can explicitly allow for the interdependence between the choice variables: it can capture the fact that issuers are more likely to be marketed to U.S. investors if they have hired a U.S. bank.[34]

The results of estimating Model 5 are reported in the final column of Table X. The hypothesis that the two choice variables in the first stage are inter-related cannot be rejected (as indicated by the significant χ^2 test), which confirms the need to model them jointly. Rho is an estimate of the correlation coefficient (normalized, as usual, to lie between –1 and +1) of the joint distribution of the underlying latent variables which generate the two binary choice variables. This correlation is estimated at 75.4% which is significant in a likelihood ratio test (p<0.1%). The determinants of the choices mirror the findings in Model 3: larger issuers are significantly more likely to hire U.S. banks and be marketed to U.S. investors, whilst privatizations are less likely to involve U.S. banks.

We use the predicted (joint) probabilities from the first stage to instrument the interaction variables of Model 4 in the second stage. Comparing the coefficients estimated in Model 4 and Model 5, we find significant differences. The negative effect of U.S. bank-backing when the IPO is not marketed to U.S. investors is drastically reduced and ceases to be significant when we allow for the endogeneity and interdependence of the two choices. This change indicates that least squares estimates are indeed biased when we fail to control for endogenous choices.[35] Interestingly and in contrast to Model 3, non-U.S. banks marketing to U.S. investors no longer achieve a significant reduction in underpricing when we account for endogeneity. Finally, the effect of employing a U.S. bank which markets to U.S. investors doubles in Model 5 compared to the least-squares estimate in Model 4: this choice reduces underpricing by 32 percentage points compared to bookbuilding conducted by a non-U.S. bank and not involving U.S.

[34] This advantage implies that it would be desirable to replace the multinomial first stage of Model 3 with a multivariate probit which allows for the interdependence of the three choice variables. Unfortunately, multivariate probits have extremely non-linear likelihood functions, and we failed to achieve convergence.

investors. This effect may seem large; however, it is in line with a univariate comparison of average underpricing: bookbuildings which involve neither U.S. investors nor U.S. banks are underpriced by 30.1% on average, as against 11.5% for bookbuildings which involve both U.S. investors and U.S. banks.

This sizeable reduction in underpricing could reflect our finding in Table VIII that pricing outside the range is more likely where U.S. banks market an offering to U.S. investors. To see if this is the case, we interacted the price revision and price revision^{+} variables in Model 5 with the first-stage instrument for U.S. bank-led IPOs marketed to U.S. investors (results not reported). The underlying econometric assumption is that neither the arrival of good or bad news during the bookbuilding phase nor the direction in which banks reprice the issue are endogenous, but that the *degree* of price revision may be different when U.S banks and U.S. investors are involved and may thus be endogenous to the issuer's choices. While the estimated coefficients for the new interaction terms (though negative as expected) were not individually significant, a Wald test did reject the null hypothesis that the sensitivity of underpricing to price revision *for IPOs with positive price revisions* is equal across choice of bank and target market (p=2.8%). This suggests that a greater willingness to price outside the range contributes to a reduction in underpricing. But it is not the sole cause: U.S. bank backing and marketing to U.S. investors continues to reduce underpricing independently of pricing outside the range, now by 27 percentage points (p=2.9%), down from 32 percentage points before.

Finally, we ask whether U.S. banks possess superior valuation technology. The spread regression R4 in Table VII showed that U.S. banks charge a 41 basis point premium even when they do not provide access to U.S. capital markets or U.S. investors. Do they deliver a corresponding reduction in underpricing? Model 6 in Table X estimates a probit 2SLS regression in the subsample of bookbuildings which are not marketed in the U.S. The first stage estimates the determinants of the probability of hiring a U.S. bank. The second stage estimates the effect of choosing a U.S. bank using the predicted probability as an

[35] The change contrasts with the one we found in the sample as a whole (Model 3) where endogenizing the choice variables caused this coefficient's standard error to rise but the coefficient itself to remain largely unchanged.

instrument.[36] The estimated effect is sizeable: choosing a U.S. bank to lead-manage a 'domestic' offering reduces underpricing by close to 29 percentage points (p=5.3%).[37] This is consistent with U.S. banks possessing superior valuation technology.

D. The total cost of IPOs

Our regression results suggest that issuers can reduce underpricing substantially by choosing between different IPO strategies. The marginal benefit of combining bookbuilding with U.S. banks and investors appears considerable, but we know from section II that such IPO strategies lead to higher costs too. The magnitude of the effects estimated in our underpricing regressions suggest that the net benefit is almost certainly positive, but the estimated coefficients are not directly comparable. In this section, we ask whether issuing firms would have been better off choosing a different IPO strategy, in terms of the trade-off between underpricing and gross spreads.

To answer this question, we borrow the econometric intuition behind Lee's (1978) two-stage switching model.[38] Specifically, we

- use the second-stage coefficient estimates from Model 3 in Table X to predict what underpricing would have been had issuers chosen differently (note that the 2SLS estimates of Model 3 are adjusted for self-selection; our predictions would otherwise be biased),
- calculate the implied change in the offer price (expressed in percent of the offer price),
- and compare this to the marginal costs (also expressed in percent of the offer price) associated with the alternative choice.

Switching regressions usually model the choice between two alternatives. In our case, we have many more. To keep things simple, we continue to concentrate on the five alternatives analyzed in our

[36] The results are not sensitive to using Heckman's (1979) lambda instead of the predicted probability in the second stage.
[37] Controlling for endogeneity makes a large difference here: the OLS estimate of the effect of U.S. bank-backing is only 12 percentage points.
[38] Applications in finance include Smith (1987) on the choice between competitive and negotiated underwriting and Madhavan and Cheng (1997) on the choice in block trades between upstairs and downstairs markets.

underpricing regressions – bookbuildings involving i) neither a U.S. bank nor U.S. investors, ii) a U.S. bank but no U.S. investors, iii) U.S. investors but no U.S. bank, and iv) both a U.S. bank and U.S. investors; or v) a fixed-price offering. We investigate two illustrative switches. The first supposes that all bookbuilding efforts continue to be bookbuilding efforts but that any firm employing a U.S. bank switches to using a local bank and that any firm being marketed in the U.S. chooses not to involve U.S. investors. This leaves two types of offerings: fixed-price ones and bookbuilt offerings without the participation of U.S. banks or investors. The consequence of this switch would be to increase the underpricing of the 694 switching firms from 11.3% on average to 38.9%. This implies a marginal underpricing cost of 28.8% of the offer price – well in excess of the marginal costs of hiring a U.S. bank or marketing to U.S. investors that we estimated in Table VII.[39] Assuming a direct cost saving of 1% of the offer price, almost 90% of the 694 issuers would have been worse off had they switched to a bookbuilding effort without the participation of U.S. banks or investors.

The second switch supposes that any bookbuilding effort not already led by a U.S. bank hires a U.S. bank. This would reduce underpricing amongst the 739 companies concerned from 26.5% to 11.4%. This reduction in underpricing would be worth 3.3% of the offer price on average, large enough to cover the higher fees charged by U.S. banks. Assuming that U.S. banks charge premia of around 1%, 433 (58.6%) of the 739 issuers would have been better off had they hired a U.S. bank, including 124 French and 80 German issuers. This suggests that not every issuer in our sample chose the optimal IPO strategy. Since France and Germany are amongst the countries in which U.S. banks have so far made the least inroads, it is perhaps not surprising that this result is so heavily concentrated within the two countries.

[39] The marginal underpricing cost (or benefit) is calculated as the actual offer price over the implied offer price given the switch, minus one. The implied offer price given the switch is calculated as the after-market price (assumed unaffected) divided by one plus the predicted underpricing given the switch.

V. Conclusions

We set out to address whether the worldwide introduction of bookbuilding methods during the 1990s has promoted efficiency in the primary equity markets. The answer appears to be 'yes'. Compared to fixed-price offerings, bookbuilding efforts – though more expensive – produce far less underpricing. Our answer is a qualified 'yes' because U.S. banks were responsible for most of this reduction in underpricing and appear to retain some advantage in the application of the technology. Whether this is because of near exclusive access to the U.S. capital markets or because they are just better at it remains an open question, though we do find evidence that U.S. banks deliver greater reductions in underpricing even in bookbuilding efforts which are not marketed to U.S. investors.

These conclusions should not be interpreted to suggest that we have no reservations regarding bookbuilding methods. Rather, we contend that they represent perhaps one of many possible second-best responses to the informational frictions present in taking companies public in a world of relatively primitive information and communications technology. As the internet makes possible the gathering together of virtually any interested party at one time and (virtual) place, it should be possible to approximate the benefits of the bookbuilding approach with an electronic auction similar to that being promoted by W.R. Hambrecht + Co. In addition to reducing direct costs, a shift from the extraordinary discretion bookbuilding methods rely on to a rules-based system might also promote confidence in the integrity of the primary markets.

Our analysis also highlights two methodological concerns relevant to the controversy surrounding the clustering of underwriting spreads around 7% in the U.S. First, Chen and Ritter (2000) appeal to the lower average underwriting spreads for non-U.S. IPOs to bolster their argument that U.S. spreads are above competitive levels. However, a more careful examination of the international evidence reveals that things are a bit more complex than Chen and Ritter allow. Until very recently, low (direct) cost, fixed-price methods were widely used outside the U.S. and this has much to do with the low average spreads considered by Chen and Ritter. But our results suggest that many issuing firms would have benefited on

net from a higher direct-cost bookbuilding effort that might have reduced the indirect cost of underpricing. Moreover, the direct costs to a non-U.S. firm of a U.S. bank-led bookbuilding effort are substantially higher than a bookbuilding effort led by a non-U.S. bank. But again, the higher direct costs are more than offset by the reduction in underpricing.

Our analysis also suggests that the endogeneity of the issuing firm's choices regarding marketing methods cannot be blithely ignored as Chen and Ritter effectively do when they further bolster their arguments by asserting that there is no link between spreads (price) and underpricing (quality) for U.S. IPOs. Habib and Ljungqvist (1999) demonstrate this point using U.S. data and our findings confirm the effect in international offerings. When the endogeneity of the issuing firm's decisions is modeled, there is considerable evidence of a tradeoff between direct and indirect costs and that issuing firms, at least in the U.S., exhibit optimizing behavior.

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Figure 1. Adoption of bookbuilding outside the U.S.

The figure plots the fraction of sample companies brought to market using bookbuilding techniques (defined using our more inclusive definition), by year. The heavy line tracks European companies only, the thin line tracks the entire sample. Note that coverage in 1992 and 1993 is largely restricted to larger, cross-border offerings.

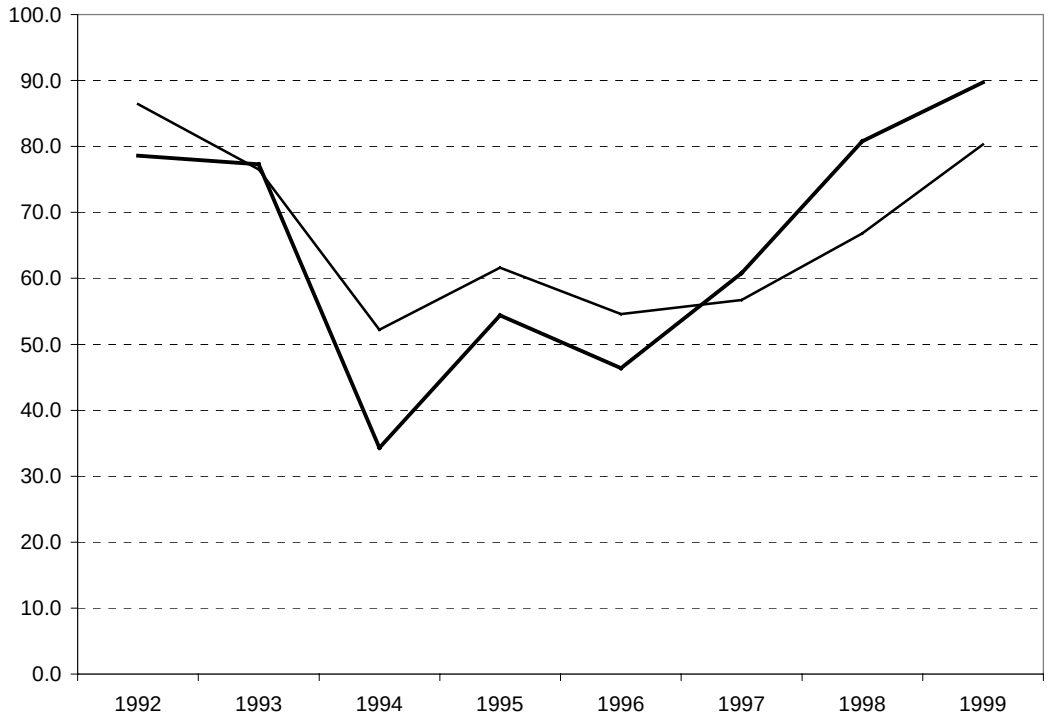

Table I. Sample distribution and descriptive statistics by country and year.

The 2,051 sample companies went public between January 1992 and July 1999. Panel A gives the sample distribution by country and year. Panel B lists several descriptive statistics, by year. Gross proceeds is expressed in million US$ converted using exchange rates on the pricing day. 'Listings include 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. 'Target market includes U.S.' refers to IPOs which are either S.E.C. registered, mention eligibility under Rule 144A, have a tranche labeled 'U.S. tranche' or are listed on a U.S. exchange. 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 U.S. bank (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. 'Fraction using U.S. bank (junior)' refers to the presence of a U.S. bank in a junior syndicate position.

	total no. of obs.	1992	1993	1994	1995	1996	1997	1998	1999
Panel A: Sample distribution									
Europe	**1,383**	**14**	**22**	**134**	**125**	**222**	**286**	**338**	**242**
France	222	1	3	20	9	20	45	83	41
Germany	237	1	1	6	18	12	28	74	97
Italy	60	1	2	2	11	12	9	13	10
Netherlands	71	1	2	8	5	10	12	19	14
Sweden	70		3	13	11	4	20	11	8
United Kingdom	424	4	3	61	45	128	106	54	23
rest of W Europe	258	5	7	17	23	31	54	77	44
rest of E Europe	41	1	1	7	3	5	12	7	5
Asia Pacific	**468**	**13**	**27**	**45**	**27**	**44**	**137**	**122**	**53**
China	92	10	18	13	5	9	26	8	3
Hong Kong	115			4	5	17	53	26	10
Japan	42			1			1	31	9
Malaysia	43	1			1	1	15	18	7
Singapore	65	1	1	1		3	23	20	16
rest of Asia/Pacific	111	1	8	26	16	14	19	19	8
North & South America	**113**	**12**	**26**	**19**	**6**	**10**	**23**	**12**	**5**
Canada	28	2	5	3	4		6	6	2
Mexico	26	3	10	5		2	5		1
rest of N/S America	59	7	11	11	2	8	12	6	2
Africa/Middle East	**87**	**5**	**6**	**7**	**6**	**15**	**11**	**28**	**9**
Israel	46	5	5	5	2	13	4	6	6
South Africa	19					1	1	14	3
rest of Africa/Middle East	22		1	2	4	1	6	8	
Total sample	**2,051**	**44**	**81**	**205**	**164**	**291**	**457**	**500**	**309**

Table I. (cont'd)

	all 2,051 firms	1992	1993	1994	1995	1996	1997	1998	1999
Panel B: Descriptive statistics									
Gross proceeds (US$m)									
median	32.9	61.0	97.0	52.5	59.0	36.8	27.4	20.5	32.6
mean	162.3	216.9	251.0	194.4	225.0	168.1	148.9	130.4	142.6
Privatization (fraction %)	9.0	38.6	33.3	16.6	13.4	5.5	7.4	4.2	4.2
Listing and marketing (%)									
… listed domestically only	74.3	43.2	34.6	64.4	60.4	72.2	75.9	85.8	83.8
… listings include U.S.	18.2	47.7	51.9	27.3	28.0	21.3	15.5	9.2	9.4
… target market includes U.S.	32.0	65.9	71.6	42.0	45.7	35.7	29.1	18.4	25.6
… marketed abroad	55.7	100.0	100.0	57.6	65.2	49.8	48.1	46.0	63.8
Syndicate (fraction %)									
… U.S. bank (senior position)	29.2	54.5	64.2	39.5	39.6	33.3	25.6	17.2	24.9
… U.S. bank (junior position)	4.6	15.9	17.3	7.8	9.1	3.8	2.4	2.4	2.9

Table II. Descriptive statistics: Country distribution.

We have spread information for 1,540 of the 2,051 sample companies. We use our more inclusive bookbuilding definition which classifies IPOs as bookbuildings if i) we have an indicative price range, ii) news searches confirm they are definite bookbuildings, or iii) Equityware flags their pricing as 'open' (as opposed to fixed). Underpricing is the percentage return from the (institutional) offer price to the trading price one week after the IPO. All other variables are as defined in Table I.

			Gross proceeds (US$ m)		Privati-zation	Book-building	Listing and marketing (fraction %)				Syndicate (fraction %)			
	total no. of obs.	no. of obs w/ spread info	mean	median	fraction (%)	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	**1,383**	**931**	**154.9**	**31.5**	**6.5**	**65.7**	**81.3**	**12.5**	**24.4**	**51.5**	**23.1**	**2.5**	**3.59**	**19.4**
France	222	48	158.4	11.2	5.4	87.8	88.7	7.7	14.9	34.7	17.1	1.4	4.25	14.0
Germany	237	154	138.2	35.2	1.3	91.1	92.4	5.5	18.6	67.9	13.5	4.2	4.57	46.5
Italy	60	52	331.5	84.0	11.7	96.7	63.3	26.7	43.3	98.3	38.3	1.7	4.30	7.9
Netherlands	71	58	248.3	69.4	5.6	94.4	57.7	32.4	50.7	91.5	50.7	4.2	4.72	13.1
Sweden	70	27	144.4	39.9	8.6	51.4	81.4	11.4	31.4	57.1	18.6	0.0	4.34	8.0
United Kingdom	424	390	92.0	17.3	0.9	20.5	89.6	8.3	15.6	18.4	14.6	0.2	2.53	15.7
rest of W Europe	258	170	208.1	55.0	12.8	82.2	68.6	17.4	36.0	74.8	36.8	4.3	4.11	13.2
rest of E Europe	41	32	144.7	67.2	51.2	92.7	36.6	39.0	43.9	95.1	51.2	12.2	4.07	14.8
Asia Pacific	**468**	**430**	**182.0**	**27.2**	**17.3**	**46.6**	**76.3**	**12.6**	**33.1**	**53.6**	**28.4**	**10.5**	**3.09**	**27.3**
China	92	81	131.3	63.6	60.9	68.5	41.3	16.3	46.7	100.0	37.0	13.0	3.71	42.0
Hong Kong	115	114	88.2	18.2	3.5	31.3	85.2	10.4	27.8	41.7	23.5	12.2	2.93	13.8
Japan	42	40	511.5	6.4	0.0	76.2	97.6	2.4	11.9	11.9	11.9	21.4	5.33	61.2
Malaysia	43	43	89.4	3.3	4.7	9.3	100.0	0.0	7.0	9.3	7.0	2.3	1.48	5.6
Singapore	65	59	43.1	9.9	1.5	12.3	95.4	4.6	9.2	18.5	10.8	1.5	1.81	33.0
rest of Asia/Pacific	111	93	313.7	122.7	16.2	67.6	67.6	25.2	59.5	81.1	51.4	10.8	3.34	21.2
N & S America	**113**	**109**	**237.6**	**135.1**	**8.8**	**100.0**	**13.3**	**80.5**	**90.3**	**94.7**	**83.2**	**7.1**	**5.26**	**6.0**
Canada	28	28	216.1	79.2	3.6	100.0	25.0	71.4	85.7	100.0	82.1	14.3	6.28	7.9
Mexico	26	24	191.4	139.7	0.0	100.0	7.7	84.6	92.3	92.3	84.6	0.0	4.75	5.0
rest of N/S America	59	57	268.2	135.1	15.3	100.0	10.2	83.1	91.5	93.2	83.1	6.8	4.96	5.6
Africa/Middle East	**87**	**70**	**76.7**	**26.4**	**3.4**	**78.2**	**31.0**	**57.5**	**70.1**	**82.8**	**59.8**	**4.6**	**5.64**	**15.5**
Israel	46	41	32.0	25.3	0.0	91.3	0.0	84.8	89.1	100.0	82.6	2.2	7.27	9.2
South Africa	19	13	172.4	3.6	0.0	21.1	78.9	15.8	21.1	21.1	15.8	0.0	2.08	35.5
rest of Africa/M East	22	16	87.5	43.8	13.6	100.0	54.5	36.4	72.7	100.0	50.0	13.6	4.35	11.4
Total sample	**2,051**	**1,540**	**162.3**	**32.9**	**9.0**	**63.8**	**74.3**	**18.2**	**32.0**	**55.7**	**29.2**	**4.6**	**3.66**	**20.3**

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 III. 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 II individually for the 20 industries with the most observations, and for the remaining firms as a group. All variables are as defined in Tables I and II.

			Gross proceeds (US$ m)		Privati-zation	Book-building	Listing and marketing (fraction %)				Syndicate (fraction %)			
	total no. of obs.	no. of obs w/ spread info	mean	median	fraction (%)	fraction (%)	... listed domestically 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	290	197	41.5	20.1	0.3	74.5	76.9	18.3	25.5	54.1	24.1	2.1	4.62	32.9
Retailing/Consumer Goods	142	113	95.2	26.7	2.8	54.2	85.2	12.0	26.8	42.3	26.1	7.7	3.16	16.4
Electronics/Electrical	138	101	47.2	23.5	2.2	62.3	79.7	13.8	22.5	49.3	21.0	2.2	3.91	17.7
Telecoms	124	104	840.0	151.4	17.7	80.6	41.1	50.8	68.5	82.3	67.7	3.2	4.10	21.9
Manufacturing	117	83	59.7	29.1	9.4	59.0	79.5	12.8	21.4	56.4	17.9	4.3	3.59	18.1
Food & Drink	96	66	61.8	29.1	5.2	68.8	86.5	8.3	24.0	57.3	22.9	8.3	3.47	12.0
Healthcare/Pharmaceuticals	90	61	64.7	28.8	3.3	58.9	72.2	23.3	32.2	51.1	28.9	5.6	4.50	14.9
Consultancies/Services	79	54	38.5	14.8	0.0	51.9	91.1	5.1	10.1	34.2	7.6	0.0	3.04	19.0
Media & Publishing	78	59	124.4	31.2	3.8	65.4	76.9	17.9	28.2	52.6	28.2	1.3	3.63	39.4
Banking & Financial Svcs	77	59	354.0	88.0	22.1	67.5	64.9	19.5	37.7	62.3	41.6	5.2	3.17	26.3
Hotels & Leisure	76	57	89.3	19.5	3.9	47.4	93.4	3.9	9.2	34.2	10.5	1.3	3.07	31.7
Real Estate	74	53	100.9	58.2	6.8	44.6	85.1	6.8	33.8	54.1	24.3	8.1	2.87	8.8
Engineering	72	57	142.7	44.9	13.9	56.9	66.7	22.2	37.5	56.9	29.2	4.2	3.63	15.3
Construction	64	54	110.5	21.5	6.3	46.9	81.3	10.9	29.7	45.3	21.9	12.5	2.55	2.6
Automotive	49	39	148.2	33.0	8.2	57.1	75.5	12.2	28.6	61.2	18.4	4.1	3.33	22.2
Oil, Coal & Gas	48	37	326.3	94.6	22.9	66.7	56.3	41.7	56.3	68.8	50.0	0.0	4.12	11.3
Transport & Shipping	47	39	54.4	31.1	10.6	51.1	66.0	17.0	34.0	53.2	25.5	10.6	3.48	18.0
Textiles & Clothing	39	29	52.3	26.9	5.1	66.7	74.4	7.7	23.1	59.0	20.5	10.3	3.24	12.1
Forest Products/Packaging	35	27	102.4	29.9	5.7	62.9	77.1	17.1	28.6	54.3	28.6	2.9	3.41	14.2
Energy/Utilities	32	28	389.8	193.9	46.9	87.5	56.3	28.1	62.5	78.1	62.5	3.1	3.59	20.1
other (23 classifications)	284	223	221.7	62.8	19.1	69.6	67.5	21.6	41.7	64.0	37.5	6.0	3.60	17.4
Total sample	**2,051**	**1,540**	**162.3**	**32.9**	**9.0**	**63.8**	**74.3**	**18.2**	**32.0**	**55.7**	**29.2**	**4.6**	**3.66**	**20.3**

Notes

Other industries are: Insurance (31), Industrials & Conglomerates (29), Chemicals (25), Rubber & Plastics (25), Biotechnology (23), Metals & Ores (19), Iron & Steel (18), Airlines (17), Glass & Ceramics (17), Mining (12), Luxury goods (12), Financial corporate (10), Agribusiness (9), Aerospace (7), Railways (6), Public Works/Public Services (6), Leasing companies (4), Investment Companies (4), Tobacco (3), Education (3), Building Societies (1), Local authority (1), Financial Trading & Dealing (1), and unclassified (1).

Table IV. Most active underwriters.

This table presents the top 25 banks in our sample by the number of IPOs in which each bank served in a senior syndicate capacity, i.e. global co-ordinator, bookrunner or (co-) lead manager. We consolidate local offices and keep track of name changes and mergers.

	Total number in senior position	*of which …*			Total number in junior position
		marketed in the U.S.	*bookbuilt*	*privati-zation*	
Warburg Dillon Read	143	*117*	*137*	*40*	68
Dresdner Bank/Dresdner Kleinwort Benson	138	*75*	*121*	*33*	114
Deutsche Bank/Deutsche Morgan Grenfell	136	*97*	*123*	*24*	108
Merrill Lynch	128	*115*	*123*	*33*	44
CS First Boston	120	*97*	*117*	*36*	65
Goldman Sachs	119	*102*	*116*	*27*	43
Morgan Stanley	115	*107*	*111*	*20*	41
ABN AMRO	93	*55*	*86*	*28*	119
Credit Lyonnais	90	*47*	*78*	*25*	90
ING Barings	86	*51*	*72*	*11*	85
Banque Paribas	83	*52*	*78*	*22*	70
UBS Securities	81	*55*	*72*	*18*	69
HSBC Securities	76	*43*	*61*	*17*	57
Salomon Brothers/Salomon Smith Barney	67	*58*	*63*	*11*	30
Lehman Brothers	64	*61*	*61*	*11*	28
Barclays de Zoete Wedd	52	*33*	*37*	*15*	54
Nomura Securities	50	*21*	*40*	*12*	88
Societe Generale	50	*21*	*40*	*12*	60
DG Bank Deutsche Genossenschaftsbank	49	*7*	*45*	*0*	31
Banque Nationale de Paris	48	*24*	*38*	*10*	28
Schroder Securities	47	*28*	*42*	*8*	45
County Natwest	46	*20*	*28*	*5*	34
JP Morgan Securities	43	*42*	*43*	*11*	27
Westdeutsche Landesbank/WestLB Panmure	39	*10*	*35*	*3*	26
Enskilda Securities	37	*16*	*25*	*0*	25
Top 25	**1,019**	***542***	***847***	***143***	**576**
as fraction of category	**49.7%**	***82.6%***	***64.8%***	***77.7%***	**28.0%**

Table V. Gross spreads on bookbuildings and fixed-price offers.

This table uses the 1,540 IPOs for which spread information is available and partitions them into bookbuildings and fixed-price offers using our more inclusive bookbuilding definition. ***, **, * = significant at 0.1%, 1%, and 5% (two-sided), respectively.

	Book-buildings		Fixed-price offerings		
	no. of obs. w/ spread info	gross spread (mean %)	no. of obs. w/ spread info	gross spread (mean %)	*t*-test of difference in means
Europe	**591**	**4.38**	**340**	**2.20**	**–20.96*****
France	46	4.25	2	4.19	–0.06
Germany	146	4.59	8	4.02	–1.37
Italy	50	4.33	2	3.50	–1.15
Netherlands	56	4.76	2	3.55	–1.04
Sweden	25	4.45	2	2.93	–1.69
United Kingdom	81	4.45	309	2.03	–12.27***
rest of W Europe	157	4.13	13	3.87	–0.55
rest of E Europe	30	4.00	2	5.13	1.06
Asia Pacific	**202**	**3.94**	**228**	**2.34**	**–11.56*****
China	57	3.83	24	3.42	–1.08
Hong Kong	36	3.89	78	2.49	–5.64***
Japan	31	5.33	9	5.33	–0.01
Malaysia	4	2.00	39	1.43	–2.04*
Singapore	7	3.97	52	1.52	–6.23***
rest of Asia/Pacific	67	3.53	26	2.83	–2.23*
N & S America	**109**	**5.26**			
Canada	28	6.28			
Mexico	24	4.75			
rest of N/S America	57	4.96			
Africa/Middle East	**58**	**6.36**	**12**	**2.13**	**–6.01*****
Israel	39	7.32	2	6.25	–0.82
South Africa	3	4.67	10	1.30	–5.01***
rest of Africa/M East	16	4.35			
Total sample	**960**	**4.51**	**580**	**2.25**	**–26.62*****

Table VI. Gross spreads on bookbuildings – the influence of U.S. banks and marketing to U.S. investors.

This table uses the 960 IPOs for which spread information is available and which are classified as bookbuildings using our more inclusive measure; see also Table V. ***, **, *, † = significant at 0.1%, 1%, 5%, and 10% (two-sided), respectively.

	Use U.S. bank in senior position?					Marketed to U.S. investors							Not marketed to U.S. investors				
	Yes		No		*t*-test of difference in means	U.S. bank in senior position				No U.S. bank in senior position		*t*-test of difference in means (not listed in U.S.)	U.S. bank in senior position		No U.S. bank in senior position		*t*-test of difference in means
						Listed in U.S.		Not listed in U.S									
	no. of obs. w/ spread info	gross spread (mean %)	no. of obs. w/ spread info	gross spread (mean %)		no. of obs. w/ spread info	gross spread (mean %)	no. of obs. w/ spread info	gross spread (mean %)	no. of obs. w/ spread info	gross spread (mean %)		no. of obs. w/ spread info	gross spread (mean %)	no. of obs. w/ spread info	gross spread (mean %)	
Europe	**287**	**4.68**	**304**	**4.09**	**–4.66*** **	**166**	**5.32**	**77**	**3.76**	**61**	**4.18**	**2.07***	**44**	**3.91**	**243**	**4.07**	**0.73**
France	30	4.51	16	3.77		17	5.37	11	3.27	2	3.10		2	4.00	14	3.87	
Germany	30	4.36	116	4.66		11	4.75	10	3.74	20	4.68		9	4.56	96	4.65	
Italy	23	4.56	27	4.13		16	4.94	5	3.52	4	3.62		2	4.07	23	4.22	
Netherlands	36	5.27	20	3.83		23	6.02	7	4.64	3	3.58		6	3.14	17	3.87	
Sweden	13	4.90	12	3.97		8	5.37	4	4.44	6	4.09				6	3.85	
United Kingdom	54	5.22	27	2.90		35	6.11	17	3.59	4	4.31		2	3.47	23	2.65	
rest of W Europe	83	4.41	74	3.81		44	4.93	22	3.86	17	3.98		17	3.76	57	3.76	
rest of E Europe	18	3.98	12	4.02		12	3.95	1	2.25	5	4.14		5	4.40	7	3.94	
Asia Pacific	**115**	**4.08**	**87**	**3.76**	**–1.35**	**54**	**5.39**	**53**	**2.96**	**28**	**2.95**	**–0.06**	**8**	**2.63**	**59**	**4.14**	**2.72****
China	33	4.17	24	3.35		15	5.64	14	2.92	10	3.08		4	3.02	14	3.55	
Hong Kong	23	4.57	13	2.69		12	6.39	9	2.61	8	2.81		2	2.50	5	2.5	
Japan	4	4.43	27	5.46		1	2.73	3	5.00						27	5.46	
Malaysia	3	1.67	1	3.00				2	2.00	1	3.00		1	1.00			
Singapore	5	4.76	2	2.00		3	6.84	2	1.62				1	3.00	2	2	
rest of Asia/Pacific	47	3.83	20	2.84		23	4.64	23	3.05	9	2.92		1	3.00	11	2.77	
N & S America	**93**	**5.36**	**16**	**4.64**	**–1.71†**	**84**	**5.45**	**6**	**4.71**	**12**	**4.96**	**0.42**	**3**	**4.17**	**4**	**3.69**	**–0.31**
Canada	23	6.34	5	6.05		18	6.75	3	4.75	3	6.33		2	5.00	2	5.62	
Mexico	21	4.77	3	4.67		19	4.80	2	4.50	3	4.67						
rest of N/S America	49	5.16	8	3.75		47	5.22	1	5.00	6	4.42		1	2.50	2	1.75	
Africa/Middle East	**49**	**6.79**	**9**	**4.03**	**–3.98*** **	**46**	**7.02**	**2**	**3.18**	**6**	**4.50**	**0.91**	**1**	**3.50**	**3**	**3.07**	
Israel	36	7.47	3	5.58		36	7.47			2	7.01				1	2.72	
South Africa	2	5.25	1	3.50		2	5.25			1	3.50						
rest of Africa/M East	11	4.87	5	3.20		8	5.47	2	3.18	3	3.17		1	3.50	2	3.25	
Total sample	**544**	**4.86**	**416**	**4.04**	**–7.45*** **	**350**	**5.59**	**138**	**3.49**	**107**	**3.96**	**3.03****	**56**	**3.73**	**309**	**4.07**	**1.65†**

Table VII. The determinants of the gross spread.

The dependent variable is the gross spread, in %. Proceeds are converted into U.S. dollars using exchange rates on the offer date. 'U.S. bank in a senior position' refers to a U.S. bank serving in a senior syndicate capacity, i.e. global co-ordinator, bookrunner or (co-) lead manager. The dummy for bookbuildings is based on our more inclusive bookbuilding definition. 'Marketed in the U.S.' refers to IPOs which are either S.E.C. registered, mention eligibility under Rule 144A, have a tranche labeled 'U.S. tranche' or are listed on a U.S. exchange. All regressions except R2 are estimated using OLS. Regression R2 allows for nonrandom sample selection and possible resulting bias in the coefficients estimated in regression R1, 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, year of issue, the size of the offering (level and log), and dummies for U.S. listings, marketing in the U.S., U.S. banks serving in senior positions, and the use of bookbuilding. To ensure the model is identified, it also includes a dummy for offerings which are purely primary (raise new equity only). White (1980) heteroskedasticity-consistent standard errors are in italics under the 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 IT IPOs face higher-than-average spreads, financial, construction and retailing companies lower ones. The year dummies for 1992 and 1993 are positive and significant and are followed by negative (but insignificant) year dummies, indicating a downward time trend in gross spreads since the early 1990s. The country dummies for the U.K., Singapore, Malaysia, and South Africa are significant and negative. They are significant and positive for Germany, Sweden, Italy, Japan, Canada, and Israel. ***, **, *, † = significant at 0.1%, 1%, 5%, and 10% (two-sided for coefficient estimates), respectively.

	Dependent variable: gross spread (%)			
	Whole sample			Bookbuildings, not marketed in the U.S.
	R1: OLS	R2: Heckman	R3: OLS	R4: OLS
Constant	4.097*** *0.272*	3.573*** *0.271*	4.079*** *0.271*	4.941*** *0.498*
Proceeds (in US$ m)	–0.0002*** *0.00004*	–0.0002*** *0.00004*	–0.0002*** *0.00004*	0.0003 *0.0003*
Log proceeds (in US$ m)	–0.438*** *0.037*	–0.376*** *0.038*	–0.425*** *0.037*	–0.350*** *0.077*
Dummy: U.S. bank in senior position	0.586*** *0.107*	0.727*** *0.111*		0.410*** *0.181*
Dummy: bookbuilding	1.156*** *0.132*	1.021*** *0.130*	1.123*** *0.133*	
Interaction: bookbuilding * U.S. bank			0.427*** *0.176*	
Dummy: marketed in the U.S.	0.471*** *0.098*	0.656*** *0.105*	0.489*** *0.122*	
Interaction: U.S. marketing * U.S. bank			0.072 *0.215*	
Dummy: listed in the U.S.	1.437*** *0.118*	1.541*** *0.120*	1.472*** *0.127*	
Country dummies	✓	✓	✓	✓
Year dummies	✓	✓	✓	✓
Industry dummies	✓	✓	✓	✓
R^2	66.5 %		66.2 %	48.9 %
No. of observations	1,540	2,051	1,540	365
Wald test of indep. eqns. ($\rho = 0$)	–	33.3***	–	–
F-test: all coefficients = 0	136.4***	–	134.5***	2,168***

Table VIII. Incidence of pricing outside range, by bank, country and year.

There are 1,090 sample IPOs with price range information, all classified as bookbuildings. 'Priced outside range' means strictly above/below the high/low indicative price. For comparison the table includes information on 3,480 IPOs by U.S. issuers in the U.S. in January 1992-July 1999. 71 of these were lead-managed by non-U.S. banks, such as Nomura International and UBS Securities. The final column tests for equality of the proportions priced outside the range by syndicates involving U.S. banks vs. not involving U.S. banks. ***, **, *, † = significant at 0.1%, 1%, 5% or 10% (two-sided), respectively.

	IPOs with U.S. bank in senior position						**IPOs without U.S. bank in senior position**						**test: equality of proportions**
	nobs	Fraction of firms (%) priced…					nobs	Fraction of firms (%) priced…					
	w/ price range	outside range	strictly above range	strictly below range	at high end of range	at low end of range	w/ price range	outside range	strictly above range	strictly below range	at high end of range	at low end of range	*z*-statistics
Non-U.S. total sample	**517**	**27.9**	**15.1**	**12.8**	**29.4**	**11.0**	**573**	**4.4**	**2.1**	**2.3**	**51.7**	**6.8**	**11.30*****
United States	**3,409**	**48.2**	**23.7**	**24.5**	**12.4**	**11.1**	**71**	**49.3**	**21.1**	**28.2**	**19.7**	**7.0**	**0.19**
Panel A: By country													
Europe	**289**	**18.7**	**9.3**	**9.3**	**33.9**	**10.0**	**523**	**3.6**	**1.3**	**2.3**	**54.7**	**6.3**	**7.18*****
France	35	17.1	11.4	5.7	11.4	5.7	135	3.0	1.5	1.5	47.4	8.9	3.18**
Germany	30	3.3	0.0	3.3	0.0	3.3	186	1.6	0.0	1.6	75.8	5.4	0.65
Italy	23	8.7	4.3	4.3	4.3	4.3	32	0.0	0.0	0.0	28.1	0.0	1.70†
Netherlands	36	27.8	22.2	5.6	22.2	5.6	26	0.0	0.0	0.0	61.5	0.0	2.85**
Sweden	11	18.2	9.1	9.1	9.1	9.1	20	5.0	0.0	5.0	20.0	15.0	1.19
United Kingdom	54	27.8	5.6	22.2	5.6	22.2	22	31.8	9.1	22.7	18.2	9.1	0.35
Rest of W Europe	84	20.2	10.7	9.5	10.7	9.5	98	4.1	3.1	1.0	46.9	6.1	3.40***
rest of E Europe	16	6.2	6.2	0.0	6.2	0.0	4	0.0	0.0	0.0	50.0	0.0	0.51
Asia Pacific	**99**	**33.3**	**21.2**	**12.1**	**25.3**	**8.1**	**36**	**5.6**	**5.6**	**0.0**	**22.2**	**13.9**	**3.26*****
China	29	24.1	13.8	10.3	13.8	10.3	11	18.2	18.2	0.0	18.2	0.0	0.40
Hong Kong	23	52.2	34.8	17.4	34.8	17.4	12	0.0	0.0	0.0	25.0	25.0	3.09**
Japan	2	0.0	0.0	0.0	0.0	0.0	1	0.0	0.0	0.0	0.0	0.0	
Malaysia													
Singapore	4	50.0	50.0	0.0	50.0	0.0							
rest of Asia/Pacific	41	29.3	17.1	12.2	17.1	12.2	12	0.0	0.0	0.0	25.0	16.7	2.13*
N & S America	**84**	**39.3**	**20.2**	**19.0**	**25.0**	**19.0**	**7**	**42.9**	**28.6**	**14.3**	**0.0**	**0.0**	**0.19**
Canada	21	52.4	28.6	23.8	28.6	23.8	2	100.0	50.0	50.0	0.0	0.0	
Mexico	19	52.6	36.8	15.8	36.8	15.8	2	50.0	50.0	0.0	0.0	0.0	
rest of N/S America	44	27.3	9.1	18.2	9.1	18.2	3	0.0	0.0	0.0	0.0	0.0	1.05
Africa/Middle East	**45**	**53.3**	**28.9**	**24.4**	**17.8**	**8.9**	**7**	**14.3**	**14.3**	**0.0**	**28.6**	**14.3**	**1.93**†
Israel	35	65.7	37.1	28.6	37.1	28.6	5	20.0	20.0	0.0	40.0	0.0	1.95†
South Africa	3	0.0	0.0	0.0	0.0	0.0	1	0.0	0.0	0.0	0.0	0.0	
rest of Africa/M East	7	14.3	0.0	14.3	0.0	14.3	1	0.0	0.0	0.0	0.0	100.0	
Panel B: By target market													
marketed in the U.S.	463	30.2	16.2	14.0	26.6	10.8	94	8.5	5.3	3.2	33.0	9.6	4.42***
not marketed in the U.S.	54	7.4	5.6	1.9	53.7	13.0	479	3.5	1.5	2.1	55.3	6.3	1.38
Panel C: By year													
1992	18	55.6	33.3	22.2	16.7	11.1	4	25.0	25.0	0.0	25.0	0.0	1.11
1993	41	43.9	31.7	12.2	22.0	14.6	2	0.0	0.0	0.0	50.0	0.0	1.23
1994	57	22.8	5.3	17.5	28.1	5.3	17	11.8	11.8	0.0	23.5	5.9	0.99
1995	58	31.0	10.3	20.7	19.0	12.1	24	4.2	0.0	4.2	33.3	4.2	2.62**
1996	88	27.3	17.0	10.2	25.0	15.9	48	6.2	4.2	2.1	43.8	4.2	2.94**
1997	103	29.1	17.5	11.7	27.2	7.8	117	3.4	1.7	1.7	38.5	6.8	5.26***
1998	77	22.1	11.7	10.4	40.3	9.1	198	4.5	1.0	3.5	62.1	6.1	4.46***
1999	75	18.7	10.7	8.0	42.7	13.3	163	3.1	1.8	1.2	57.1	9.2	4.13***

Table IX. Average underpricing, by pricing relative to the initial range.

Final price set…	**No. of obs.**	**Mean underpricing**	**Standard error**
Within the initial range	921	19.8%	1.56%
At top of range	448	36.4%	2.86%
At bottom of range	96	–1.1%	1.51%
Outside the initial range			
Above the range	90	28.5%	4.54%
Below the range	79	6.5%	5.30%
	Difference in underpricing	***t*–test**	***p*–value**
Above relative to within	+8.71%	1.68	0.093
Above relative to top	–7.86%	–1.17	0.241
Below relative to within	–13.29%	–2.40	0.017
Below relative to bottom	+7.63%	1.50	0.136

Table X. OLS and two-stage least squares underpricing regressions.

The dependent variable in all OLS regressions and in the second stages of the 2SLS regressions is underpricing, the percentage return from the (institutional) offer price to the trading price one week after the IPO. Proceeds are converted into U.S. dollars using exchange rates on the offer date. Price revision is the percentage change between the midpoint of the initial price range and the offer price. Price revision^{+} equals price revision when it is strictly positive, and zero otherwise. Splitting price revisions this way allows us to capture potential asymmetries in the relationship between underpricing and price revisions in the face of positive information (measured by the sum of the coefficients for price revision and price revision^{+}) and negative information (measured by the coefficient for price revision alone). White (1980) heteroskedasticity-consistent standard errors are reported in italics under the coefficient estimates. Model 1 estimates a least-squares regression of underpricing on the full set of explanatory variables. Model 2 replaces the dummies for bookbuilding, choice of U.S. bank, and marketing to U.S. investors in Model 1 with four interaction terms equal to one if a bookbuilding involves i) neither a U.S. bank nor U.S. investors, ii) a U.S. bank but no U.S. investors, iii) U.S. investors but no U.S. bank, and iv) both a U.S. bank and U.S. investors. The regression constant captures fixed-price offerings. Model 3 allows for the possible endogeneity of the choice between fixed-price offerings and the four alternatives i)-iv) in Model 2 using a two-stage methodology to obtain consistent estimates. The first stage estimates a multinomial logit of the probability of a firm choosing any of alternatives i)-iv) rather than a fixed-price offering. The explanatory variables are the level and natural log of gross proceeds (in million US$), a dummy equal to one for privatizations, and a full set of country, year and industry dummies. The second stage uses the predicted probabilities from the first stage as instrumental variables for alternatives i)-iv) in a least-squares regression with underpricing as the dependent variable. Model 4 re-estimates Model 2 for the sub-sample of bookbuildings. Model 5 again allows for the endogeneity of the choice variables using two-stage model. The first stage estimates a bi-variate probit which allows for the interdependence of a firm's choice of hiring a U.S. bank and having its IPO marketed to U.S. investors. The second stage uses the predicted probabilities from the first stage as instrumental variables for alternatives i)-iv) in a least-squares regression with underpricing as the dependent variable. Model 6 is a probit 2SLS model estimated over the subsample of bookbuildings which are not marketed in the U.S. The first-stage estimated the probability of hiring a U.S. bank in such offerings.

	Whole sample					**Bookbuildings**		**Domestic**
	Model 1	**Model 2**	**Model 3**			**Model 4**	**Model 5**	**Model 6**
	OLS	OLS	Multinomial logit 2SLS			OLS	Bivariate probit 2SLS	Probit 2SLS
Stage 1:			**Multinomial logit**				**Bivariate probit**	**Probit**
			Bookbuilding and U.S. …				U.S. bank	Marketed	U.S. bank
			i) bank ✕ investors ✕	ii) bank ✓ investors ✕	iii) bank ✕ investors ✓	iv) bank ✓ investors ✓	in senior position?	to U.S. investors?	in senior position?
Constant			–1.529**	–7.892***	–7.453***	–7.923***	–2.847***	–2.670***	–4.555***
			0.559	*1.102*	*0.989*	*0.727*	*0.427*	*0.461*	*0.544*
gross proceeds			–0.0009	–0.0005†	–0.004**	–0.0006**	0.0007†	–0.0001*	0.0004
			0.0008	*0.0003*	*0.001*	*0.00002*	*0.0004*	*0.0001*	*0.0005*
ln(gross proceeds)			0.667***	1.700***	1.908***	2.053***	0.569***	0.601***	0.677***
			0.096	*0.167*	*0.200*	*0.121*	*0.080*	*0.085*	*0.125*
Dummy: Privatization			–0.432	–0.892†	–0.308	–1.140**	–0.422***	–0.235	–0.096
			0.417	*0.540*	*0.455*	*0.396*	*0.132*	*0.215*	*0.190*
Country/year/industry dummies			✓	✓	✓	✓	✓	✓	✓
			Pseudo-R^2: 46.6%				bivariate? (χ^2): 79.7***		Pseudo-R^2:
			LR test (χ^2): 2,594.9***				Rho: 75.4 %***		33.1%

Stage 2:			**OLS with IV**		**OLS with IV**	**OLS with IV**
Constant	0.354***	0.331***	0.366***	0.315***	0.431***	0.449***
	0.087	*0.087*	*0.104*	*0.093*	*0.109*	*0.171*
Dummy: Bookbuilding	–0.065†					
	0.036					
Dummy: U.S. bank (senior)	–0.045*					–0.288*
	0.023					*0.148*
Dummy: Marketed to U.S. investors	–0.135***					
	0.029					
Bookbuilding and U.S. …						
i) … bank ✕, investors ✕		–0.045	0.044			
		0.040	*0.102*			
ii) … bank ✓, investors ✕		–0.159**	–0.196	–0.115*	–0.063	
		0.051	*0.281*	*0.047*	*0.362*	
iii) … bank ✕, investors ✓		–0.226***	–0.445*	–0.177***	–0.343	
		0.041	*0.201*	*0.041*	*0.325*	
iv) … bank ✓, investors ✓		–0.214***	–0.282***	–0.162***	–0.321**	
		0.035	*0.058*	*0.035*	*0.112*	
Dummy: Privatization	0.088*	0.085*	0.111*	0.051	0.067	–0.046
	0.041	*0.041*	*0.045*	*0.043*	*0.047*	*0.096*
Price revision	0.051	0.089	0.350*	0.186	0.354*	0.324
	0.163	*0.162*	*0.149*	*0.159*	*0.154*	*0.416*
Price revision+	1.606***	1.525***	1.125**	1.295***	1.093**	2.255***
	0.410	*0.408*	*0.374*	*0.392*	*0.390*	*0.694*
Country/year/industry dummies	✓	✓	✓	✓	✓	✓
R^2	15.7 %	15.6 %	15.6 %	18.3 %	18.1 %	21.4 %
No. of observations	2,051	2,051	2,051	1,308	1,308	684

Introduction. In recent years, policymakers, especially in the developing countries, have come to the conclusion that foreign direct investment (FDI) is needed to boost the growth in their economy. It is claimed that FDI can create employment, in-crease technological development in the host country and improve the eco-nomic condition of the country in general.Â The OECD (2002) simply stated that FDI increases efficiency of resources and raises factor productivity in the host coun-try, so it sees the influence of FDI on growth as positive.Â After decades of skepticism, international events reshaped the attitude of developingÂ Now, almost every country wants FDI to supplement local investments and this has increased the activities of MNEs in developing countries tremendously. EFFICIENCY -a more efficient process will have lower unit costs because it is using its resources more effectively. THE IMPORTANCE OF EFFICIENCY -businesses are constantly trying to improve their efficiency because if they can drive down unit costs they can bring the price down or make higher profits with the same price.Â INCREASING EFFICIENCY: INCREASING LABOUR PRODUCTIVITY -if business can achive more output from a given number of employees then assuming the wages and salaries stay the same, the cost per unit falls. -e.g. 100 employees produce 200 units with labour costs of Â£2000 -labour productivity = 200/100 = 2 units per employee. MinLaw and IPOS are working with the economic agencies to introduce the IP Development Incentive (IDI) scheme which will promote the exploitation of IP arising from R&D activities undertaken in Singapore. 4.Â (c) Third, the emerging opportunities for Singapore to capture a slice of international workflows, through leveraging our existing strengths such as our global connectedness, best-in-class legal and financial infrastructure and highly-skilled workforce.Â 1.3.3 IPOS has built a team of more than 100 patent examiners with expertise spanning a wide range of technologies â€“ engineering, Information and Communications Technology (ICT), semiconductor, chemistry etc. More than 90 per cent of the patent examiners are scientists with PhD qualifications.