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ABSTRACT

Conflicts of Interest and Efficient Contracting in IPOs*

We study the role of underwriter compensation in mitigating conflicts of interest between companies going public and their investment bankers. Making the bank's compensation more sensitive to the issuer's valuation should reduce agency conflicts and thus underpricing (Baron (1982); Biais, Bossaerts, and Rochet (2002)). Consistent with this prediction, we show that contracting on higher commissions in a large sample of UK IPOs completed between 1991-2002 leads to significantly lower initial returns, after controlling for other influences on underpricing and a variety of endogeneity concerns. These results indicate that issuing firms' contractual choices affect the pricing behaviour of their IPO underwriters. Moreover, we cannot reliably reject the hypothesis that the intensity of incentives is optimal, and so that contracts are efficient.

JEL Classification: G24 and G32
Keywords: initial public offerings, integrated securities houses, intermediation, underpricing and underwriting contracts

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1. Introduction

Do investment banks maximize value to issuers when underwriting offerings of securities? Recent empirical research into IPO pricing implicitly assumes a conflict of interest between investment banks and issuers leading to higher underpricing (Loughran and Ritter (2002, 2003); Ljungqvist and Wilhelm (2003)). Around the world, investment banks have drawn flak for the way they have allegedly allocated intentionally underpriced stock to friendly parties during the boom market in dotcom stocks. In the U.S., for instance, the Securities and Exchange Commission and NASD Regulation jointly fined CSFB $100 million for 'taking millions of dollars from customers in inflated commissions in exchange for allocations of 'hot' Initial Public Offerings' between April 1999 and June 2000.[1] Such allocations would have generated huge customer profits at a time when the average IPO was underpriced by 70%. Similarly, in October 2002, the U.K. Financial Services Authority launched an investigation of 'spinning', the practice of providing underpriced shares in popular IPOs to senior executives of unrelated companies in the hope of attracting corporate finance business.

In principle, issuers can mitigate agency conflicts in two ways: they can monitor the investment banks' selling effort and pricing behavior directly, or they can use contract design to realign the banks' incentives by making their compensation an increasing function of the offer price. Ljungqvist and Wilhelm (2003) provide evidence consistent with monitoring in the U.S., by showing that first-day returns are lower, the greater are the monitoring incentives of the issuing firms' CEOs. Of course, reputation concerns should ensure that agency conflicts do not get too much out of hand: issuing companies will presumably stay away from banks with histories of excessive underpricing (Beatty and Ritter (1986)).

In this paper, we focus on the role of contract design while controlling for monitoring incentives following Ljungqvist and Wilhelm (2003). In a typical IPO, the banks buy the shares from the issuer at the offer price less a spread. The spread is agreed well in advance of the offer price being fixed and typically is set as a fraction of the offer price. Thus, the size of the spread can be thought of as the

pay-for-performance sensitivity of the bank's compensation. All else equal, we would expect a higher spread to lead the bank to expend greater effort, resulting in offer prices being set higher, or equivalently, underpricing being reduced. This intuition is modeled formally by Baron (1982) in the context of a fixed-price offering and Biais, Bossaerts, and Rochet (2002) for bookbuilding efforts.

Testing these agency models with U.S. data is difficult for two reasons. First, as Chen and Ritter (2000) show, spreads cluster at 7% so cross-sectional tests of the relation between spreads and underpricing have little power.[2] Perhaps not surprisingly, therefore, Chen and Ritter fail to find a trade-off between underpricing and gross spreads in the U.S., a result confirmed by Kim, Palia, and Saunders (2002). Second, there is unobserved heterogeneity because researchers do not observe the bundle of services issuers expect to receive in return for the 7% spread. These services include not only selling effort but also after-market price support and analyst coverage, among others. The part of the 7% that goes toward inducing selling effort is thus not directly observable in the U.S.

IPO contracts in the U.K. are not subject to these shortcomings. First, there is no clustering. Banks' compensation takes the form of a linear, two-part function consisting of a flat fee and a percentage commission on shares sold that varies between zero and seven percent. (Clearly the flat fee has no effort incentive properties at the margin. Flat fees are rare if not unheard of in the U.S.) Second, IPO contracts in the U.K. lack the uniformity we see in the U.S. They explicitly outline the bundle of services issuers buy, and issuers' choices are very heterogeneous.

This heterogeneity allows us to estimate the cost drivers that make up the commission, and thus to isolate econometrically that part of the commission that goes toward inducing selling effort. Linking this to realized underpricing, we show that contracting on higher commissions leads to significantly lower underpricing. The point estimate suggests that a one percentage point increase in the commission rate reduces log initial returns by 2.7 percentage points, after controlling for other influences on underpricing and for various sources of potential endogeneity bias.

This evidence of a trade-off between fees and underpricing indicates that issuing firms'

contractual choices affect the pricing behavior of their IPO underwriters in exactly the way predicted by Baron (1982) and Biais, Bossaerts, and Rochet (2002). Moreover, we cannot reliably reject the hypothesis that the intensity of incentives is optimal, and so that contracts are efficient. In other words, the cost of increasing commissions further would approximately offset the benefit of improvements in the offer price.

Of course, given the many structural differences between the U.K. and U.S. IPO markets, we make no claim that our results can be generalized to the U.S. These structural differences are not confined to compensation design. Investment banks' organizational structure is much less homogenized in the U.K. than in the U.S. Banks specializing in either corporate finance or institutional brokerage co-exist with the more familiar U.S.-style integrated securities houses (many of which are U.S.-owned). Integrating the corporate finance and brokerage functions can lead to conflicts of interest to the detriment of either issuers or investors, depending on whether the bank views future business with investors or corporations as the more lucrative. Banks specializing in corporate finance rather than broking should not be subject to such conflicts of interest. In other words, when pricing an IPO they are more likely to look after issuers' interests, leading to lower underpricing. Consistent with this prediction, our results show that issuers choosing relatively more specialized corporate finance advisers experience lower underpricing.

Our empirical model has three components. Beginning with the last, we wish to test the comparative static prediction that higher commissions reduce initial returns. Commissions are endogenous and so we need to model them explicitly to mitigate the possibility of bias in the initial return regression. Commissions reflect not only issuers' intended pay-for-performance incentives but also the bundle of IPO services they have negotiated with their banks. These services are presumably also chosen endogenously, so we first need to model issuers' IPO service choices to mitigate the possibility of selection bias in the commission equation.

The paper proceeds as follows. Section 2 details the sample and data sources. Section 3 describes U.K. IPO contracts. In Section 4, we outline the econometric foundations of our empirical model. Section 5 estimates two parts of that model: the determinants of issuers' choices of the various IPO services, and commissions. Section 6 analyzes the link between commissions and underpricing and provides various robustness tests. Section 7 concludes.

2. Sample and Data

2.1 Data and Sources

Our dataset spans the period January 1991 to December 2002 and is an updated version of the dataset compiled by Ljungqvist and Wilhelm (2002) which ends in May 2000. The list of IPOs was obtained from the London Stock Exchange, Dealogic's Equityware, and Thomson Financial's SDC and covers firms listing on the London Stock Exchange irrespective of their country of origin. After excluding IPOs by investment trusts, companies previously listed elsewhere, privatizations, global depository receipts trading on SEAQ International, and introductions (listings not accompanied by the sale of securities), there were 1,108 IPOs in the U.K. over the sample period. For 1,064 of these, we have obtained the IPO contracts from filings with the London Stock Exchange or the U.K. Listing Authority. The contracts contain information regarding the commission rate and flat fee elements of the compensation function. From the prospectuses, we hand-collect data on company age, sales, debt, industry affiliation, and ownership structure at the time of the IPO, as well as offer prices and gross proceeds. First-day trading prices are from Datastream, with all initial returns in excess of 30% cross-checked using Reuters. We lack after-market prices for ten IPOs, including four of those for which we have underwriting contracts. All currency amounts are in December 2001 purchasing power, deflated using the Retail Price Inflation index. To control for the effect of withdrawn IPOs, we identify 345 offers that were cancelled or postponed between 1991 and 2002 using filings with the London Stock Exchange and the U.K. Listing Authority and a Reuters news search.

2.2 Descriptive Statistics

Table 1 provides descriptive sample statistics for the overall period and by year. IPO volume ranges from 12 IPOs in 1991 to 227 in 2000, with more than 100 IPOs in 1994, 1996, 1997, and 2000. The average (median) company raised £46.4 million (£8.9 million) in its IPO, and median gross proceeds declined substantially over the sample period. Roughly half the companies listed on the junior market tier (the Unlisted Securities Market, USM, from 1991 to 1995, and the Alternative Investment Market, AIM, from June 1995), rather than on the Official List. As Table 1 shows, junior market listings account for a larger fraction of the sample in the second half of the period, following the opening of AIM.

Next, Table 1 describes certain firm characteristics used as controls for uncertainty about the issuer's value. At the time of its IPO, the average (median) company was 20 (seven) years old. Over the period, age at issue declined substantially, and at the peak of the hot market in 1999-2000, the median company went public aged three to five years. This is comparable to the U.S. during the 1990s (Ljungqvist and Wilhelm (2003)). Based on a reading of the prospectuses, internet-related firms account for 14% of the sample overall, and 32% to 45% in 1999 and 2000, mirroring developments in the U.S. The level of 'indebtedness' at the time of the IPO (which listing rules define as secured and unsecured loans, bank overdrafts, leasing commitments, and loan guarantees) averages £35.8 million. Leverage (defined as debt over debt plus post-IPO market value of equity) averages 12.6%. As James and Wier (1990) argue, the presence of credit relationships can reduce valuation uncertainty. To control for size effects we include revenue. In the last twelve-month accounting period before the IPO, the average (median) company had sales of £66.7 million (£6.0 million).

The average (median) CEO in our sample owns 29.2% (20.9%) of equity outstanding just before the IPO. This is about 50% above CEO ownership levels in U.S. IPOs (Ljungqvist and Wilhelm (2003)). CEOs sell stock in 34.3% of sample offerings.

The final two columns of Table 1 show the mean and standard deviation of first-day returns.

Initial returns average 29.1% over the period, with notable spikes in 1999 and 2000 when the average IPO jumped in price by 88.7% and 64.8% on its first day of trading, respectively. These spikes also mirror conditions in the U.S. IPO market at the time. The median initial return (not shown) of 9.7% is two-thirds below the mean. Given this large degree of skewness, we follow Benveniste et al. (2003) and others and model initial returns in logs.[3]

3. IPO Contracts and Services in the U.K.

3.1 Contracting Environment

The London Stock Exchange requires IPO issuers to hire a 'sponsor' (or, on AIM, a 'nominated adviser') and a 'nominated broker'. The sponsor fulfills the same role as the lead manager's corporate finance department in the U.S., such as valuing the company and helping prepare the IPO prospectus. The broker places the stock with investors in much the same way as a lead manager's equity capital markets desk does in the U.S. Sponsor and broker need not be the same bank. In our sample, they are different in 38.5% of cases.

London Stock Exchange regulations also require every *listed* company to have a nominated adviser and a nominated broker. Companies that go public customarily hire their IPO sponsor and broker to fulfill these functions after the IPO, typically on multi-year contracts. The banks are paid annual retainers for their services which are separate from their IPO compensation and so not included in our analysis. The formal role of the adviser, post-IPO, is to advise the company's directors as to compliance with stock exchange rules and regulations. Informally, advisers typically work with the company on corporate finance-related tasks, such as takeovers or capital issues. The nominated broker would be expected to market the stock to institutional investors in the after-market, not least by publishing analyst research on an on-going basis.

The typical sequence of an IPO in the U.K. is as follows. About one month prior to listing, the company releases a 'pathfinder' prospectus which resembles a 'red herring' in the U.S. The pathfinder contains a draft contract between the issuer, the sponsor, and the broker, setting out the

duties and responsibilities of the parties as well as the banks' IPO compensation, typically taking the form of a flat fee and a commission rate.[4,5] As in U.S. seasoned offers (Bhagat and Frost (1986)), contracts are negotiated rather than awarded through competitive sealed bid auctions. The final prospectus containing the offer price is released on 'impact day', about 10 days prior to listing. At this point, the IPO contract becomes binding conditional on the Exchange approving the listing by a certain date. Following impact day, the broker endeavors to place the shares with investors.

3.2 Sponsor Independence

Conceptually, there are three types of sponsor in the U.K. marketplace: those (such as Baring Brothers or N.M. Rothschild & Sons) that rarely or never act as brokers; integrated securities houses (such as Morgan Stanley or UBS Warburg) that usually broker the deals they sponsor; and institutional brokers (such as Cazenove & Co or HSBC James Capel) that rarely act as sponsor. These differences in specialization likely affect how well a sponsor's interests are aligned with those of the issuer. The more specialized the sponsor, the more it depends on issuers rather than buy-side investors for business. Thus, unlike a broker whose interests may be to leave more 'money on the table' to benefit its investor clients, a specialized sponsor has little or nothing to gain from high underpricing.

To measure the degree of specialization – or equivalently, the sponsor's independence of the interests of buy-side investors – we compute, for each of the 109 sponsors in the sample, the ratio of the number of deals the bank has sponsored over the sample period to the sum of the number of deals it has sponsored and the number of deals it has brokered.[6,7] This ratio ranges from zero to one. It equals one for a sponsor that never brokers IPOs, ½ for an integrated securities house that brokers all the deals it sponsors, and less than ½ for a broker that only occasionally acts as a sponsor. The median sample company uses an integrated securities house (independence measure of 0.48), while 23.3% of sample companies use a sponsor that never brokers IPOs.

3.3 Bank Compensation

The compensation the sponsor and broker receive for their IPO services follows one of three

main schedules in the U.K.:

- The linear, two-part function consisting of a flat fee and a percentage commission on shares sold is the dominant form, and is used in 850 of the 1,064 contracts in the sample. This includes two special cases: 162 contracts where the banks received no flat fee, resembling U.S. practice, and 84 contracts where the banks received only a flat fee and no commission.
- Some contracts combine a flat fee with commission rates that differ across tranches. In offers open to the public prior to January 1996, banks were typically paid a higher commission on shares placed with retail investors than on shares placed with institutions (89 cases). And in some rare cases, insiders pay a commission rate on the shares they sell in the IPO that is higher (eight cases) or lower (18 cases) than the rate the company pays on newly issued stock. In either case, we compute and report the weighted average commission rate (since that is the bank's expected marginal compensation) and so treat the compensation schedule as a linear, two-part function.
- The commission rate can also be a step function of the number of shares placed or of proceeds raised. For instance, banks might be paid 3% for the first 10 million raised, rising to 4% for the next five million. Such convex incentives are present in 37 contracts, including 19 cases where issuers offer the banks 'performance bonuses' of between ½ and 1% of gross proceeds, payable after the IPO at the sole discretion of the board. We have no information regarding the actual payment of the bonuses. The reverse, though rare, is possible too: lead managers may be paid a *lower* rate on additional shares sold. Such concave incentives are present in 15 contracts. For the purpose of our empirical tests, we compute average commission rates though our results are robust to using the (highest) marginal rate.

Table 2 provides details of IPO compensation in the U.K. We know the commission rate for 1,013 of the 1,064 contracts and the size of the flat fee for 848. Commission rates average 2.08% over the period (median: 2%), with a pronounced positive drift from 1.41% in 1991 to 3.31% in 2002. The range (not shown) is zero to 7%. The most frequent commission rate is 3% (19.2% of cases),

followed by ¾% (12.4% of cases) and 2% (8.2% of cases).

In December 2001 money, flat fees average £138,425 (median: £91,126). They exhibit a fair degree of variation but no clear trend over time. Together, the commission and flat fee (where disclosed) amount to 4.57% of gross proceeds for the average firm (median: 3.92%), considerably less than the typical 7% spread paid by U.S. issuers (Chen and Ritter (2000)). Part of the difference may be due to the British practice of keeping the sponsor and broker under contract after the IPO, which might promote the banks' willingness to spread some of their costs over time. In the U.S., by contrast, there is only an expectation that the lead bank will get future business (for a job well done). Total spreads were substantially higher in 2001 and 2002 than in previous years, possibly due to the decline in gross proceeds and the larger fraction of firms listing on the junior market shown in Table 1.

3.4 IPO Services

In addition to distributing the stock, what services do investment banks offer issuers? We focus on four discretionary services that issuers may demand and that may increase the cost of their IPOs: underwriting cover, price support, marketing to investors in the U.S., and retail participation.

- As in U.S. firm-commitment offers, underwriting cover guarantees the issuer will receive the net proceeds regardless of the broker's success in placing the stock. Unlike in the U.S., where deals are typically priced just hours before final allocations take place, U.K. banks tend to bear underwriting risk for several days. It is common for underwriters to lay off part of this risk by pre-placing shares with investors, who receive a commitment fee out of the underwriter's commission.
- Like in the U.S., banks managing an IPO in the U.K. are allowed to engage in activities that stabilize prices in the first month of trading. Unlike in the U.S., however, they can only do so if they have previously alerted investors to the possibility of price stabilization via an explicit statement in the IPO prospectus.[8,9] This is not a boilerplate statement, suggesting that issuers decide whether or not to allow for price support on a case-by-case basis.
- Marketing in the U.S. requires either registration under the 1933 Securities Act or exemption

under Rule 144A for sale to 'qualified institutional buyers' only. In either case, the IPO prospectus includes a prominent disclaimer. Ljungqvist, Jenkinson, and Wilhelm (2003) show that marketing IPOs in the U.S., though more costly, leads to significant price improvement in a sample of new issues from 65 countries, perhaps because the involvement of U.S. investors improves competition among investors.

- Until January 1996, issues exceeding certain proceeds thresholds were required to offer some shares to retail investors. Since January 1996, issuers can freely choose between a 'placing' targeted solely at institutional or extremely wealthy investors, and offers that are open to retail investors (see Ljungqvist and Wilhelm (2002), Appendix C for further details).[10] Ljungqvist and Wilhelm show empirically that restricting allocations, ex ante, to institutional investors leads to higher underpricing. In such offerings, retail investors no longer provide the fallback in bargaining with institutional investors envisioned by Benveniste and Wilhelm (1990).

Table 3 shows that 65.3% of sample offerings were underwritten, 8.3% flagged the possibility of price support, 10.0% were marketed to U.S. investors, and 23.4% were open to retail investors. Retail participation declined over time as regulations requiring retail participation were first relaxed (in December 1993 and January 1995) and then abolished (in January 1996). Note, however, that around one in six issuers voluntarily chose to market their offerings to retail investors post-1996.

3.5 Broker Services

In addition to the four IPO services discussed in Section 3.4, we control for analyst coverage. Given the perceived importance of analyst reputation in choosing IPO underwriters (Cliff and Denis (2002), Loughran and Ritter (2003)), it seems likely that (almost) every issuer expects the broker to provide analyst coverage. However, the quality of analyst coverage presumably depends on the quality and reputation of the broker's research analyst, and so issuers may differ in their choice of analyst quality (especially if higher quality comes at a higher price).

To measure the reputation of the broker's analysts, we use the annual Extel Survey of

Investment Analysts (now owned by Thomson Financial). This is similar to the annual Institutional Investor survey in the U.S. The Extel Survey provides institutional investors' views on brokerage houses based on votes cast for individual analysts, weighted by the investors' funds under management. To illustrate, in 2001, UBS Warburg's analysts received 11.88% of all weighted votes cast, making it the highest ranked London broker. Our variable 'analyst ranking' is defined as the percent of weighted votes the IPO issuer's broker received in the Extel survey published in the year the IPO takes place. For instance, 'analyst ranking' equals 11.88 for all IPOs brokered by UBS Warburg in 2001. If a broker is not ranked in the Extel survey, it is given a score of zero. In the case of IPOs with multiple brokers, we compute the simple average of each broker's weighted votes.

The average analyst ranking, shown in Table 3, is 2.13%, which to put into perspective is about the same as the 2.1% that earned Credit Lyonnais the number 10 rank in 1995. 64.6% of IPOs, accounting for 13.9% of money raised, used an unranked broker. This is comparable to the U.S. For a sample of 1,062 IPOs completed between 1993 and 2000, Cliff and Denis (2002) report that 77.2% of issuers hire underwriters whose analysts are not ranked in the Institutional Investor survey.

When estimating the commission model, we will control for issuers choosing a ranked broker. Our empirical results are unaffected if instead we use the Extel Survey votes as a continuous measure of broker quality.

4. Estimation Issues[11]

The purpose of our empirical model is to test the comparative static prediction that higher commissions reduce initial returns. As discussed in the introduction, commissions vary across firms not only because some firms seek to provide stronger selling effort incentives than others, but also because firms differ in the bundle of (costly) IPO services that they demand from their underwriters. Thus, we need to isolate that part of observed commissions intended to induce greater selling effort, that is, the part that is in 'excess' of the payment required for the chosen bundle of IPO services. We thus need to model issuers' choices of IPO services, observed commissions, and initial returns. As

these are likely interrelated, their estimation requires some care to ensure consistency.

The primary regression equation of interest models initial returns, *IR*, as follows:

$$IR = \lambda\, excess\, commissions + \beta_1 X_1 + u_1 \qquad (1)$$

where X_1 is a matrix of explanatory variables to be discussed later and u_1 is the usual zero-mean i.i.d. error term. If paying excess commissions leads to a reduction in underpricing, we expect $\lambda < 0$. Excess commissions are not observed but can be estimated in an auxiliary model. We observe the actual commissions issuers pay, as well as the bundle of IPO services they choose. To the extent that these IPO services are costly, commissions vary according to issuers' choices. In addition, other factors such as issuer characteristics (say, risk), bank reputation, and prevailing market conditions may also affect commission rates. Controlling for these, we take the unexplained part of commissions to be our estimate of 'excess' commissions.[12] Specifically,

$$commissions = \sum_k \gamma_{2k} d_k + \beta_2 X_2 + u_2 \qquad (2)$$

where *d* is a matrix of *k* binary choice variables representing the IPO services, and X_2 is a matrix of explanatory variables that control for issuer characteristics etc.

Using the residuals $\hat{u}_2$ from equation (2), the underpricing regression in (1) is estimated as

$$IR = \lambda \hat{u}_2 + \beta_1 X_1 + u_1 \qquad (1')$$

Because (1') includes a generated regressor, $\hat{u}_2$, that is itself estimated with sampling error, we correct the second-step covariance matrix following Murphy and Topel (1985).

Two-step estimators are consistent under mild regularity conditions (Murphy and Topel (1985); Maddala (1983), Chapter 8). In particular, λ, the parameter of interest, can be estimated consistently as long as the system is identified and we have consistent estimates of $\hat{u}_2$. We return to identification in Section 6.2. Except for the presence of the IPO service dummies, equation (2) (and thus $\hat{u}_2$) can be consistently estimated using OLS. The dummies pose an estimation problem to the extent that they

reflect endogenous choices, for then OLS may yield inconsistent estimates of the coefficients γ_2 required to estimate $\hat{u}_2$. In this case, we can obtain consistent estimates following Heckman's (1978) 'treatment effects' procedure. This requires explicit modeling of the IPO service choices, d_k, which are assumed to stem from *k* latent processes

$$d_k^* = \delta_k Z_k + u_k \tag{3}$$

measuring the propensity to choose service *k* as a function of some variables Z_k that capture the net benefits of the choice. The latent variables d_k^* are unobservable, but we observe the following binary outcomes: $d_k = 1$ if $d_k^* > 0$ and $d_k = 0$ if $d_k^* \leq 0$. Bias may arise if the errors u_k in (3) are correlated with the errors u_2 in (2). Heckman (1978) shows that (2) can be consistently estimated if we augment it with the 'hazard' h_{jk} of observing issuer *j* choosing IPO service *k*, obtained using the probit MLE predicted values $\hat{\delta}_k Z_k$.[13] The hazards are then included in equation (2), alongside the d_k dummies for each of the IPO services. The augmented regression is

$$commissions = \sum_k (\gamma_{2k} d_k + \theta_k h_k) + \beta_2 X_2 + u_2 \tag{2'}$$

which can be consistently estimated using least squares (subject only to mild regularity conditions). The Heckman correction is identified even if all variables *Z* used to model IPO services are contained in the set of variables X_2 used to model commissions (see Maddala (1983), p. 121).

Our empirical approach is thus as follows. In Section 5, we estimate the choice of IPO services in (3) to form the Heckman correction for the commission model in (2'). From this, we generate our estimate of excess commissions. In Section 6, we estimate the underpricing model (1').

5. IPO Services and Commissions

5.1 Issuers' Choices of IPO Services

Prior work gives us little guidance as to the determinants of issuers' choices of the IPO services modeled in equation (3) and shown in Table 3. While this implies that our choice of explanatory

variables is necessarily conjectural, it is worth recalling that the main purpose of these models is to generate hazards for inclusion in the commission model rather than to test particular theories.

We conjecture that issuers' choices are functions of conditions in the stock market in general and the IPO market in particular, as well as offer and firm characteristics. Specifically, we expect underwriting cover and price support to be more valuable, the greater the risks that investor demand will fall short of intended proceeds and the price will fall in the aftermarket. Issuers may wish to insure against the former risk if they need the IPO proceeds for investment purposes. The latter risk affects the price investors are willing to pay for the IPO, so issuers may wish to insure investors against the risk of price falls to obtain a higher offer price (Benveniste, Busaba, and Wilhelm (1996)). While we do not observe these risks, they may reasonably be expected to be greater when the stock market has been performing poorly or is more volatile and the IPO market is less 'hot'. Retail participation offers the benefit of increasing the pool of available capital, which may be more attractive when many issuers are competing for the attention and capital of institutional investors. We have no strong prediction for the effect of market conditions on the choice of U.S. marketing or whether to hire a broker whose research analysts are ranked in the Extel Survey.

Issue size likely affects each IPO service. All else equal, larger offers are harder to place, thus increasing the risk of failing to raise the intended proceeds, which in turn may increase the demand for underwriting. Hiring a reputable (i.e. ranked) broker may make it easier to place the stock, which is more necessary (and valuable) the larger the issue. Larger offers may also require retail participation, either by force of regulation (before January 1996) or to ensure the stock can be absorbed by the market without undue pressure on price. Ljungqvist, Jenkinson, and Wilhelm (2003) relate the U.S. marketing decision to offer size, arguing that costly U.S. marketing makes most sense in larger issues where underpricing translates into larger reductions in issuers' wealth. For similar reasons, offer size may also affect issuers' demands for price support. Specifically, Prabhala and Puri (1999) argue that underwriters provide price support as a form of commitment to more complete information

production in the premarket, which is likely more valuable in larger issues.

Uncertainty about the issuer's value may similarly increase demand for all services: for underwriting to avoid the chance of the issue having to be withdrawn; for price support to 'insure' investors against possible overpricing (Benveniste, Busaba, and Wilhelm (1996)); for U.S. marketing if U.S. investors have a comparative advantage in valuing risky companies (Ljungqvist, Jenkinson, and Wilhelm (2003)); for retail participation if retail investors provide underwriters with a fallback that lessens the market power of informed investors and uncertainty increases the need for information production in the pre-market (Ljungqvist and Wilhelm (2002)); and for a broker with a prestigious analyst team to reduce the informational asymmetries between different investors that may contribute to underpricing (Rock (1986)). While riskier firms may have more to gain from underwriting and price support, they may also find banks less willing to provide these services, so the overall effect on observed choices is unclear.

Finally, where current insiders intend to sell stock in the IPO, demand for underwriting may be higher if insiders are risk averse, and having sold (part of) their holdings, insiders may be relatively less concerned about after-market price declines, reducing their demand for price support. Greater retail participation implies relatively fewer shares held by institutions after the IPO (Brennan and Franks (1997)) which may be attractive to a CEO who wishes to maintain his private benefits of control. The larger his equity stake, the more entrenched he is anyway; but the smaller his equity stake, the more retail participation may reduce institutional holdings post-IPO. Thus we predict a negative relation between CEO stakes and retail participation. On the other hand, control consideration may not be paramount when a CEO sells stock in the IPO, so we expect a lower likelihood of retail participation in that case.

We control for market conditions using *market returns* (using the Financial Times Stock Exchange (FTSE) All Share Index over the 180 calendar days before the pricing date), *market return volatility* (the standard deviation of daily index returns over the same period, times $\sqrt{180}$), *lagged*

underpricing (the average initial return of companies going public in the prior 180 days), *IPO volume* (the number of IPOs completed in the prior 180 days), and the *IPO withdrawal rate* (the number of IPOs that are cancelled divided by the sum of completed and cancelled IPOs in the 12 months to pricing).[14] To control for offer and firm characteristics we include *offer size* (the log of real gross proceeds), *age* (the log of one plus years since founding), *size* (the log of one plus real sales in the prior 12 months), *leverage* (as defined previously), *internet* (a dummy equaling one if the issuer's business is internet-related), *CEO ownership* (the size of the CEO's equity stake pre-IPO), and *CEO sales* (a dummy equaling one if the CEO sells stock in the IPO).[15]

The probit MLE results are reported in Table 4. Instead of coefficients, we report the change in the probability for an infinitesimal change in each continuous variable and, by default, the discrete change in the probability for dummy variables. White heteroskedasticity-consistent standard errors are shown in italics. The pseudo R^2 for the five models range from 26% to 55%, indicating good overall fit.

Looking across the five columns, the most consistent determinant of issuers' choices of the various services is offer size. The greater are log proceeds, the more likely are U.K. IPOs to be underwritten, to allow for price stabilization, to be marketed to U.S. investors, to involve retail investors (after allowing for compulsory retail participation using dummies for the years 1991 through 1995), and to hire brokers whose analysts are ranked in the Extel Survey. The *t*-statistics are all in excess of eight. These findings are consistent with our conjectures.

The likelihood of underwriting is not significantly related to conditions in the stock market or the IPO market. Smaller firms (by sales, p=0.012) and those whose business is internet-related (p=0.032) are less likely to be underwritten. To the extent that these variables capture valuation uncertainty, which reasonably should increase the demand for underwriting, the results suggest that banks provide underwriting cover mostly to lower-risk issuers. As predicted, we find that issuers are more likely to demand underwriting cover when their CEOs sell stock in the IPO (p=0.020).

The likelihood of price support is unrelated to market returns but increases in more volatile

markets (p=0.060) and when more IPOs are withdrawn (p=0.024), which is precisely when we would expect it to be more valuable. It also increases in the number of recent IPOs (p=0.002). If demand curves for stocks slope downward, a larger supply of IPOs may increase the risk that the aftermarket price will fall below the offer price, making price stabilization more desirable to issuers and bookbuilding investors. The only valuation uncertainty proxy to be significant is log sales, which reduces the likelihood of price support (p=0.004). This is consistent with the conjecture that riskier (or at least smaller) companies have more to gain from insuring their investors against price falls.

The model of U.S. marketing has very good fit (with a pseudo R^2 of 52.6%), even though only three variables have significant coefficients: offer size (as already mentioned), the number of recent IPOs (p=0.083), and the IPO withdrawal rate (p=0.015). The result for offer size is consistent with the findings of Ljungqvist, Jenkinson, and Wilhelm (2003): it is only the largest companies that choose to approach U.S. investors. A larger supply of IPOs may increase competition for domestic investors' money, perhaps explaining why firms are then more likely to market their deals to U.S. investors. Why the IPO withdrawal rate should matter is less clear. Perhaps issuers seek to make up for lack of demand at home by targeting investors abroad.

Controlling for time variation and size dependence in regulations mandating retail participation in the early years, firms are more likely to market their offers to retail investors when more IPOs compete for the attention and capital of institutional investors (p=0.01) and when more IPOs are being withdrawn (p=0.018). These may correspond to times when demand is especially hot or cold, respectively. Retail participation is also more likely the more highly leveraged the company (p=0.087). Interpreting leverage as a proxy for valuation uncertainty, this is consistent with the argument in Ljungqvist and Wilhelm (2002). Retail participation is less likely when the CEO owns little equity (p=0.056) or does not sell stock in the IPO (p<0.001). While alternative interpretations are certainly possible, these results are consistent with the notion that CEOs interested in protecting their private benefits use retail participation to reduce the number of shares allocated to institutional

shareholders who might challenge their control after the IPO (Brennan and Franks (1997)).

Contrary to our expectation, firm-level uncertainty has no effect on the choice between ranked and unranked brokers. In fact, apart from offer size, the only significant determinants of this choice are stock market volatility and the CEO's pre-IPO equity stake, both of which have negative coefficients (p=0.032 and p=0.006, respectively). Even so, the explanatory power of the model is very high, given a pseudo-R^2 of 45.1%.

5.2 IPO Commissions

Armed with the hazards computed from the five auxiliary probits in the previous section, we now estimate the augmented commission equation (2'). Specifically, we regress commission rates on

- dummy variables for issues that are underwritten, have flagged the possibility of price support, are marketed in the U.S., are open to retail investors, or have hired a broker who is ranked in the Extel Survey. The estimated coefficients are measures of the average increase in commissions that is due to each service;[16]
- the corresponding hazards h_k;

as well as a set of controls, X_2, which includes the following variables:

- *Sponsor independence*. We allow for the possibility that banks specializing in corporate finance work rather than institutional brokerage charge different levels of fees by including our measure of sponsor independence. Higher fees would be expected if integrated securities houses enjoy synergies between broking and corporate finance, though specialization could confer a cost advantage on more independent sponsors. We interact the independence measure with a dummy equaling one if the sponsor also brokers the deal to control for fee differences when issuers hire two separate banks.[17]
- *Market conditions*. Marketing an IPO presumably requires greater effort in bearish or volatile markets or when many IPOs are being withdrawn. Periods of high initial returns may prompt

issuers to offer higher commissions so as to reduce underpricing in their own offering. Similarly, when IPO volume is particularly high, the bank's opportunity cost of effort may increase (Altinkilic and Hansen (2000)) also prompting issuers to offer higher commissions.

- *Offer size*. In the U.S., there is ample evidence of economies of scale in IPO spreads (Chen and Ritter (2000); Dunbar (2000); James (1992)), with smaller issues charged larger spreads.[18] Whether this will be the case for commissions in the U.K., however, is not clear: after all, issuers could cover the banks' fixed cost of managing an IPO via the flat fee. Nevertheless, we include log proceeds to allow for the possibility of economies of scale in commission rates.
- *Uncertainty* about the issuer's value should increase the effort required in marketing the deal, so we include log age, log sales, leverage, and the internet dummy variable.
- Finally, we allow for the possibility of substitution between contracting and *monitoring* in mitigating the agency conflict between issuer and bank. Monitoring intensity is unobservable, but Ljungqvist and Wilhelm (2003) argue that the CEO will expend less effort monitoring on behalf of other shareholders when his stake in the outcome is smaller. His stake in the outcome is, in turn, related to the fraction of pre-IPO equity he owns and to whether he sells stock in the IPO (since Habib and Ljungqvist (2001) show that owners are more tolerant of underpricing the fewer shares they sell at the time of the IPO, because the benefit of costly monitoring then is smaller).

Model (6) in Table 5 reports the results. Overall, the regression has good fit: the adjusted R^2 is 37.7%. Commission rates are not significantly related to whether an offer is open to retail investors or the broker's analysts are ranked in the Extel Survey. (The absence of a significant effect does not rule out that brokers with higher-ranked analysts charge more via the annual post-IPO retainer, though lack of data prevents us from investigating this possibility.) Underwriting cover increases commission rates by 88 basis points on average (p=0.091). This is the only IPO service for which the hazard is even marginally significant (p=0.06), indicating that self-selection generally causes relatively little bias in our data. Price support increases commission rates by 199 basis points (p=0.005), while marketing

to U.S. investors adds 141 basis points (p=0.061). Taken together, these estimates confirm Altinkilic and Hansen's (2000) conjecture that bank compensation increases at the margin in the cost of services provided. Moreover, we find no significant relation between commissions and log proceeds, suggesting that what fixed costs exist are most likely covered via the flat fee.

Relatively more independent sponsors charge higher commissions (p=0.02), consistent with a cost disadvantage. This effect does not depend on whether they also broker the deal. In the next section, we will investigate whether hiring a more independent sponsor leads to an offsetting benefit, in the form of reduced underpricing.

Consistent with our conjecture that marketing an IPO may require greater effort in bearish or volatile markets, we find commissions are higher following poor market returns (p=0.012) and when volatility is high (p=0.03). Conditions in the IPO market also behave as predicted. Commissions are higher, the higher the level of underpricing during the 180 days pre-pricing (p=0.077), consistent with issuers offering higher commissions following periods of high underpricing so as to reduce underpricing in their own offering. Commissions further increase, the more firms have recently withdrawn their IPOs (p=0.011), suggesting that an unfavorable climate for IPOs enables banks to charge more for their services. Finally, commissions are unrelated to the number of firms that went public in the prior 180 days. This contrasts with our conjecture that banks' opportunity cost of effort increases during high-volume periods, prompting issuers to offer higher commissions.

Commissions increase in valuation uncertainty given the negative coefficient estimated for log sales (p<0.001), though somewhat surprisingly we find a positive coefficient for log age (p=0.03). This appears to be driven by a high correlation between sales and age. Excluding log sales, the coefficient for log age is not statistically significant.

Finally, we find evidence consistent with contracting and monitoring being substitutes. Issuers pay 28 basis points lower commissions when the CEO sells stock in the IPO and so has a personal interest in monitoring the banks' pricing and selling effort (p=0.006).

Model (7) is an alternative specification of the commission regression that treats the five IPO services as exogenous. The fit in this specification is just as good, and all control variables have the same signs and virtually identical coefficients compared to model (6). The main difference concerns the effect of underwriting cover. Consistent with our finding in model (6) that underwriting cover is chosen endogenously, its coefficient ceases to be significant and switches sign when we treat it as exogenous. We also find that when treated as exogenous, the estimated cost of U.S. marketing declines but becomes more statistically significant (p=0.001) while retail participation significantly increases commissions (p=0.059) when previously it didn't.

5.3 Excess Commissions

If we take the regression models of commissions in Table 5 as the average pricing schedule, holding IPO services, market conditions and firm/offer characteristics constant, we can impute each issuer's chosen incentive payment, $\hat{u}_2$, as the difference between the actual commission agreed and the commission predicted by this model. Excess commissions $\hat{u}_2$ will be positive (negative) when issuers pay more (less) than their bundle of services, market conditions, and characteristics require on average. In this view, higher effort incentives correspond to paying a commission rate in excess of that predicted by the regressions in Table 5.

6. Commissions, Selling Effort, and Underpricing

Having generated an estimate of excess commissions, all that remains is to define the set of explanatory variables X_1 in the underpricing model and estimate equation (1'). If issuers design compensation contracts that induce investment banks to expend greater selling effort, we expect excess commissions to have a negative effect on underpricing, *ceteris paribus*. Furthermore, if issuers contract efficiently, we expect a negative one-to-one relation between excess commissions and log initial returns: if log initial returns are reduced by 1% when excess commissions are increased by 1%, the net benefit is zero and so issuers have provided optimal incentives on average.[19]

6.1 An Empirical Model of Underpricing

Most theories of IPO underpricing, including Baron's (1982) and Biais, Bossaerts, and Rochet's (2002) agency models, predict that initial returns are higher, the greater is the ex ante uncertainty about an issuer's value. We attempt to control for this using log age (Loughran and Ritter (2003); Ljungqvist and Wilhelm (2003)), leverage (James and Wier (1991); Habib and Ljungqvist (2001)), and the internet dummy (Loughran and Ritter; Ljungqvist and Wilhelm).[20]

As discussed earlier, Ljungqvist and Wilhelm (2003) argue that underpricing will be higher, the less of a stake the CEO has in expending monitoring effort to reduce it, so we expect an inverse relation between initial returns and CEOs' pre-IPO equity stakes. Habib and Ljungqvist (2001) argue that insiders are more tolerant of underpricing, the fewer shares they sell at the time of the IPO, so we expect a negative relation between initial returns and a dummy equaling one when the CEO sells stock in the IPO – especially in view of the substitution effect between CEO selling and commission rates documented in the previous section. Recall from footnote 15 above that a Durbin-Wu-Hausman test cannot reject the null that CEO selling is exogenous with respect to underpricing.

Our model includes the 180-day pre-pricing index return and daily return volatility, though there is controversy over whether conditions in the stock market impact initial returns. Loughran and Ritter (2002) find that initial returns increase in prior market returns in the U.S., suggesting that underwriters fail to fully incorporate public information in the offer price. Lowry and Schwert (2003), on the other hand, find that this effect is economically negligible (albeit statistically significant).

Conditions in the IPO market are likely to impact initial returns as follows. Lowry and Schwert (2002) show that underpricing is relatively persistent over time. We thus include lagged initial returns. Benveniste and Spindt (1989) argue that investment banks can reduce underpricing by 'bundling' deals over time. A higher deal flow enables them to cut off informed investors from future lucrative deals as punishment for misrepresenting their private information during bookbuilding. Higher deal flow should therefore lead to a lower marginal cost of acquiring information, i.e. less money

'being left on the table' in the form of underpricing. Thus we include recent IPO volume. Finally, Busaba, Benveniste, and Guo (2001) argue that underpricing is lower when the threat to withdraw an offering is greater, as this threat reduces informed investors' expected profit from understating their private information. This calls for including the IPO withdrawal rate.[21]

Since our market conditions variables are defined over trailing windows, we do not separately control for year effects. Including year dummies does not affect our results, except to increase the standard errors estimated for the market conditions variables.

We allow for the possibility that the reputation of the firm's broker, as measured by the ranking of its analysts, reduces underpricing. Carter and Manaster (1990) argue that a higher-ranked underwriter can better certify the quality of the issuing firm, leading investors to demand a smaller IPO discount. Alternatively, a higher-ranked broker may have access to a higher quality network of investors and so may be able to extract more information during bookbuilding (Benveniste and Spindt (1989)). Finally, a broker with more reputation capital at stake may be less likely to exploit the agency problem, or exploit it as much (Beatty and Ritter (1986)). Auxiliary tests indicate that we cannot treat the analyst ranking variable as exogenous[22] and so we model it explicitly. Following Benveniste et al. (2003), Loughran and Ritter (2003), and Ljungqvist and Wilhelm (2003), the analyst ranking equation uses as instruments log proceeds and a dummy for VC backed companies.[23] As we will show, our results are robust to using alternative instruments.

We saw in the previous section that relatively more independent sponsors charge higher commissions. We now investigate whether there is an offsetting benefit in the form of reduced underpricing. The U.K. distinction between sponsors and brokers allows issuers to hire a bank to advise them in their pricing negotiations with the broker (whose interests may be to leave more 'money on the table' to benefit buy-side investors). The more specialized or independent the sponsor, in the sense of relying more on corporate finance work than on brokerage business, the harder a bargain it may drive with the broker. This effect should be stronger when a relatively more

independent sponsor brokers the deal itself, as this removes a layer of agency. A Durbin-Wu-Hausman test cannot reject the null that sponsor independence is exogenous with respect to underpricing.[24]

One popular variable that we cannot include due to lack of data is the revision between the indicative and final offer prices. Hanley (1993) shows that initial returns are higher, the more the lead manager has revised the offer price upwards relative to the midpoint of the indicative price range filed prior to bookbuilding. This supports Benveniste and Spindt's (1989) prediction that underpricing will be greater for deals drawing strong interest from institutional investors during the bookbuilding effort. However, controlling for partial adjustment in the U.K. is complicated by the fact that it is unusual for issuers to file indicative price ranges (although potential investors are privately given valuation indications; see Ljungqvist and Wilhelm (2002) for further details).[25]

Controlling for these factors, we expect excess commissions to be negatively related to initial returns, and if contracts are efficient, we expect a negative one-to-one relation. This is the central test of the role of contracting in overcoming the agency problem between issuers and underwriters.

6.2 Identification

Our empirical model consists of three equations: one for initial returns, one for commissions, and one for broker ranking (which the Durbin-Wu-Hausman test suggested cannot be treated as exogenous). A necessary condition for this system to be identified, and so for consistency, is the order condition. This requires that each equation exclude at least two variables from among all exogenous and endogenous variables in the system. This is satisfied here: the initial return and commission equations are overidentified while the analyst ranking equation is exactly identified. The order condition is only necessary for identification. The rank condition, which ensures that no equation can be obtained as a linear combination of the other equations, is both necessary and sufficient. It can easily be shown that this too holds in our model.

Thus the system is identified and consistent estimates can be obtained using two-step methods. We still require that our instruments be both valid and strong. Instrument validity requires that the

reduced-form regressions of commissions and broker ranking include (at least) two variables each that correlate, respectively, with commissions and analyst ranking but not with initial returns. Even when this is the case, instruments that are 'weak' will not be effective in correcting endogeneity bias. To be considered strong, the instruments should be jointly significant in their first-step equations with *F*-tests in excess of 10 (Staiger and Stock (1997)).

Our instruments are both valid and strong. The commission equation shown as model (6) in Table 5 includes twelve instruments (the five IPO services and corresponding hazards, log proceeds, and log sales). These are valid (their correlation with initial returns is not significant) and strong (with an *F*-statistic of 35.9 in the first step). The simpler commission model (7), which treats the IPO services as exogenous, has five fewer instruments, but again these are valid and strong.

The broker ranking equation includes two instruments (log proceeds and a dummy for VC backed companies). The *F*-statistic from the first step is 181.8, so these are certainly strong instruments. A Hansen J test cannot reject the validity of the instrument set (p=0.147), meaning they don't correlate with initial returns. The reduced-form (first-stage) results are shown as model (8) in Table 6. Larger issuers and those that are VC backed choose higher-ranked brokers, as do more highly leveraged firms. The adjusted R^2 is 36.4%.

6.3 Results

Table 6 presents the results of estimating equation (1') using as covariates the variables discussed in Section 6.1. We report three models of initial returns. Model (9) uses excess commissions instrumented from model (6) in Table 5 and broker rankings instrumented from model (8) in Table 6. To show that our results are not driven by the structure we have imposed on the estimation, model (10) is instrumented from the simpler commission specification shown as model (7) in Table 5, which treats the five IPO services as exogenous with respect to fees. Model (11) re-estimates model (9) except that the first-stage broker rank equation is identified using alternative instruments. Since all these models include generated regressors (excess commissions and the instrumented broker

rankings), we correct the covariance matrices following Murphy and Topel (1985).

The overall fit of model (8) is good, in view of the adjusted R^2 of 16.9%. As conjectured, firms subject to lower valuation uncertainty experience less underpricing: log initial returns decrease in log age (p=0.002) and gearing (p=0.001) while internet companies are more underpriced (p=0.001). Monitoring incentives behave as predicted: initial returns are lower, the greater the CEO's equity stake (p=0.117) and when the CEO sells stock in the IPO (p=0.063). These results, though noisy, mirror the findings of Ljungqvist and Wilhelm (2003) for the U.S.

We find no evidence that offer prices fail to incorporate recent market returns (or volatility). Conditions in the IPO market, on the other hand, do influence underpricing. Consistent with findings in the literature, initial returns increase in lagged market-wide underpricing (p=0.003) and the rate of IPO withdrawals (p=0.10), and decrease in IPO volume (p<0.001).

As conjectured, underpricing decreases in the reputation of the issuer's broker (p<0.001): replacing an unranked broker with a broker of average rank (a move from 0 to 2.2) reduces log initial returns from the average of 0.164 to 0.122, holding all other covariates at their sample means.

Initial returns are also lower, the more independent the sponsor (p=0.063), especially if the sponsor brokers the deal itself (p=0.011). A one standard deviation increase in our sponsor independence measure (from 0.616 to 0.872) reduces log initial returns by two percentage points if the sponsor doesn't broker the IPO and by five percentage points if it does. This more than offsets the higher level of commissions independent sponsors were found to charge in Section 5.

Controlling for these effects, we find that excess commissions are significantly and inversely related to initial returns (p=0.009): a one percentage point increase in excess commissions (a little under one standard deviation) reduces log initial returns from 0.164 to 0.137, ceteris paribus. This provides strong evidence for the view that issuers can mitigate agency problems by offering banks higher commission rates.

Are contracts efficient? While the point estimate of –0.027 for the effect of excess

commissions on log initial returns is large in absolute magnitude, it is only marginally statistically significantly different from the negative one-to-one relation we expect under efficient incentives (p=0.099). Thus, we cannot reliably reject the hypothesis that the intensity of incentives is optimal.

6.4 Alternative Instruments

Are these results driven by our choice of instruments? When we re-estimate the initial return model using the simpler specification of commissions shown as model (7) in Table 5, our results, reported as model (10) in Table 6, are remarkably similar. We continue to find that initial returns are lower, the larger are excess commissions (p=0.007), and the magnitude of the effect is unaffected. Thus, even though Table 5 provides evidence that the effect of underwriting cover on commissions would be underestimated if treated as exogenous, this makes next to no difference to our main findings in practice.

In models (9) and (10) shown in Table 6, brokers' analyst rankings are instrumented using log proceeds and VC backing. We obtain qualitatively similar results with alternative instruments. For instance, we might conjecture that out of reputational concerns, brokers with more highly ranked analysts will pass on penny-stock IPOs and offerings by firms with low profitability. These two variables are again valid instruments (the p-value for the Hansen J test is 0.315, so the variables do not correlate with initial returns) and strong (the first-step F-statistic of 37.9 easily exceeds 10). The second-stage results for initial returns are shown as model (11) in Table 6. Instrumented this way, broker rankings continue to be negatively related to initial returns (p<0.001), while paying excess commissions still reduces underpricing (p=0.007). Again, the magnitude of the effect is unaffected.

6.5 Robustness

Every asymmetric-information model of underpricing predicts a positive relation between initial returns and valuation uncertainty. In unreported regressions, we have experimented with alternative proxies, such as book value of assets, asset tangibility, asset mix (current versus fixed), and pre-IPO cash flow profiles (in logs and whether the issuer was cash flow-positive or not). None of these

add anything at the margin to the variables used in Table 6. Our results are also robust to alternative measures of debt (using book-value leverage or the log of outstanding debt).

Our market conditions variables are constructed without conditioning on industry affiliation due to the relatively small number of offerings in each industry. This is in contrast to Benveniste et al. (2003), who investigate the effect of information spillovers from the IPO and stock markets, defined at the Fama-French (1997) industry level, on the pricing of IPOs in U.S. If we follow their approach, the coefficients estimated for the market conditions variables become considerably noisier, while our other results remain unaffected (not shown).

To control for analyst quality, we have used each broker's Extel ranking. As Table 3 shows, 64.6% of sample firms use a broker not ranked in the Extel Survey. Our results are robust to using a dummy equaling one when the broker is ranked, and zero otherwise. Alternatively, we could follow Megginson and Weiss (1991) who measure underwriter quality using trailing market shares. This also does not change our results. Moreover, if we include both the Extel ranking and the Megginson-Weiss market share measure in the underpricing models, it is only the Extel ranking that is significant.

Unlike some work on U.S. IPOs, we have not imposed a minimum size filter on the data. To investigate the possibility that our results are driven by the smaller deals, we have re-estimated the system in sub-samples that exclude deals below £1 million (6.8% of deals), £2 million (14.9% of deals), or £3 million (22.7% of deals), in real terms. In each sub-sample, we continue to find that paying higher commissions reduces initial returns, with coefficients ranging from –0.015 to –0.03.

We have conducted our analysis within the agency framework of Baron (1982) and Biais, Bossaerts, and Rochet (2002) while allowing for the information-acquisition role modeled by Benveniste and Spindt (1989) and controlling for the main economic determinants suggested by prior theory and empirical evidence. However, it is worth commenting on factors we have not included.

Tinic (1988) argues that the fear of shareholder lawsuits may prompt issuers to deliberately underprice IPOs. Lowry and Shu (2002) find evidence in favor of this hypothesis in a sample of

U.S. IPOs. However, Jenkinson (1990) argues that due to differences in laws and regulations, there is no legal liability motive for underpricing in the U.K.

Brennan and Franks (1997) view underpricing as a means to entrench managers' private benefits of control. Underpricing leads to greater rationing and so, assuming pro-rata rationing rules, to fewer large shareholders who might hold the manager to account. However, during our sample period, there were very few IPOs with pro-rata allocation rules. Instead, issuers could freely choose their desired ownership structure directly, via discretionary allocations after building the book. Alternatively, using U.S. data, Smart and Zutter (2003) show that companies with dual-class shares are underpriced less than single-class issuers, perhaps because a dual-class structure effectively protects managers' private benefits and so makes underpricing redundant. However, the London Stock Exchange discourages issuers from adopting dual-class structures.

Loughran and Ritter's (2002) prospect theory of underpricing is premised on an agency conflict between issuers and underwriters, which is also the key assumption in the Baron (1982) and Biais et al. (2002) models tested here. It is harder to test whether, as Loughran and Ritter predict, issuers are content to do nothing about this conflict whenever the 'bad news' of high underpricing is accompanied by the 'good news' that they are wealthier than they had expected. If we had a measure of issuers' contentedness, we could test if it affects the level of excess commissions.

7. Conclusion

Using IPO contracts from the U.K., this paper has provided evidence that issuing firms' contractual choices affect the pricing behavior of their IPO underwriters. Specifically, we have shown that when issuers pay banks abnormally high commissions, initial returns are substantially reduced. While this implies the existence of an agency problem between issuers and banks as hypothesized by Baron (1982), it also implies that contract design can mitigate the agency problem, at a cost. Moreover, we cannot reliably reject the hypothesis that the intensity of incentives is optimal, and so that contracts are efficient.

Our results may help explain why in the U.S., seasoned issuers prefer to negotiate compensation after selecting their banks, even though competitive bidding is associated with lower fees (Bhagat and Frost (1986)). Minimizing fees without regard to the incentives this provides to the bank may simply not be optimal. Our results suggest that part of the fee difference may represent payment for (better) performance.

We have also shown that banks specializing in corporate finance advice are associated with less underpriced IPOs compared to integrated securities houses or banks specializing in institutional brokerage. This suggests that the integration of corporate finance and broking under the same roof, common in the U.S. marketplace, can lead to agency conflicts that upset the delicate balancing of issuers' and investors' interests.

Finally, our results contribute indirectly to the debate on underwriter compensation in the U.S. The typical U.S. gross spread of 7% is substantially greater than the average commission of 2.08% or the total spread of 4.57% in our U.K. sample. Different interpretations are possible. Perhaps 7% is the optimal incentive in the U.S., given market conditions and issuer characteristics (Yeoman (2001)). Or perhaps U.S. banks are over-paid relative to the optimum: spreads may be so high that the marginal cost exceeds the marginal benefit of inducing greater selling effort. Chen and Ritter (2000) suggest that lack of competition among U.S. underwriters could be responsible for keeping spreads above competitive levels. In contrast, Hansen (2001) argues there is little evidence of collusion or lack of competition, and that underwriters compete on the (unobservable) quality of their services. Our results suggest such a quality-fee trade-off in the U.K. Whether U.S. issuers would be worse off if they reduced underwriter compensation remains an open question.

But what may be more remarkable than the difference in the level of underwriter compensation is the apparent high degree of homogenization of not just spreads but underwriting contracts in general in the U.S. compared to the U.K. Behavior in the U.K. suggests that a one-size-fits-all contract finds little favor with issuers.

Endnotes

[1] NASD Regulation, Inc. news release dated January 22, 2002.

[2] Penny stock offerings in the U.S. sometimes grant underwriters additional compensation in the form of warrants whose exercise price depends on the offer price. Dunbar (1995) shows that underpricing is reduced when warrants are used, consistent with the hypothesis that issuers choose compensation contracts that minimize the costs of going public.

[3] In a previous draft, we reported estimation results in both levels and logs. Both give rise to the same conclusions. The levels results are available on request.

[4] When the sponsor and broker are different banks, they split the fee and commission in some (often undisclosed) fashion.

[5] In addition to the flat fee, the sponsor and broker are reimbursed for reasonable 'out-of-pocket expenses', which we ignore. Note that the flat fee does not include the annual retainers that the sponsor and broker are due to be paid after the IPO.

[6] In the case of multiple sponsors or brokers working on a deal, each is credited with the corresponding fraction of the deal.

[7] In our empirical models, we obtain qualitatively similar (albeit somewhat noisier) results if we measure independence using the sum of IPO proceeds rather than the number of IPOs.

[8] A typical disclosure reads: 'In connection with the global offer, Bank XYZ may over-allocate or effect other transactions intended to enable it to satisfy any over-allocations or which stabilize, maintain, or otherwise affect the market price of the shares […] at levels which might not otherwise prevail in the open market.'

[9] Note that such disclosure does not imply that after-market prices will, in fact, be stabilized. Actual stabilization has to be notified to Stock Exchange member firms when it is carried out.

[10] A typical disclosure reads: 'This offer is not and does not constitute an offer to the public within the

meaning of Schedule 11A to the Financial Services Act 1986. The offer is only open to persons whose ordinary activities involve them in acquiring, holding, managing or disposing of investments (as principal or agent) for the purposes of their businesses or otherwise in circumstances which will not result in an offer to the public in the United Kingdom within the meaning of the Public Offers of Securities Regulations 1995 (as amended) or the Financial Services Act 1986.'

[11] I am grateful to Bill Greene for many helpful discussions and suggestions.

[12] This is similar to estimating 'surprise' inflation or 'unexpected' money demand growth in macro models.

[13] Alternatively, we can use traditional 2SLS with linear first-stage regressions (rather than probits). Both procedures give consistent estimates, asymptotically. In our sample, the results are virtually identical in both procedures.

[14] All market conditions variables in the paper are computed over the 180-day period leading up to the pricing day. Our results are not materially affected using shorter windows up to 90 days or longer windows up to 365 days.

[15] CEO selling is potentially endogenous. Here, and in the context of the commission and initial returns models discussed later, we will treat it as exogenous. Formal Durbin-Wu-Hausman endogeneity tests (Davidson and MacKinnon (1993), pp. 237f), using as instruments a dummy equaling one if the company is cash flow negative and a dummy for VC backed companies, fail to reject the null of exogeneity in all three cases. This suggests that CEO selling decisions are made well before the details of the IPO are agreed.

[16] Each service might also increase the flat fee, but given its lack of incentive properties the flat fee is not the focus of this study.

[17] Sponsor independence is potentially endogenous. However, a Durbin-Wu-Hausman test cannot reject the null that it is exogenous with respect to commissions (p=0.36), using a dummy for VC backed companies for identification.

[18] Altinkilic and Hansen (2000) take issue with this view in the context of underwritten seasoned equity and bond issues, pointing out that the additional services required to sell larger issues in fact increase underwriter compensation at the margin. Since we control for the additional services directly, their criticism has less force in our model.

[19] Given the log specification, and assuming that the first-day trading price remains unaffected, reducing log initial returns by 1% is equivalent to increasing the offer price by $e^{0.01}$–1, or about 1%.

[20] Another popular proxy for uncertainty is offer size. This is a curious proxy, for it is clearly endogenous to the offer price. Habib and Ljungqvist (1998) prove that as a matter of identities, underpricing is strictly decreasing in offer size *even when holding uncertainty constant*. Moreover, it is not significantly related to initial returns in our data (p=0.225). We thus refrain from including it.

[21] Our approach of including the withdrawal rate as a regressor is equivalent to a simple Heckman (1979) correction that conditions on time only. Modeling the effect of withdrawals using a formal Heckman sample selection model leaves our results qualitatively unchanged.

[22] The Durbin-Wu-Hausman test statistic is $F_{1,993}$ = 13.8 (p<0.001), so we reject the null that analyst ranking is exogenous with respect to initial returns. Identification is discussed in Section 6.2.

[23] Benveniste et al. (2003) motivate these instruments economically as follows: ‘By virtue of being repeat players in the IPO market, venture capitalists can develop long-term relationships with top-tier underwriters and thereby increase the chances that such underwriters will lead-manage a given IPO. This argument is consistent with Megginson and Weiss’s (1991) finding that VC-backed IPOs are underwritten by more prestigious investment banks.’ The use of log proceeds is motivated by Ritter and Welch (2002) as follows: ‘The choice of underwriter is typically determined by the issue’s size

and industry on one hand and the underwriter's prestige and experience on the other.' Adding industry dummies does not affect our results.

[24] The DWH test statistic is $F_{1,946} = 0.58$ (p=0.448), using as instruments a set of industry dummy variables which aggregate four-digit SIC codes into the 48 industry groupings studied by Fama and French (1997). These are jointly significant at the 10% level in the auxiliary but not the underpricing regression, and a Hansen J test cannot reject instrument validity (p=0.150).

[25] We have indicative price ranges for 304 of the 1,064 firms. One way to use this data is to include in the model a variable that equals the price revision when available, and zero otherwise. This is clearly a noisy measure of price revisions. Consistent with Hanley's finding, the coefficient estimate (not reported) is positive (p=0.001). Its inclusion does not, however, materially change the coefficients estimated for the other regressors. Similar (albeit much noisier) results are obtained if we restrict the estimation to the sub-sample of 304 firms.

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Table 1. Descriptive sample statistics

The sample consists of the 1,064 (out of 1,108) IPOs on the London Stock Exchange for which IPO contracts are available. Gross proceeds equal the offer price times the number of shares sold, including shares sold under an over-allotment option where exercised. Foreign currencies are converted into pound sterling (£) using exchange rates on the pricing day. £1 was worth roughly $2 prior to summer 1992 and $1.50 thereafter. All currency amounts are expressed in December 2001 purchasing power terms, using the Retail Price Index (excluding mortgage interest) deflator. Listings on the junior market are on the Unlisted Securities Market (USM) from 1991 to 1995, or on the Alternative Investment Market (AIM) from June 1995. Age at IPO is the IPO year minus the year operations commenced, as identified in the prospectus. Internet-related companies are identified based on a reading of the business description section of each prospectus. Indebtedness includes secured and unsecured loans, bank overdrafts, leasing commitments, and loan guarantees. It is prominently disclosed in U.K. prospectuses, and reflects indebtedness at the time of the IPO rather than at the date of the last audited accounts. Leverage is defined as debt over debt plus the market value of equity (using the first-day trading price). Sales are consolidated revenues in the most recent twelve-month accounting period before the IPO, as reported in the prospectus. CEO ownership is the fraction of the company's cash flow rights the CEO holds immediately prior to the IPO. CEO sales measure the frequency with which CEOs sell stock in the IPO. The initial return is defined as the first-day closing price divided by the offer price, minus one. First-day closing prices are from Datastream, with all initial returns in excess of 30% cross-checked using Reuters. We lack after-market prices for ten IPOs.

	Number of IPOs		Gross proceeds (£m, real)			Age at IPO			Indebtedness		Sales (£m, real)		CEO		Initial return (%)	
	total	w/ under-writing contract	mean	median	% listed on junior market	mean	median	% internet-related	mean (£m, real)	lever-age (%)	mean	median	pre-IPO equity stake, % mean	sales in IPO, fraction in %	mean	st.dev.
all years	1,108	1,064	46.4	8.9	51.9	19.9	7	13.7	35.8	12.6	66.7	6.0	29.2	34.3	29.1	118.5
1991	12	6	27.2	18.4	33.3	97.2	92	0.0	57.1	23.4	58.3	36.9	33.9	33.3	12.9	22.3
1992	25	16	119.9	38.6	18.8	31.4	11.5	0.0	94.7	15.2	161.4	66.1	23.7	43.8	6.9	14.4
1993	78	74	59.6	24.6	6.8	27.5	14.5	0.0	59.4	14.1	124.1	27.9	25.6	48.6	13.4	22.4
1994	120	117	54.9	19.4	7.7	33.6	12	0.9	56.7	17.9	68.0	25.1	23.9	50.4	7.2	10.5
1995	65	64	38.3	10.4	23.4	24.6	8	0.0	20.3	16.1	49.6	20.0	26.3	45.3	16.1	17.5
1996	163	160	33.3	6.6	57.5	21.7	9	3.1	28.8	13.7	71.8	6.9	33.0	35.0	13.5	16.1
1997	128	124	43.2	7.2	53.2	27.1	11	1.6	32.4	11.8	85.9	7.6	34.6	40.3	12.2	12.7
1998	72	71	53.4	7.8	50.7	19.0	8	2.8	15.9	13.0	87.4	9.2	31.6	33.8	18.6	34.8
1999	75	73	45.8	4.2	68.5	11.1	5	34.2	56.4	12.6	64.0	2.9	32.2	27.4	88.7	163.4
2000	227	223	40.6	9.3	71.3	5.6	3	44.8	13.4	6.3	15.8	0.4	28.2	27.8	64.8	232.0
2001	80	76	52.2	3.0	90.8	14.0	5	13.2	20.8	12.6	55.7	1.4	28.8	15.8	15.2	27.4
2002	63	60	52.0	4.2	76.7	19.3	5.5	1.7	90.3	16.4	114.8	2.6	24.7	13.3	14.2	24.9

Table 2. U.K. IPO compensation

Bank compensation in U.K. IPOs usually consists of a flat fee and a commission paid on each share sold. Commissions are calculated as a percent of the offer price. Both the flat fee and the commission rate are agreed before the offer is priced. The flat fee is expressed in December 2001 purchasing power terms. The total spread equals the bank's total compensation from the flat fee and commissions, divided by the gross proceeds of the offer. We know the commission rate for 1,013 of the 1,064 contracts. The size of the flat fee element is disclosed in 848 contracts. £1 was worth roughly $2 prior to summer 1992 and $1.50 thereafter.

	Commission (%)			Flat fee (£'000s, real)			Total spread (flat fee/proceeds + commission) (%)		
	mean	st.dev.	median	mean	st.dev.	median	mean	st.dev.	median
all years	2.08	1.48	2.00	138.4	191.0	91.1	4.57	3.75	3.92
1991	1.41	0.88	1.37	143.7	237.0	69.6	3.43	1.98	2.97
1992	1.63	1.43	1.25	136.2	110.7	151.0	3.21	1.79	2.43
1993	1.34	0.96	1.19	174.1	161.5	144.7	2.54	1.74	2.11
1994	1.18	0.88	0.83	183.0	178.1	151.4	2.65	1.64	2.28
1995	1.49	1.25	1.00	151.1	213.3	116.0	3.73	2.16	3.78
1996	1.78	1.33	1.50	140.9	221.0	76.2	3.93	2.67	3.65
1997	1.82	1.24	1.75	117.4	183.3	55.7	3.89	2.34	3.56
1998	2.01	1.42	1.83	147.5	190.7	88.9	4.46	2.33	4.00
1999	2.43	1.37	2.58	69.5	90.0	36.4	4.97	3.95	4.00
2000	2.78	1.63	3.00	145.5	227.0	82.9	4.86	2.37	4.28
2001	2.70	1.50	3.00	120.4	137.4	101.2	7.76	6.82	5.75
2002	3.31	1.50	3.00	127.5	134.8	113.3	7.60	6.85	5.98

Table 3. IPO services and analyst quality in the U.K.

We focus on four services that U.K. issuers can purchase from their investment bankers: underwriting, after-market price stabilization, marketing of the IPO to U.S. investors, and retail participation. The first four columns show the fraction of IPOs in the sample that include these four services. In addition to these services, we control for the quality of the post-IPO analyst coverage provided by the issuer's broker. To measure the quality of analyst coverage, we use the IPO broker's percent of weighted votes cast in the annual Extel Survey of Investment Analysts. This ranges from 0.18% (Credit Agricole Indosuez Cheuvreux in 2000) to 18.14% (Merrill Lynch in 1998). See text for further details. Unranked brokers are those not ranked in the Extel survey.

	Fraction …				Broker's analyst ranking		
	under-written	flagging possibility of price support	marketed in the U.S.	w/ retail partici-pation	Mean (% of weighted votes in Extel Surveys)	Fraction w/ unranked broker	Proceeds-weighted fraction w/ unranked broker
all years	65.3	8.3	10.0	23.4	2.13	64.6	13.9
1991	50.0	0.0	0.0	50.0	1.77	83.3	80.2
1992	87.5	12.5	12.5	56.3	5.75	50.0	40.0
1993	93.2	2.7	5.4	55.4	5.29	33.8	9.8
1994	93.2	3.4	8.5	35.0	3.69	47.0	13.7
1995	71.9	4.7	9.4	28.1	2.87	59.4	10.6
1996	64.4	3.8	5.6	13.8	1.84	64.4	12.6
1997	58.9	6.5	4.8	12.1	1.83	66.9	10.0
1998	66.2	8.5	12.7	12.7	2.17	63.4	8.1
1999	53.4	15.1	17.8	17.8	1.27	74.0	9.1
2000	58.3	14.5	15.7	21.7	1.26	69.1	17.8
2001	46.1	6.6	5.3	18.4	0.56	88.2	8.2
2002	45.0	15.0	13.3	25.0	1.17	83.3	19.8

Table 4. Choice of IPO services

The table reports probit models of issuers' choices of the investment banking services presented in Table 3. The probits correspond to estimates of equation (3) in Section 4. Market returns are estimated using the Financial Times Stock Exchange (FTSE) All Share index excluding investment trusts. The mean initial return in the 180 days before pricing is computed over all IPOs completed during that period. The IPO withdrawal rate is the number of withdrawn IPOs over the sum of withdrawn and completed IPOs in the previous 365 days. All other variables are as defined in Tables 1 and 3. The model of retail participation in column (4) includes year dummies for 1991 through 1995 to proxy for the regulatory changes concerning mandatory participation of retail investors. To aid the economic interpretation of the results, the table shows the change in the probability for an infinitesimal change in each independent, continuous variable and, by default, the discrete change in the probability for dummy variables, rather than the probit coefficients. White heteroskedasticity-consistent standard errors are shown in italics. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively. The number of observations is 1,009 (we lack after-market prices for four of the 1,013 IPOs for which IPO contracts are available).

	Dependent variable: Dummy = 1 if …				
	under-written	flagging possibility of price support	marketed in the U.S.	retail partici-pation	broker is ranked in Extel Survey
	(1)	(2)	(3)	(4)	(5)
Market conditions					
Market return, 180 days before pricing	–0.146	0.014	–0.030	–0.224	0.389
	0.224	*0.022*	*0.045*	*0.198*	*0.290*
St.dev. of daily market return, 180 days before pricing	–0.949	0.162*	–0.022	–0.652	–1.989**
	0.729	*0.099*	*0.131*	*0.793*	*0.923*
Mean initial return, 180 days before pricing	0.008	–0.001	0.006	0.052	0.032
	0.042	*0.004*	*0.007*	*0.040*	*0.053*
Number of IPOs, 180 days before pricing	–0.015	0.018***	0.019*	0.154***	0.062
	0.059	*0.009*	*0.011*	*0.059*	*0.073*
IPO withdrawal rate, year to pricing	–0.213	0.069**	0.177***	0.800**	–0.061
	0.284	*0.042*	*0.061*	*0.339*	*0.328*
Firm and offer characteristics					
ln(1+real gross proceeds in £m)	0.157***	0.021***	0.038***	0.113***	0.293***
	0.017	*0.008*	*0.009*	*0.013*	*0.024*
ln(1+age)	0.021	0.000	–0.348	0.009	0.027
	0.016	*0.002*	*0.003*	*0.014*	*0.019*
ln(1+real sales in £m)	0.043**	–0.004***	–0.003	0.009	0.026
	0.017	*0.002*	*0.003*	*0.012*	*0.018*
Leverage	–0.042	0.011	0.010	0.157*	–0.048
	0.114	*0.011*	*0.021*	*0.092*	*0.137*
Dummy =1 if internet-related	–0.116**	–0.002	0.014	0.055	–0.058
	0.057	*0.004*	*0.014*	*0.052*	*0.061*
CEO equity stake pre-IPO (in %)	–0.001	0.000	0.000	–0.0011*	–0.002***
	0.001	*0.000*	*0.000*	*0.0006*	*0.0008*
Dummy =1 if CEO sells stock in the IPO	0.084**	0.001	–0.004	–0.120***	0.041
	0.035	*0.003*	*0.006*	*0.026*	*0.043*
Pseudo R^2	26.0 %	55.2 %	52.6 %	27.4 %	45.1 %
Wald test: all coefficients jointly zero (χ^2)	276.5***	150.2***	171.0***	224.0***	241.1***

Table 5. Bank compensation regression

We estimate the determinants of the commission rate (in percent) taking into account the endogeneity of issuers' choices of the IPO services modeled in Table 4. This corresponds to estimating equation (2') in Section 4. Specifically, we compute the hazard of issuers choosing each of the five IPO services using the estimates in Table 4 and include them alongside binary variables for underwriting, price support, U.S. marketing, retail participation, and hiring an Extel-ranked broker in a least-squares regression with commission rates as the dependent variable; see model (6). For comparison, model (7) treats the five IPO services as exogenous. Sponsor independence is measured as the ratio of the number of deals a bank has sponsored over the sample period to the sum of the number of deals it has sponsored and the number of deals it has brokered. This ratio varies between zero and one, with one corresponding to a sponsor that never brokers IPO deals. All other variables are defined as in Table 4. White heteroskedasticity-consistent standard errors are shown in italics. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively. The number of observations is 1,009 (we lack after-market prices for four of the 1,013 IPOs for which IPO contracts are available).

Dependent variable:	Commissions (%)	
	(6)	(7)
IPO services		
Dummy=1 if underwritten	0.876*	–0.079
	0.518	*0.098*
Dummy=1 if flagging possibility of price support	1.993***	2.220***
	0.711	*0.220*
Dummy=1 if marketed in the U.S.	1.408*	0.619***
	0.751	*0.191*
Dummy=1 if retail participation	–0.205	0.212*
	0.313	*0.112*
Dummy=1 if broker is ranked in Extel Analyst Survey	–0.212	–0.087
	0.410	*0.098*
Heckman correction (hazards from Table 4 probits)		
Underwriting	–0.573*	
	0.305	
Price support	0.077	
	0.389	
U.S. marketing	–0.445	
	0.389	
Retail participation	0.270	
	0.206	
Broker ranking	0.085	
	0.251	
IPO advisers		
Sponsor independence	0.458**	0.444**
	0.196	*0.197*
Sponsor independence × (sponsor = broker)	–0.012	0.035
	0.228	*0.218*

Table 5 (continued)

	(6)	(7)
Market conditions		
Market return, 180 days before pricing (in %)	–0.015**	–0.016***
	0.006	*0.005*
St.dev. of daily market return, 180 days before pricing (in %)	0.045**	0.036**
	0.021	*0.018*
Mean initial return, 180 days before pricing (in %)	0.0021*	0.0024**
	0.0012	*0.0012*
Number of IPOs, 180 days before pricing	0.002	0.002
	0.002	*0.002*
IPO withdrawal rate, year to pricing (in %)	0.019**	0.020***
	0.007	*0.007*
Firm and offer characteristics		
ln(1+real gross proceeds in £m)	–0.069	0.044
	0.136	*0.049*
ln(1+age)	0.082**	0.094**
	0.038	*0.037*
ln(1+real sales in £m)	–0.259***	–0.252***
	0.040	*0.039*
Leverage	–0.127	–0.170
	0.259	*0.257*
Dummy=1 if internet-related	–0.028	–0.119
	0.165	*0.155*
Monitoring incentives		
CEO equity stake pre-IPO (in %)	0.001	0.001
	0.002	*0.002*
Dummy=1 if CEO sells stock in the IPO	–0.283***	–0.160**
	0.102	*0.073*
Constant	0.760*	0.960***
	0.390	*0.298*
Adjusted R^2	37.7 %	37.6 %
F-test: all coefficients jointly zero	39.5***	43.1***

Table 6. Initial return regressions

We estimate the effect of 'excess commissions' on initial returns using least squares (see equation (1') in Section 4). Excess commissions, computed as the residuals from the commission models in Table 5, are expected to have a negative effect on initial returns. If contracts are efficient, we expect a negative one-to-one relation between excess commissions and log initial returns. A Durbin-Wu-Hausman test indicates that broker ranking is endogenous with respect to initial returns ($p<0.001$), so we instrument it using log proceeds and a dummy equaling one for VC-backed companies as instruments. A Hansen J test cannot reject the validity of our instruments ($p=0.147$), that is, we cannot reject that initial returns are unrelated to log proceeds and venture backing. The F-statistic for the test of excluded instruments in the first-stage regression is 181.8, confirming that these are strong instruments, as required (see Staiger and Stock (1997)). The reduced-form (first-stage) results for broker ranking are shown as model (8). We report three models of initial returns. Model (9) uses excess commissions instrumented from model (6) of Table 5, while model (10) uses the alternative specification that treats IPO services as exogenous, shown as model (7) in Table 5. The results are virtually identical. Model (11) re-estimates model (9) except that the first-stage broker rank equation is identified using a dummy for penny stocks and earnings per share. These instruments are again valid ($p=0.315$) and strong ($p<0.001$). The first-stage results are not shown to conserve space. Throughout, intercepts are not shown. Since the initial return regressions include generated regressors, we correct the covariance matrices following Murphy and Topel (1985). Standard errors are shown in italics. We denote significance at the 1%, 5%, and 10% level by ***, **, and *, respectively. The number of observations is 1,009 (we lack after-market prices for four of the 1,013 IPOs for which IPO contracts are available).

Table 6 (continued)

Dependent variable:	broker's Extel ranking	log initial return	log initial return	log initial return
	(8)	(9)	(10)	(11)
Firm characteristics				
ln(1+age)	0.051	–0.023***	–0.023***	–0.022***
	0.098	*0.007*	*0.007*	*0.007*
Leverage	1.662**	–0.186***	–0.186***	–0.183***
	0.739	*0.056*	*0.056*	*0.056*
Dummy=1 if internet-related	0.350	0.168***	0.168***	0.169***
	0.365	*0.052*	*0.052*	*0.052*
Monitoring incentives				
CEO equity stake pre-IPO (in %)	–0.006	–0.0006	–0.0006	–0.0006*
	0.004	*0.0004*	*0.0004*	*0.0004*
Dummy=1 if CEO sells stock in the IPO	–0.142	–0.026*	–0.026*	–0.025*
	0.245	*0.014*	*0.014*	*0.014*
Market conditions				
Market return, 180 days before pricing (in %)	0.026*	0.0015	0.0015	0.0016
	0.015	*0.0011*	*0.0011*	*0.0011*
St.dev. of daily market return 180 days before pricing (in %)	–0.031	–0.002	–0.002	–0.002
	0.052	*0.003*	*0.003*	*0.004*
Mean initial return, 180 days before pricing (in %)	–0.008***	0.001***	0.001***	0.001***
	0.003	*0.0004*	*0.0004*	*0.0004*
Number of IPOs, 180 days before pricing	–0.010**	–0.002***	–0.002***	–0.002***
	0.004	*0.0005*	*0.0005*	*0.0005*
IPO withdrawal rate, year to pricing (in %)	–0.022	–0.0023*	–0.0023*	–0.0024*
	0.020	*0.0013*	*0.0013*	*0.0014*
IPO advisers				
Broker's Extel ranking		–0.019***	–0.019***	–0.020***
		0.004	*0.004*	*0.004*
Sponsor independence	0.567	–0.078*	–0.078*	–0.078**
	0.531	*0.042*	*0.042*	*0.042*
Sponsor independence × (sponsor = broker)	–0.388	–0.119**	–0.119**	–0.118**
	0.573	*0.047*	*0.047*	*0.047*
Pay-for-performance incentives				
Excess commission rate (in %)		–0.027***	–0.028***	–0.027***
		0.010	*0.010*	*0.010*
Instruments				
Dummy=1 if VC backed	0.420*			
	0.243			
ln(1+real gross proceeds in £m)	1.586***			
	0.085			
Adjusted R^2	36.4 %	16.9 %	17.0 %	16.5 %
F-test: all coefficients jointly zero	42.2***	18.0***	18.0***	18.0***
F-test of excluded instruments	181.8***			
p-value: contracts are efficient (coeff. for excess commissions = –0.01)		0.099	0.082	0.099