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Do investment banks compete in IPOs?: the advent of the "7% plus contract"[☆]

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Abstract

The large number of initial public offerings (IPOs) with a 7% spread suggests either that investment bankers collude to profit from 7% IPOs or that the 7% contract is an efficient innovation that better suits the IPO. My tests do not support the collusion theory. Low concentration and ease of entry characterize the IPO market. Moreover, the 7% spread is not abnormally profitable, nor has its use been diminished by public awareness of collusion allegations. In support of the efficient contract theory, banks

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compete in pricing 7% IPOs on the basis of reputation, placement service, and underpricing.

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1. Introduction

The frequency with which a 7% spread is used in initial public offerings (IPOs) has risen dramatically, from six in 1981 to hundreds per year in the 1990s. A spread is the underwriting syndicate's fee as a percentage of the proceeds. In this paper I empirically investigate two theories for the convergence on 7%. The cartel theory asserts that there is collusion in the IPO market to maximize profit from the 7% spread. The efficient contract theory asserts that the 7% IPO is the survivor of competition that determines the fittest IPO contract. To date, there are no empirical tests of either theory.

Theoretically, collusion in the IPO market will be either explicit or implicit, both of which require the expected gains from continuing to charge 7% to exceed the gains expected from defection. In explicit collusion, many employees from several banks jointly agree to fix the spread at 7%. Chen and Ritter (2000) favor implicit collusion by independent bankers. Their paper has inspired a class action lawsuit against 27 banks for not competing on price, as well as a U.S. Department of Justice investigation of "alleged conspiracy among securities underwriters to fix underwriting fees".[1] They relate their claim to the Christie and Schultz (1994) claim of implicit collusion among dealers to avoid odd-eighth bid–ask spreads for Nasdaq stocks, and the stunning evidence in Christie et al. (1994) of a significant drop in bid–ask spreads when that collusion claim became public. They rely on Chen (1999), who adapts Dutta and Madhavan's (1997) model of implicit collusion among dealers to apply it to IPO investment bankers.

Empirically distinguishing between the two types of collusion can be problematic because they often produce observationally similar outcomes. My tests focus on establishing whether collusion can be rejected or whether competition can be rejected. If these tests, which are often independent, reveal evidence of collusion, then more testing could be called for to determine the collusion type.

[1] Stories about the lawsuit and the investigation are found in "Allegations parallel new academic study" (Dow Jones News Service, November 4, 1998), "Coincidence or collusion? Two academics question the standard 7% IPO fee" (Business Week, November 9, 1998, p. 163), "Lawsuit accuses 27 firms of fixing fees for IPOs" (Wall Street Journal, November 11, 1998, C22), and "IPO firms face probe of 7% fee – U.S. Antitrust group questions a standard" (Wall Street Journal May 3, 1999, C1).

However, if the tests do not show evidence of collusion, then the distinction between explicit and implicit collusion is immaterial. In general, the tests in this study do not reveal evidence of collusion.

Under the survivorship principal, in a competitive market a contract's survival implies that it is efficient (Alchian, 1950; Stigler, 1958). For example, Smith and Warner (1979) discus the survival of bond covenants and argue that their current forms succeed because they are an efficient contractual solution for the firm. In IPO contracts, the important competition takes place between the lead banks (i.e., syndicate managers and co-managers) that provide certification services. The IPO contract has multiple dimensions, including underpricing and certification and marketing services, so limiting the spread is not evidence of anticompetitive price setting because competition will decide the contract's price in its other dimensions. If the level of certification and marketing would require a spread above 7%, then higher underpricing can lessen the underwriter's placement burden and bring the contract to a 7% equivalent. Or, to hire a more-reputable bank, the issuer can lower the offer price until the IPO is underpriced and investor interest is increased enough to square the underwriter's reputation exposure with 7%. Because underpricing substitutes for placement effort and reputation, the pricing of the 7% contract is perhaps best perceived as "7% plus" negotiated underpricing.

The survivorship principal also implies that the 7% contract has an economic edge in serving IPOs. I suggest three possible advantages. One is that a 7% spread narrows informational externalities spawned by the large ex ante error in valuing speculative IPO firms.[2] A spread's gap from what was expected could raise suspicions about firm value and underwriter veracity. Investors will discount the speculative firm more deeply if they suspect that an unexpected narrow spread signals a charade to inspire overvaluation, or that overvaluation is signaled by an unexpected generous spread. A uniform spread across IPOs limits doubt about what underwriter compensation is going to be. Less ex ante suspicion about underwriter veracity can, in turn, lower underwriter and management exposure to ex post lawsuits claiming deliberate misvaluation. A second possible benefit is reduced moral hazard. The verifiability of underwriter placement effort is impaired by a large IPO valuation error. With costly collective monitoring, underwriters will be more inclined to respond to a declining spread, as occurs in non-7% IPOs, as a penalty for the costly search for a higher price. A flat spread provides a simple ex ante delegated monitoring mechanism that encourages search, raising value. Williams (1998) provides a competitive equilibrium model in which a fixed spread commission across all brokers and clients minimizes their agency problems, to explain the constant 6% broker contract in U.S. residential housing markets. The third possible

[2] For discussion of IPO firm valuation error, see Rock (1985), Allen and Faulhaber (1989), Benveniste and Spindt (1989), Brennan and Franks (1997), and Kim and Ritter (1999).

advantage of a fixed spread is lower contracting costs. In a traditional seasoned equity offering (SEO) contract, the spread is negotiated jointly with the overallotment option inclusion decision, the proceeds amount, and the offer price, all of which share entangled relations with common determinants (see Hansen, 1986). In the case of IPOs, the negotiations are further complicated by the overhanging uncertainty about the market price of the firm's stock. The 7% contract helps simplify this more complex contracting environment by reducing both the number of items to negotiate and redundant haggling. Ball et al. (1985) argue that to lower transaction costs, volatile common stocks are often quoted at rounded wide price intervals, such as 1/2, rather than 1/4 or 3/4, and are even less likely to be quoted at 3/8 or 5/8, etc.

How might competition bring about convergence on 7%? Because the spread plus underpricing generally exceeds 15% (Carter et al., 1998), there are sustainable spreads other than 7%. The convergence on the 7% might be a convention, initiated by a fortuitous abnormal use, or by its strong allure, at the time when IPO volume began to expand. Alternatively, the convergence could be a practical conceit. If a constant spread improves IPO contracting then the level that would be settled upon in a business setting will probably be the most agreeably reasonable number. A most agreeable number is the mean spread in non-7% IPOs, which is near 7%, which after rounding makes 7% a strong focal point.

Other innovations have succeeded in reducing firm commitment contracting costs. One surviving innovation is the overallotment option, which gives the underwriter the right to sell up to an additional 15% of the offering. The added flexibility reduces underwriter losses from a mismatch of post-offer sales with pre-offer indications of interest, thus lowering marketing cost and the spread (Hansen et al., 1987). The option is now used widely in IPOs and SEOs. Another survivor is the supplementing of underwriter compensation with warrants representing a claim on the issuer's upside equity value. Linking compensation to future stock price performance helps ease investor suspicion of underwriter veracity and placement effort, thereby lowering certification costs and the spread. Dunbar (1995) finds that the use of warrants lowers the spread. Among unsuccessful innovation attempts are the use of competitive bidding to award the firm commitment contract (Hansen and Khanna, 1994) and the use of the shelf procedure (Denis, 1991).

At the theoretical level, a lack of evidence of IPO collusion suggests that investment banking lacks the conditions that make collusion profitable and possible. One unmet precondition could be sufficient enforcement to assure enduring collusion among all banks. In explicit collusion, the threats and punishments that are required to control cheating in charging spreads and sharing of profits might be too costly to sustain. Perhaps their discovery by authorities would be too easy or they are likely to invite lethal legal reprisal from opportunistic opponent banks. In implicit collusion, which by definition cannot have explicit enforcement, the requirements of spread observability and independent behavior, to include autonomous profiting, might not be possible. Though Chen and Ritter (2000) suggest that reporting 7% on the prospectus assures observability, this is noisy observability at best since actual spreads can differ from reported spreads. For example, lead banks could grant secret concessions to issuers within reciprocal agreements. Independence is problematic for two reasons. First, setting the spread is often the result of explicit group decision making among bankers in the lead bank and the other banks. Second, results reported later contradict independent profiting. Nor is there an obvious external source of authority that might hold a cartel together for so long.

Another unmet precondition could be that expected losses from large fines and damage to individual careers and to banks' solid reputations are not too severe. For example, in a plausible model of implicit collusion among independent bankers, 7% might not be enough to cover each banker's losses from career damage following discovery of the collusion by control persons inside the bank.[3] Chen's (1999) model assumes noiseless spread observability, that underwriting contracts are rendered by independent individual bankers (not by banks of interdependent bankers) of like economic size and market share, who are unconcerned with excessive fines and damage to careers or bank reputation.

My investigation has three phases. The first phase presents evidence from four tests that focus on market structure, collusion, and profit. Two tests examine whether IPO market structure is consistent with monopoly or competition. The first test examines concentration in the IPO market. Collusion is typically allied with a highly concentrated market. Dutta and Madhavan (1997) note that this is not so in their implicit collusion model because their dealers are the same size with the same market share. However, these same-size assumptions are too unrealistic for investment banks (for example, in March 1999 equity market value, Morgan Stanley was ten times bigger than Bear Stearns and 75 times bigger than Hambrecht and Quist). The second test investigates entry into the IPO market, which typically must be deterred for both explicit and implicit collusion. The evidence indicates low and unchanging concentration and a high degree of entry over the 7% era, contrary to collusion. In the third test, I apply to IPOs the Christie et al. (1994) experiment for Nasdaq dealer collusion. Use of 7% does not decline after the collusion allegation probe is announced. The fourth test examines whether 7% is a profitable spread. My benchmark spread is based on a fitted model of spreads paid in non-7% IPOs by U.S. firms. Using those estimated coefficients, the 7% spreads are, if anything, too low to contain abnormal profit. These findings argue against collusion of either type. Chen and Ritter (2000) argue that 7% is profitable since it is above the spreads paid in

[3] For discussion of consequences born by banks and their employees that break significant federal laws, see Smith and Walter (1997, Chapter 1, "A walk on the dark side"). Beatty and Ritter (1986), Booth and Smith (1986), Smith (1986), Carter and Manaster (1990), Hansen and Torregrosa (1992), and Chemmanur and Fulghieri (1994) discuss the importance of underwriter reputation.

foreign IPOs. However, that benchmark does not take other considerations into account, such as the dimensions of the IPO contract, underwriter quality, and legal and other institutional differences between U.S. and foreign primary markets. None of the above findings reject the hypothesis that the IPO market is competitive, as required for efficient contracting.

In the second phase I report findings from tests of implications drawn from the efficient contract theory. Logistic regression estimates indicate that firms going public through 7% IPOs are more difficult to value, and they use more-reputable underwriters. They also have significantly higher underpricing. Tobit regressions show that their underpricing is greater when they are more difficult to value and when they hire more-reputable banks. In contrast, non-7% IPO underpricing shows less sensitivity to these characteristics. More 7% contract price variation in the underpricing is consistent with efficient contracting. Overall, these results are consistent with lead banks competing in 7% IPOs on the basis of their reputations, underpricing, and placement services.

Phase three pursues the grave prospect that a subtler collusion might nevertheless exist. I focus on two explanations for why the tests could not reveal abnormal profits to a subtle collusion. First, IPO profits are unobservable because they are dissipated over many revenue sources of a much wider collusion. I examine the closely related SEO market under the theory that a broader collusion would produce similar contracting behavior there. However, a fixed spread is not evident in the SEO market. Second, cartel profits are collected through other means than the 7% spread. Two potential means are the underpricing and the spread paid in the issuer's subsequent SEO. Underpricing is unrelated to concentration in the IPO market, and issuers' first SEO spreads appear to be normal. These results argue against a subtle collusion.

Section 2 of the paper follows with a discussion of the 7% IPO. Section 3 reports the four tests focusing on market structure, collusion, and profit. Section 4 reports tests of the efficient contract theory. Section 5 takes up the additional tests for cartel profit. The paper concludes with Section 6.

2. Description of the sample and 7% IPOs

The sample used in this paper is drawn from the U.S. IPO population reported on the April 1998 *Securities Data Company*, *Worldwide New Issues Data Base*. *Securities Data Company* provides offer data (IPO type; contract form; offer date; gross proceeds, excluding funds from exercising the overallotment option; the portions secondary; offer price; shares issued; lead and co-lead banks; venture capital status; underwriter spread) and issuer data (Standard Industrial Classification code, company name, assets, sales, earnings before interest and taxes, debt-to-capital ratio). I use the Center for Research in Security Prices (CRSP) files for information about exchange listing, post-offer market price

Table 1
Initial public offerings (IPOs) statistics on all IPOs since 1980 of at least $10 million in proceeds and underwritten and syndicated, and by industrial or financial firms (Standard Industrial Classification code not in the 4,000s), excluding offers with warrants and unit offers, as reported on the April 1998 Securities Data Company, Worldwide New Issues Data Base. Industrial IPOs (Standard Industrial Classification not in the 6,000s or the 4,000s) are at least 50% primary capital. Proceeds are expressed in January 1998 dollars using the Consumer Price Index.

Proceeds (millions of dollars)	All IPOs			Industrial IPOs		
	Number of IPOs	Mean spread (%)	Capital (billions of dollars)	Number of IPOs	Mean spread (%)	Capital (billions of dollars)
10–20	985	7.42	14.9	824	7.43	12.6
20–30	801	7.07	19.9	713	7.07	17.7
30–40	652	6.99	22.6	575	7.00	19.9
40–50	379	6.96	17.0	327	6.97	14.7
50–60	262	6.92	14.3	204	6.96	11.1
60–70	174	6.87	11.2	141	6.90	9.1
70–80	142	6.78	10.6	105	6.80	7.8
80–90	95	6.76	8.1	66	6.77	5.6
90–100	81	6.64	7.7	49	6.68	4.6
100–110	56	6.57	5.9	36	6.61	3.8
110–120	63	6.51	7.2	36	6.44	4.1
120–150	116	6.44	15.7	51	6.25	6.9
150–200	93	6.30	16.2	33	6.07	5.8
200–250	70	6.19	15.4	28	5.78	6.1
250–500	121	6.06	40.9	37	5.45	12.3
500–1,000	46	6.16	31.1	8	5.31	4.7
1,000 or more	17	5.97	27.8	4	4.66	7.0
All offers	4,153	6.98	286.5	3,237	7.03	153.8

(underpricing), shares outstanding, and daily return volatility. I aggregate *Securities Data Company* data to get underwriter market share and Herfindahl-Hirschman indexes. I use annual underwriting data from *Investment Dealer's Digest* and corporate age data from *Moody's Industrials Manual*. To allow comparison over time and with other studies, all monetary variables are expressed in January 1998 dollars using the Consumer Price Index. I exclude best effort IPOs and bought deals, and I focus on firm underwritten, syndicated IPOs (excluding utilities, whose Standard Industrial Classification code is between 400 and 499). I exclude offers that have warrants or are in a unit offer. I report results as data are available.

Table 1 reports mean spreads and total capital by $10 million proceeds increments, for 4,153 IPOs and 3,237 industrial, primary IPOs (they exclude financials whose Standard Industrial Classification codes are between 600 and 699, and offers 50% or more secondary). Proceeds tend to be small, with 43% of

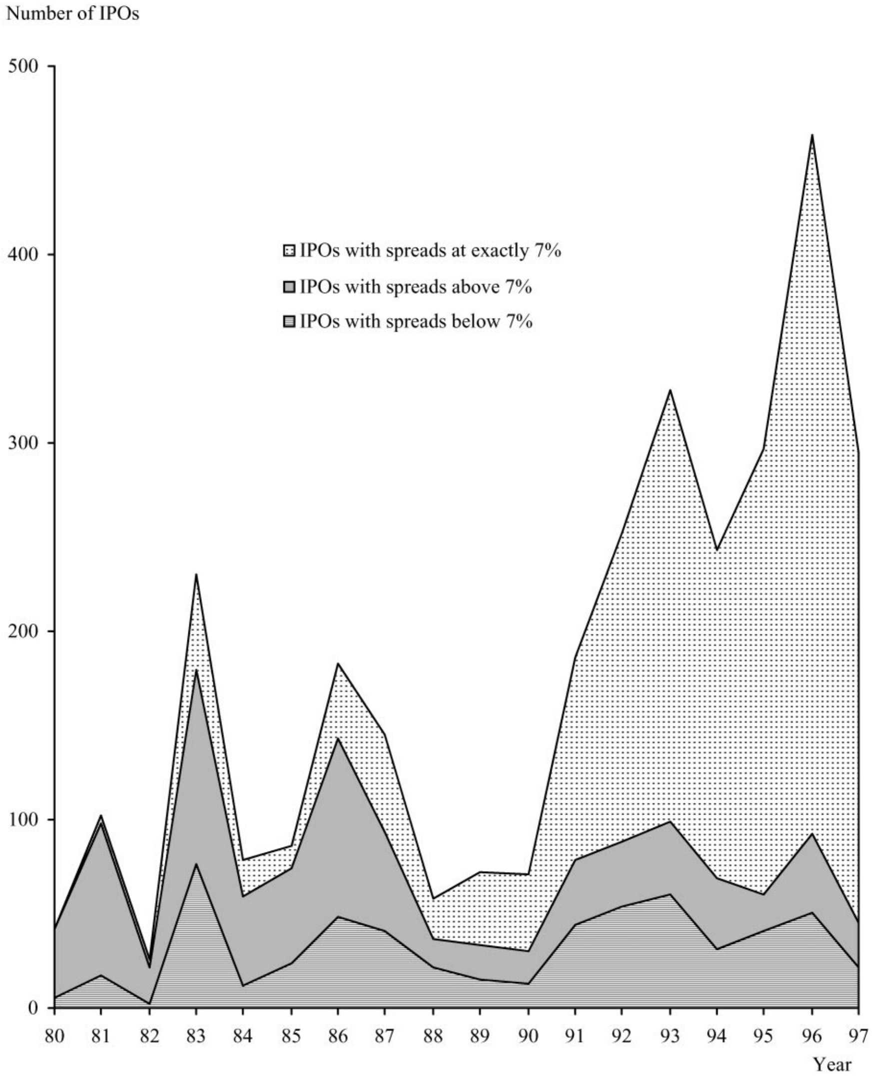


Fig. 1. Annual number of IPOs with spreads at exactly 7%, above 7%, and below 7%. The sample is industrial primary IPOs (Standard Industrial Classification not in the 6,000s or the 4,000s) during the 1980s and the 1990s.

the IPOs below \$30 million and 60% below \$40 million. The mean spreads fall as proceeds increase.

As in earlier studies, I focus on industrial IPOs. Volume is reported in Fig. 1. There are two lengthy volume waves. The early wave has three peaks with the

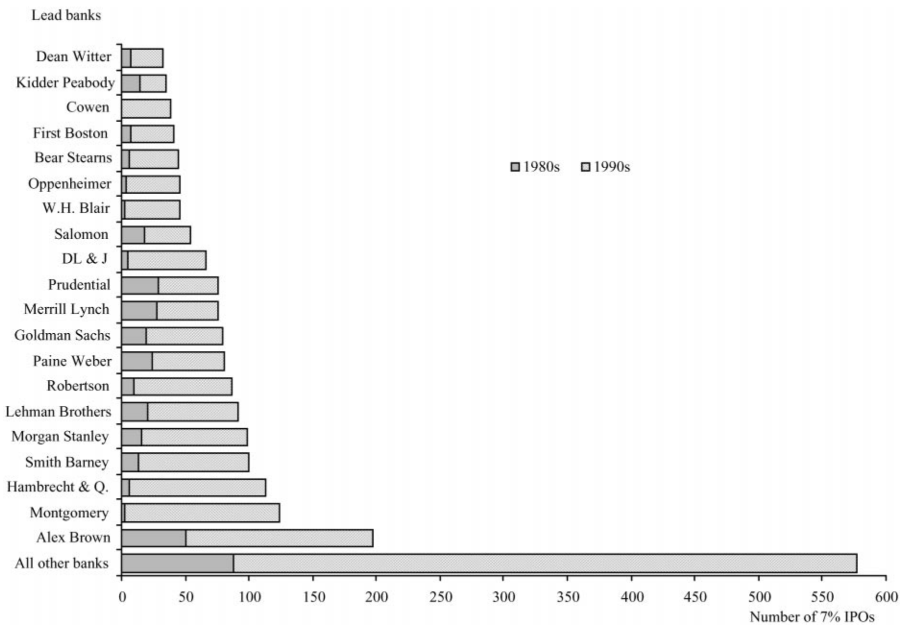


Fig. 2. Number of 7% spread IPOs by syndicate leading investment banks that used 7% most frequently and by all other banks. The sample is all industrial primary IPOs (Standard Industrial Classification not in the 6,000 s or the 4,000 s) during the 1980s and the 1990s.

highest at 230 IPOs in 1983, and the much higher latter wave has peaks of 328 in 1993 and 463 in 1996. In between is a slump in response to the 1987 stock market crash; the slump ends in 1990. Fig. 1 distinguishes among IPOs with spreads exactly at, above, or below 7%, in terms of volume. IPOs with spreads above 7% have become less frequent; 339 in 1981–85, 182 in 1986–89, 125 in 1990–93, and 122 in 1994–97, while those with spreads below 7% show no clear time pattern; 136, 125, 171, and 145 in the noted yearly intervals. By contrast, while 7% volume grew modestly in the 1980s, it surges after 1990 to account for most of the total volume thereafter. Thus, relative use of non-7% IPOs has fallen significantly.

Fig. 2 reports 7% spread use by the 20 IPO syndicate lead banks that use 7% most often as well as by the "other banks". There is no obvious bank-specific origin or cluster of 7% IPOs in the 1980s. This is confirmed by closer inspection. The first six 7% IPOs occur in 1981, with one by a highlighted bank (Merrill Lynch). Other banks lead the four 1982 7% IPOs. In the hot 1983 market; there is a surge of 56 7% IPOs and 11 highlighted banks have their first one. In 1984, Bear Stearns and First Boston have their first, and in 1986 Montgomery Securities, Lehman Brothers, Donaldson, Lufkin & Jenrette, and Oppenheimer have their first. By 1991 all highlighted banks are using 7%, and by 1997 many had been using it for 15 years. In the active 1992–97 period, the 20 lead banks average nine 7% IPOs per year, per bank.

Table 2 shows cross sections of IPOs and SEOs according to 7% use by lead bank class; "top banks" are the ten banks that lead more IPOs in the 1980s and 1990s than the "other banks". (The top ten banks are Alex Brown, Donaldson, Lufkin & Jenrette, Credit Suisse First Boston, Goldman, Sachs, Lehman Brothers, Merrill Lynch, Morgan Stanley, Paine Webber, Prudential Securities, and Salomon Smith Barney.) Volume in the 1990s for each bank class is up over 100% from the 1980s, with top banks capturing more of the growth in "large" offers (those above $80 million) and other banks getting more of the high growth in "medium" offers ($20–$80 million). There is low growth in "small" IPOs ($10–$20 million).

One critical fact shown in Table 2 is that lead banks are not evenly distributed over the IPOs. Top banks lead a majority of large offers and a minority of those under $40 million (78% and 25%, respectively). Notice further that in the 1990s almost all ten top banks underwrite offers in each size class, and that the number of other distinct banks rises to 140, up 149% from the 1980s. Panels C and D, whose layouts are like Panels A and B, show a similar pattern for the SEOs that meet the IPO sample criteria from *Securities Data Company*.

Table 2 contains three other important facts. First, the top banks' proportion of 7% IPOs in the 1990s is similar to their proportion of all IPOs (36% and 38%, respectively). Therefore, while 7% IPOs have increased over time, they are not disproportionately concentrated in top banks or in smaller banks. This would seem to argue against the cartel view. Second, in the 1990s there are a striking 258 small IPOs at 7%, up 445% from 58 in the 1980s. Third, there is a very big increase in 7% use among large IPOs (from five to 63). Thus, while large IPOs are fewer, their use of 7% is increasingly common. An additional piece of evidence that underscores this trend is reported in Section 3.2.

Fig. 3 displays IPOs' spread frequency by proceeds in the 1980s in Panel A and in the 1990s in Panel B. Fractiles are formed by rounding the spread to half points (e.g., 6.5%, 7%, 7.5%, etc.). Thus, the 7% fractile contains all spreads from 6.75% to 7.24%. In every proceeds group, 7% use is up in the 1990s. These data reveal two significant patterns. First, virtually the entire decline in above-7% spreads (Fig. 1) occurs in IPOs under $30 million. Second, non-7% IPO spreads decline with proceeds. Thus, 7% is a relatively low spread for IPOs under $30 million and a relatively high spread for IPOs above $30 million.

This evidence raises an important question for the cartel theory. Why are there so many (258) small 7% IPOs? The small non-7% IPO spread is typically above 7%, arguably to cover fixed underwriting costs. But this would seem to suggest that 7% is not even a break-even spread. That is, a cartel could do better by charging the above-7% spread on small IPOs without igniting defection since there is no obvious incentive to lower their spread to 7%.

The convergence on 7% reveals another curious pattern. While the overall rate of 7% use in the 1990s is 75%, it is less for small IPOs (61%), higher for \$20–\$40 million IPOs (88.5%), and less and declining for larger IPOs (72% for \$80–\$100 million, 62% for \$100–\$110 million, 32% for \$110–\$120 million, and 6% for over \$120 million). It is thus natural to ask whether this concave pattern in the frequency of 7% use can be reconciled with the cartel or efficient contract theories. In explicit collusion, profits from 7% on large IPOs might be so large as to destabilize the cartel, in which case lower spreads would be set. Likewise, 7% should not be used in small IPOs because the above-7% spread is more profitable. For the implicit collusion case, Chen and Ritter (2000) argue that for IPOs above some critical size, 7% will ignite a price war so it is not used. They exclude small IPOs from their analysis and offer no implicit collusion story for less frequent use of 7%. Recall, however, that use of 7% in larger IPOs tapers off gradually as proceeds expands, not quickly. Thus, the concave pattern is not easily reconciled with the collusion theories.

Efficient contract explanations can reconcile the concavity. Consider, for example, a costly spread gap externality. Negotiated spreads normally decline with issue size because of economies of scale in underwriting and because larger, higher quality firms tend to have larger issues (Altınkılıç and Hansen, 2000). Thus, many IPOs would have spread gaps, and given the large IPO valuation error the 7% contract will be sensible to many issuers and underwriters. However, for lower valuation error the externality is weaker, which is likely to improve negotiation's appeal to at least one of the parties. However, that appeal is likely to be greater for the small and large IPOs, since negotiated spreads for mid-sized IPOs will be near 7% anyway. Negotiation cost savings can also suggest a concave pattern; both issuer and underwriter will prefer the 7% contract to a costlier fully negotiated deal, unless the prospects from a negotiated spread are large, which is likely to occur more frequently for small and large offers.

3. Market structure, profit, and collusion tests

In this section I conduct four tests that evaluate the state of competition in the IPO market, assess whether 7% is due to collusion, and examine whether 7% contains abnormal profit.

3.1. IPO market structure

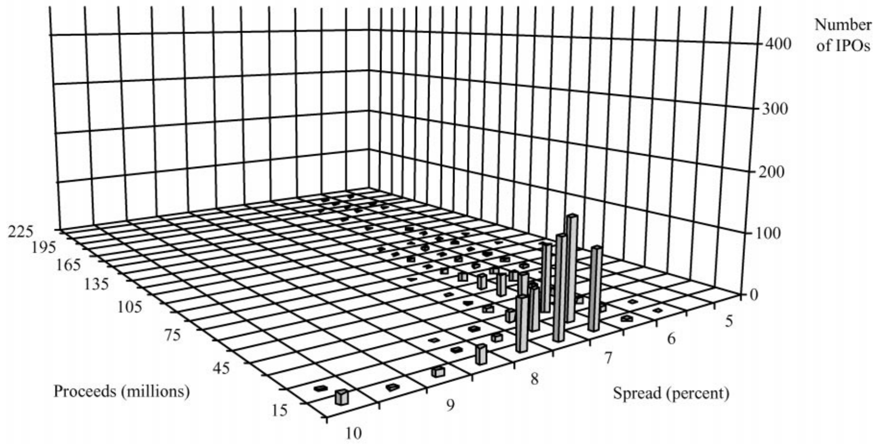
Market structure tests provide a classic measure of whether the IPO market is symptomatic of monopoly. They can indicate if there is sufficient competition to invoke the survivorship principal.

Table 2
Unseasoned and seasoned equity offers in the 1980s and 1990s by seasoning, by use of 7% spread, and by top lead banks and other lead banks. The sample is industrial offers (Standard Industrial Classification not in the 6,000s or the 4,000s) of $10 million–$120 million in January 1998 dollars using the Consumer Price Index. A lead bank is a lead or co-lead bank of the underwriting syndicate. The number of distinct banks is the number of different banks that led offers within the size class. Top banks are the following: Alex Brown; Donaldson, Lufkin & Jenrette; Credit Suisse First Boston; Goldman, Sachs; Lehman Brothers; Merrill Lynch; Morgan Stanley; Paine Webber; Prudential Securities; and Salomon Smith Barney. Other banks are all other lead banks.

Proceeds (millions of dollars)	Top banks				Other banks				All banks		
	Number of offers	Offers with 7% spread		Number of distinct banks	Number of offers	Offers with 7% spread		Number of distinct banks	Number of offers	Offers with 7% spread	
		Number	Percent			Number	Percent			Number	Percent
Panel A: 1980s' IPOs											
10–20	76	22	29.0	9	325	36	16.0	84	401	58	14.5
20–40	146	63	43.2	10	227	66	29.1	53	373	129	34.6
40–80	107	36	33.6	10	64	14	21.9	23	171	50	29.2
80–120	25	2	8.0	8	24	3	12.5	10	49	5	10.2
120–250	13	0	0.0	4	5	0	0.0	3	18	0	0.0
All offers											
Number	367	123	33.5	10	645	119	18.5	94	1,012	242	23.9
Percent	36.3	50.8			63.7	49.2					
Panel B: 1990s' IPOs											
10–20	50	42	84.0	8	373	216	57.9	115	423	258	61.0
20–40	284	258	90.9	10	631	552	87.5	87	915	810	88.5
40–80	317	254	80.1	10	289	246	85.1	50	616	500	81.2
80–120	97	34	35.1	10	41	23	56.1	21	138	57	41.3
120–250	83	5	6.0	9	11	1	9.1	4	94	6	6.4
All offers											
Number	831	593	71.4	10	1,345	1,038	77.2	140	2,176	1,631	75.0
Percent	38.2	36.4			61.8	63.5			100.0	100.0	

Panel C: 1980s' SEOs											
10–20	60	1	1.7	10	274	8	2.9	67	334	9	2.7
20–40	168	2	1.6	10	235	5	2.1	44	403	7	1.7
40–80	126	1	0.8	10	136	0	0.0	30	262	1	0.0
80–120	47	0	0.0	9	36	0	0.0	11	83	0	0.0
120–250	43	0	0.0	9	30	0	0.0	9	73	0	0.0
All offers											
Number	444	4	0.9	10	711	13	1.8	75	1,155	17	1.5
Percent	38.4	23.5			61.6	76.5			100.0	100.0	
Panel D: 1990s' SEOs											
10–20	29	7	24.1	7	157	27	17.2	69	186	34	18.3
20–40	114	5	4.4	10	228	16	7.0	72	342	21	6.1
40–80	203	1	0.0	10	175	4	2.3	53	378	5	1.3
80–120	95	0	0.0	9	46	1	2.2	20	141	1	0.7
120–250	98	0	0.0	9	25	0	0.0	0	123	0	0.0
All offers											
Number	539	13	0.0	10	631	48	7.6	109	1,170	61	5.2
Percent	46.1	21.3			53.9	78.6			100.0	100.0	

Panel A: Frequency of 1980s' IPO spreads by proceeds



Panel B: Frequency of 1990s' IPO spreads by proceeds

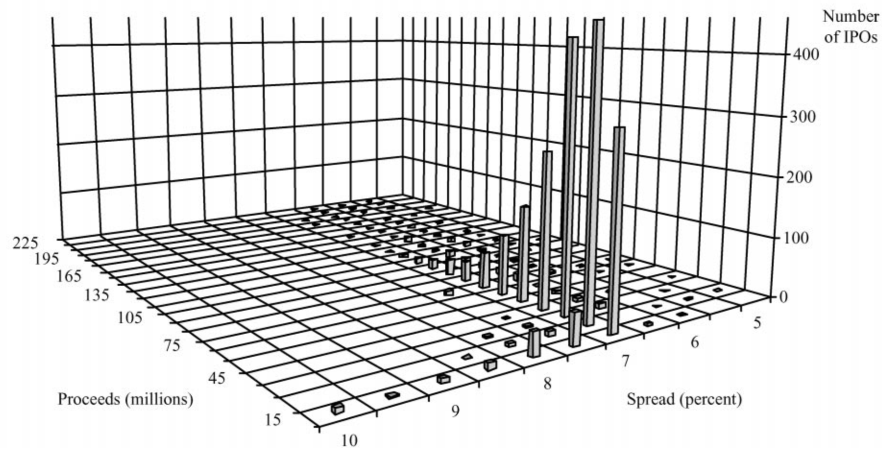


Fig. 3. Frequency of IPO spreads by proceeds ($15 denotes proceeds from $10 to $20 million, $25 denotes proceeds from $20 to $30 million, etc.). The sample is industrial primary IPOs (Standard Industrial Classification not in the 6,000s or the 4,000s) during the 1980s and the 1990s. Spread fractiles are formed by rounding the spread to the nearest half point (e.g., 6%, 6.5%, 7%, 7.5%, etc).

3.1.1. Concentration

Concentration is often seen as an important measure of economic power over price. Stigler (1968) suggests that high seller concentration can indicate extracompetitive prices (above cost plus a normal return). Scherer and Ross (1990) point out that concentration is often high in monopolized markets and low in competitive markets. The Department of Justice views concentration as one important indicator of monopoly power (see Section1.5, in Merger Enforcement Information, Horizontal Merger Guidelines, on their web site, www.usdoj.gov/atr/pubdocs.html). Thus, if the IPO market is concentrated then collusion is more likely. Efficient contracting requires a competitive and hence, low-concentration market. I examine three concentration measures. Two are annual Herfindahl-Hirschman indexes, which sum lead banks' squared annual share of the value of all IPOs. One index is computed with sample lead banks' market shares. The second index uses the independently constructed market shares from *Investment Dealer's Digest* League Tables, and thus measures concentration in the narrower national market. The Department of Justice classifies a market as "highly concentrated" when the Herfindahl-Hirschman index is above 1,800 and "unconcentrated" when it is below 1,000 (see their web site). Thus, if five banks share the market equally the index would be 2,000 and the market would be highly concentrated. For ten banks, the index would be 1,000 and the market would be unconcentrated. The third concentration measure is the top four banks' annual share of the value of IPOs as reported in *Investment Dealer's Digest* League Tables.

Concentration is reported in Fig. 4. Throughout the 7% era, both the broader IPO sample market and the narrower *Investment Dealer's Digest* national market are unconcentrated in all years but 1985 and the 1988–91 crash-through-recession period. Dunbar (1999) reports similar index behavior for the 1984–94 IPO market. In addition, over 1992–98, the index is always below 800, with a mean of 700. If 14 banks share the market equally, the index would be 714. The share of the top four banks moves similarly over this period, showing no evidence of unbalanced market power. The results therefore indicate that concentration has remained the same throughout the heavy 7% era as it was before. The 7% spread does not seem to have caused, or been caused by, changes in concentration. The concentration findings argues against collusion.

3.1.2. Entry

Another indicator of monopoly is difficulty of entry (see the U.S. Department of Justice web site). Entry can be forestalled by limit pricing strategies (Scherer and Ross, 1990). Further, a potential barrier to IPO market entry is a lack of one or more inputs for IPO underwriting (e.g., bank prestige, retail distribution capability, research, and analyst coverage). However, entry is not likely to be barred by a lack of these items if they are in economically reasonable supply from other banks. Based on casual observation, this seems to be the case since lead banks that lack one or more inputs frequently combine with other banks in complementary fashion and co-lead syndicates. For example, while First Boston lacked a significant retail business before merging with Credit Suisse, it led many syndicates.

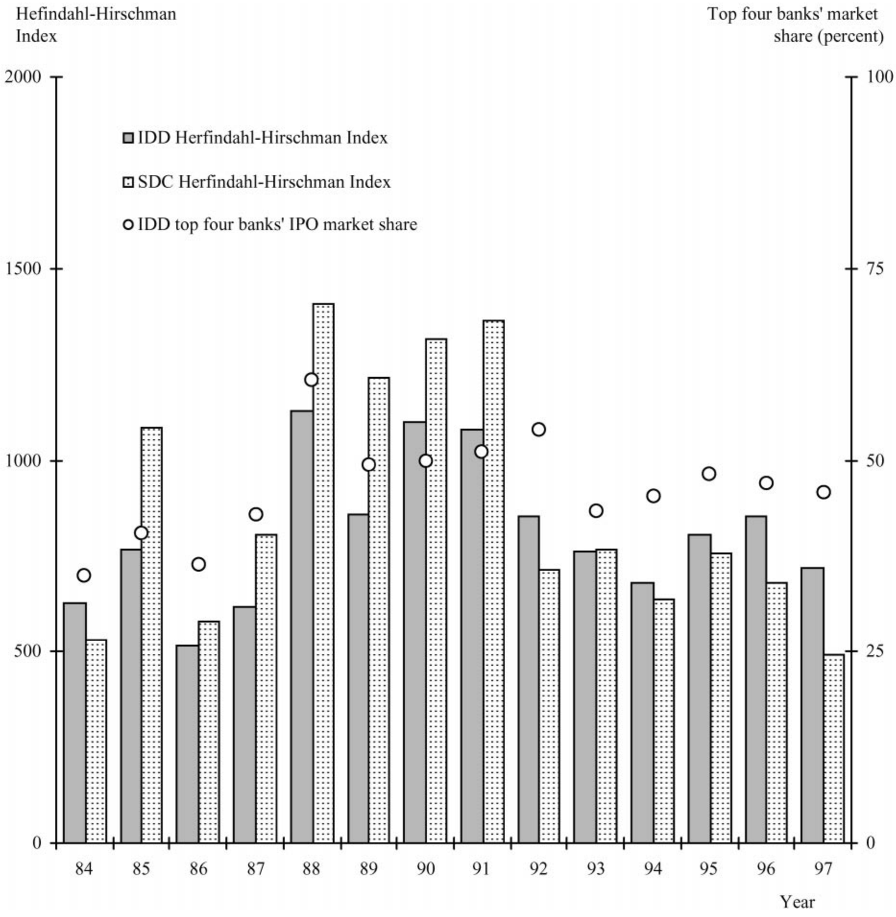


Fig. 4. Investment bank concentration in the IPO market. The sample is industrial primary IPOs (Standard Industrial Classification not in the 6,000s or the 4,000s) from 1984 through 1997. Depicted are the annual Herfindahl-Hirschman index, which is the sum of the banks' squared annual lead share of the value of all IPOs, and the top four banks' annual lead share as reported in *Investment Dealer's Digest*. The index is measured two ways: IDD uses top bank market shares reported in *Investment Dealer's Digest* annual League Table's top 15 IPO banks, and SDC uses the market shares of sample lead banks.

Ease of entry into the IPO lead market would argue against collusion. Long-term explicit or implicit collusion would seem to require difficult if not impossible entry. Dutta and Madhavan (1997, p. 248) note that implicit collusion cannot be an equilibrium in their model if there is no entry barrier. For the 7% contract to be efficient there should be ease of entry into the IPO market. Because I cannot measure barriers, per se, I examine entry. During the 1980s and 1990s the number of different lead banks grows annually, with an interruption caused by the 1987 market crash. There are 62% more lead banks per year in the 1990s' market relative to the 1980s' market (81 versus 50, on average), and almost 100% more in the 1994–97 market (98, on average). I also consider entry into the prestigious top-15 IPO lead banks featured in *Investment Dealer's Digest* League Tables. Seven of the 1998 top-15 banks are not in the 1985 top 15. Further, over 15 different banks have been a top-five bank at least once since 1985.

The 7% era overlaps the era of deregulation of the 1933 Glass-Steagall Act, which prohibited commercial bank underwriting of corporate securities. In 1990 the Federal Reserve began easing this barrier to commercial bank entry into underwriting by increasing the amount of corporate equity securities these banks can underwrite within their Section 20 investment banking subsidiaries. A number of commercial banks thus became legally eligible in the 7% era to enter the corporate debt and equity (seasoned and unseasoned) underwriting markets. Gande et al. (1999) examine underwriter spreads in the corporate bond market and report that commercial bank entry has intensified bond underwriting competition.

Have barriers kept commercial banks from the IPO lead market? In the post-1992 era, when the market is saturated with 7% spreads, five large commercial banks have joined *Investment Dealer's Digest's* League Table's top-15 IPO banks (J.P. Morgan, Nationsbank, Bankers Trust, Bank of America Corp., and BankBoston). In addition, while Goldman Sachs, Merrill Lynch, and Morgan Stanley lead the rankings in this period, 27 different banks rank among the top 15, and 11 different banks hold a top five spot.

During the period of 7% growth there has been substantial new entry and turnover among banks. Further, all of the aforementioned banks actively use the 7% IPO contract. This argues against collusion.

3.2. The Christie et al. test for collusion

One important modern collusion test is to assess how IPO spreads behave in response to the Department of Justice investigation of collusion allegations. Christie et al. (1994) apply a similar test to Nasdaq bid–ask spreads following allegations of spread fixing, and show a "sudden and dramatic narrowing of the inside spreads" (p. 1841), which as they note, is consistent with implicit collusion.

Under the cartel theory and the Christie et al. (1994) logic, the revelation of collusion allegations is likely to signal the demise of any collusion. The Department of Justice probe raises the likelihood of collusion discovery, thereby reducing if not eliminating the expected gain from continuing to overprice IPOs, while increasing the expected legal/regulatory penalties. Demise is also supported with prisoners' dilemma logic if higher penalties will be imposed on banks that do not cooperate with authorities Short of outright demise, the sudden deterioration in the collusion benefit–cost calculus should trigger a sharp decline in 7% use. Under the efficient contract theory, while the revelation might cause an initial panic backlash from 7%, the 7% contract should prevail because it is relatively efficient (unless the cost of continued 7% use is expected to rise due to its unjustified punishment).

To investigate spread behavior after *The Wall Street Journal* report of the Department of Justice probe, I collect spreads on IPOs after May 4, 1999 using IPO Data Systems (www.ipodata.com) and IPO.com (www.ipo.com). The Securities and Exchange Commission's EDGAR filings (web.lexis-nexis.com) fills in missing data. I identify 299 completed industrial IPOs of $10–$250 million from June 1, 1999 through December 31, 1999. Of these, 276 (89%) pay 7%. Broken down by proceeds, the number (percent) of IPOs paying 7% is as follows: $10–$20 million, 21 (61.9%); $20–$40 million, 54 (92.6%); $40–$80 million, 144 (99.3%); $80–$120 million, 51 (92.2%); $120–$250 million, 29 (69.0%). After the May 4 announcement, 7% use has risen in all proceeds groups, including the largest IPOs, with increased convergence on 7% in every proceeds group. These findings are not consistent with collusion in the IPO market.

3.3. Profitability of 7% spreads

Another important way to assess collusion's presence, whether explicit or implicit, is to determine if the 7% spread contains monopoly profit. In this section, I test this notion. Under explicit or implicit collusion, 7% contains abnormal profit, whereas under efficient contracting, 7% does not contain abnormal profit. Because profit cannot be measured, this test examines if 7% contains a "surplus" relative to the spread expected for a non-7% IPO. I thus assume that since collusion runs the risk of significant penalties, yet colluding agents forgo the non-7% spread, their revealed preference indicates that 7% is a richer spread. To estimate the surplus I use a two-step process. The first step estimates parameters of a multivariate empirical model of the spread paid in non-7% IPOs. The second step uses those estimated parameters to compute the surplus in the 7% spread.

Based on existing studies, I use four independent variables in the empirical model of the expected spread. The first variable is the gross proceeds, measured in natural logarithm. Greater proceeds should have a more negative effect on the spread, reflecting economies of scale (e.g., Bhagat and Frost, 1986; Denis, 1991; Megginson and Weiss, 1991; Dunbar, 1995; Altınkılıç and Hansen, 2000). Second is the ratio of proceeds to market value. Higher relative proceeds should raise placement costs as more certification is needed to offset rising adverse selection cost, and more marketing is needed to expand demand (Krasker, 1986; Merton, 1987; Altınkılıç and Hansen, 2000). Market value is stock price times shares outstanding. The third variable is stock return volatility. Studies show that the spread increases with volatility. Volatility is a proxy for information asymmetry between managers and investors, which increases certification cost (Booth and Smith, 1986; Denis, 1991). It is also a proxy for the underwriter's put option risk premium for buying the shares at the offer price to resell them at the lower of the offer price or market price (Bhagat and Frost, 1986; Hansen and Torregrosa, 1992). Barry et al. (1991) find that volatility immediately after the offer date has no significant effect on IPO spreads. I measure volatility with the stock return standard deviation over the one hundred trading days after 30 trading days past the offer date. I exclude the first 30 days because underperforming offers in this period are often stabilized (Aggarwal, 2000; Ellis et al., 2000), which can drive measured volatility towards zero. The fourth variable is the fraction of the offer that represents current stockholders' sales. A priori, secondary sales have an ambiguous effect on the spread. On the one hand, they can signify dilution of managers' incentives and thus raise certification cost and the spread. On the other hand, Mikkelson et al. (1997) suggest that they are associated with better timing of IPOs with good earnings prospects for the company. Timing is thus likely to lower the spread to the extent that it coincides with periods of above-average investment opportunities in the industry and economy, during which adverse selection cost will be less (Choe et al., 1993; Bayless and Chaplinsky, 1996). Logue and Lindvall (1974) note that more insiders can raise bargaining power with underwriters. Dunbar (1995) finds that IPO spreads fall as secondary sales increase.

Panel A of Table 3 reports parameter estimates from two models, one for the 1980s and one for the 1990s. They indicate that spreads fall with proceeds and secondary shares, and increase with relative size and stock return volatility. They confirm earlier findings. The adjusted R^2 indicate good explanatory power. The model parameters are not particularly different across the decades.[4]

[4] The parsimonious model lessens the missing values problem that arises when using more variables, thus reducing the sizes of the estimation samples and the fitted sample. However, despite sample-size changes, the estimated spread differences are robust to other specifications such as the econometric technique of substituting known mean values for missing exogenous data. Because the more complex routes lead to similar conclusions, I report results using only the parsimonious model. One difficulty with specifying the IPO spread model that is not present for SEO spread models is that data are often absent because they do not exist. Authors have thus suggested an array of imperfect proxy variables for risk. I examine issuer age (James, 1987) but it is statistically insignificant. Studies have included the inverse of the offer price among the independent variables (James, 1987; Beatty and Welch, 1996). However, the offer price is likely to be determined endogenously with the spread, so I leave it out. I consider operating variables; higher sales and higher earnings before interest and taxes per dollar of proceeds diminish the spread. Prior studies report mixed findings about the effect of underwriter reputation on the spread. Some report that spreads are lowered by hiring more-reputable lead banks (Megginson and Weiss, 1991; James, 1987; Dunbar, 1995), and others report that a premium is paid in the spread for the reputation (Beatty and Welch, 1996). Megginson and Weiss (1991) find that IPOs associated with venture capitalists have lower spreads. I examine both underwriter reputation and venture capital backing in an IPO spread regression model. Unlike the prior studies, my results are unimpressive. Estimated spread differences using these more complex models indicate a larger estimated spread surplus than is reported in Table 3.

Table 3

Differences between 7% and expected spreads, and ordinary least squares model estimates of the expected spread using industrial (Standard Industrial Classification not in the 6,000s or the 4,000s) non-7% IPOs. Panel A shows the ordinary least squares expected spread model parameter estimates with t-statistics in parentheses using non-7% IPOs; ln(proceeds) is the logarithm of proceeds. Proceeds/value is the ratio of proceeds to market value of common stock on the offer date. Volatility is the common stock rate of return standard deviation over 100 trading days following 30 days after the offer. Secondary is the fraction of the IPO that represents sales of shares by insiders. Panel B reports the mean and median predicted surplus estimate (equal to 7% less the expected spread) and the number of 1990s' 7% industrial IPOs. The expected spread is measured using the parameters from Panel A for the 1990s as well as for the 1980s (p-values are in parentheses).

Sample period	Independent variable					Adjusted R^2	F statistic
	Intercept	ln(proceeds)	Proceeds/value	Volatility	Secondary		
Panel A: Ordinary least squares estimates for non-7% IPO spreads in two different decades							
1980s	9.43	−0.69	3.07	3.74	−0.77	0.47	94
	(0.001)	(0.001)	(0.001)	(0.021)	(0.001)		(0.001)
1990s	8.61	−0.50	1.56	6.90	−0.27	0.47	58
	(0.001)	(0.001)	(0.006)	(0.008)	(0.194)		(0.001)
Expected spread Sample period	Proceeds (millions of dollars)					All IPOs	
	10–20	20–40	40–80	80–120	120–250	Equal weighted	Value weighted
Panel B: Mean and median estimated spread surplus (percent) for 1990s 7% industrial IPOs							
1980s	−0.76	−0.33	0.08	0.54	0.58	−0.25[a]	−0.11[a]
	−0.76	−0.33	0.08	0.54	0.58	−0.25[b]	−0.25[b]
1990s	−0.54	−0.23	0.07	0.39	0.38	−0.18[a]	−0.07[a]
	−0.51	−0.22	0.08	0.39	0.41	−0.18[b]	−0.18[b]
Number IPOs	213	647	357	41	1	1,259	1,259

[a]Statistically significant at the 0.01 level, Student t-statistic.
[b]Statistically significant at the 0.01 level, Wilcoxon signed rank statistic.

Error can enter the spread–proceeds relation to the extent that spread negotiations tend to terminate before the proceeds are set. For example, perhaps the agreed-upon spread is 7.5% in anticipation of raising \$18 million, which might be increased to \$23 million or reduced to \$13 million when more is learned about demand. If the spread is not reset, the 7.5% might overstate or understate, and thus measure the correct spread with error. However, the degree to which spreads are not reset is unknown, and because the errors are in the dependent variable they are not likely to introduce bias into the estimation (Maddala, 1992).

Panel B of Table 3 reports the mean and median surplus estimates. Using the 1980s' expected spread model, the estimated surplus is negative for the majority (81%) of IPOs, the equal-weighted mean surplus is -25 basis points, and the value-weighted mean surplus is -11 basis points. Both measures are statistically significantly negative. The Wilcoxon test confirms these results. Similar results are obtained using the 1990s' expected spread model; the respective equal- and value-weighted mean surpluses, -18 basis points and -7 basis points, respectively, are statistically significantly negative, and the predicted surplus is negative for 74% of the IPOs. These results are also confirmed by the Wilcoxon test. I conclude from these results that 7% is below the spread that underwriters would receive in otherwise similar non-7% offers. They contradict the view that 7% contains abnormal profit, and they argue against collusion.

These results shed light on two important related questions. First, are the 7–8 basis point surpluses on the \$40–\$80 million IPOs and the bigger surpluses for the largest IPOs enough to offset the negative surpluses on the small IPOs, making a cartel "all in" profitable from the 7% spread? And, second, is the surplus shared in proportion to the number or value of IPOs underwritten by lead underwriters? The answer to both questions is no. Aggregate spread profits are negative because the value-weighted mean surplus is negative. And because lead banks are unevenly distributed over small and large offers (Table 2), so are the surpluses. Consider a back-of-the-envelope application of the Table 3 surpluses to the corresponding proceeds groups in Table 2 (using midpoints to estimate proceeds). The top ten banks' estimated total surplus is \$6.2 million [$= -\$15 \times 42 \times 0.0054 - \$30 \times 258 \times 0.0023 + \$60 \times 0.254 \times 0.0007 + \$100 \times 0.34 \times 0.0039 + \$185 \times 5 \times 0.0038$, in millions], or \$10,521 per IPO. Other banks have aggregate losses of \$36.6 million [$= -\$15 \times 0.216 \times 0.0054 - \$30 \times 552 \times 0.0023 + \$60 \times 0.246 \times 0.0077 + \$100 \times 23 \times 0.0039 + \$185 \times 0.0038$, in millions], or $-$\$35,328 per IPO.

A possible concern is that the 7% IPOs are of a higher quality (e.g., less speculative) than accounted for in the benchmark spread, which could create downward bias in the surplus estimates. Based on findings reported in Section 4.1, however, this does not appear to be the case. Those findings indicate the opposite; the negative surplus is likely to be upward biased.

These results indicate that the 7% spreads are too low relative to non-7% spreads (after adjusting for IPO characteristics). They are not consistent with the collusion hypothesis.

4. Efficient contract tests

The findings indicate that competitive banks will not break even using 7%, all else the same. The efficient contract theory asserts, however, that all else is not the same and competition in other dimensions will adjust the IPO contract to a "7% equivalent". Here, I investigate two implications of this theory.

4.1. Comparative advantage and 7% use

In the 1980s and 1990s, the 7% contract survived alongside the traditional negotiated firm commitment contract. This suggests there is likely to be a comparative advantage to the 7% contract for some capital raising firms. As a consequence, firms going public should self-select and exhibit qualitative differences that depend on their contract type. Under the efficient contract theory, the 7% contract users are qualitatively different. In particular, earlier arguments suggest they are more likely to be speculative, difficult-to-value issuers. I examine five issuer characteristics and one underwriter characteristic using a logit model of the likelihood of a 7% spread. From the above discussion and Fig. 3, smaller and larger offers use 7% less frequently. To clearly illustrate this concave effect, I choose a set of piecewise zero–one dummy variables to denote proceeds size categories. Thus, Proceeds (\$L–\$U) denotes IPO proceeds from \$L to \$U million, presented in \$25 million increments. Excluded is Proceeds (\$25–\$50). Consequently, the coefficients of Proceeds (\$L–\$U) are all expected to be negative. The second issuer characteristic is aftermarket stock return volatility. To the extent that greater volatility is associated with more speculative issuers, more volatility should raise the likelihood of using a 7% contract. The third variable is the fraction of insider selling. If the 7% contract is more efficient, insiders should choose it more often.

The fourth and fifth characteristics focus on the difficulty with valuing the IPO firm. Kim and Ritter (1999) report that growth-oriented issuers have less valuation error when earnings are better. I include earnings before interest and taxes, which are deflated by proceeds instead of assets that are often missing and could come from quarterly or annual statements. To reflect the growth orientation of the issuer's investment opportunities, I include the debt-to-capital ratio at the time of the offer. Myers (1977) predicts that less growth-oriented firms will have higher leverage. Smith and Watts (1992) report supporting evidence in cross-sectional regressions of leverage on growth opportunities. Crutchley and

Hansen (1989) and Lang et al. (1996) indicate in cross-sectional regressions that firms with higher growth have less leverage.

The sixth variable is the reputation of the lead underwriter. Beatty and Ritter (1986) and Carter and Manaster (1990) suggest that issuers hire more-reputable banks to better certify the fairness of the offer price. Thus, difficult-to-value issuers stand to benefit more from hiring a more-reputable underwriter, all else the same. I measure lead bank reputation using the Carter and Manaster (1990) ranking of 184 banks, denoted "C-M rank", as reported in Carter et al. (1998). To obtain rankings for banks not among their 184 banks, I use Booth and Chua's (1996) regression forecast method. I fit a regression of the known ranks in the sample to the natural logarithm of the total gross proceeds underwritten for the decade and the offerings' mean price. I obtain C-M rank = 0.997 + 0.806ln(1990s' proceeds underwritten) + 0.0979 (mean price). I then use this model to obtain the predicted rank for lead banks not among the 184. (I also replace the missing ranks with 0% and obtain virtually identical results, which go unreported here.) Some logits include a time trend (1990 is indexed as year 1) to control for unaccounted-for growth in 7% contract use.

Table 4 reports estimates from four logit models. Model 1 reveals that a 7% contract is less likely for IPOs under $25 million or over $50 million, and even less so as proceeds increase more, confirming that 7% use is concave in the amount of capital raised. Furthermore, 7% use is more likely when stock return volatility is higher, and when more of the IPO is secondary. Insiders' preference for 7%, hence greater migration away from the non-7% IPO, can explain their weaker effect on the spread in the 1990s (Table 3).

Model 2 includes all independent variables except time. The likelihood of 7% use remains concave in the proceeds, and is larger as secondary shares increase. Moreover, it is higher for issuers with poorer earnings and less debt. These results are consistent with more likely use of 7% being associated with firms that are more difficult to value. The effect of return volatility is weakened by the inclusion of these variables.

The positive coefficient on the Carter-Manaster reputation measure indicates that higher bank reputation increases the likelihood of a 7% contract. To check the validity of this result, I use Beatty and Welch's (1996) reputation measure, or lead bank market share. For offers before 1995, I use their 1991 market shares; for later offers, I use their 1994 market shares. I assign a 0% market share to all banks not in their 50 prominent banks. Their measure also has a positive and statistically significant coefficient, confirming that hiring a more-reputable bank increases the likelihood of a 7% IPO. I do not report these results.

Time trends in the qualitative variables could exist and cause spurious results in the Model 2 estimates. Perhaps, over the decade, IPOs became more volatile and involved more insider selling, while issuers hired more-reputable banks. However, the independent variables do not exhibit these trends. Nevertheless, I address this concern using a two-step process. First, each independent variable

Table 4
Coefficient estimates and Chi-square statistics of the logit equation. Dichotomous dependent variable is one for initial public offerings (IPOs) with a 7% spread and zero for non-7%. Contract type use is modeled as a function of 11 independent variables. Proceeds enters as five zero–one dummy variables of the form Proceeds($L–$U), equal to one if proceeds are from $L million to $U million. Volatility is the common stock rate of return standard deviation over 100 trading days following 30 days after the offer. Secondary is the fraction of the IPO that represents sales of shares by insiders. EBIT/proceeds is the ratio of earnings before interest and taxes to proceeds. Debt/capital is the firm's leverage ratio. C-M rank is the Carter and Manaster (1990) bank ranking, as reported in Carter et al. (1998). Time is an index for the offer year, where 1990 is set to one. Missing ranks are replaced by the method devised by Booth and Chua (1996). I first estimate a prediction model using known rankings, yielding C-M rank = 0.997 + 0.8063ln(proceeds underwritten) + 0.0979(mean offer price), where proceeds underwritten is the bank's 1990s' total IPO proceeds underwritten and mean offer price is the average of those IPOs' offer prices (all coefficients have $p = 0.01$, adjusted R^2 is 0.60). Missing ranks are then replaced by their predicted ranks from the prediction model. In Column 3, the independent variables are first detrended by regressing them on time and then using their respective residuals. The sample is industrial primary IPOs (Standard Industrial Classification not in the 6,000s or the 4,000s) during the 1990s (p-values are in parentheses).

Independent variable	(1)	(2)	(3)	(4)
Intercept	1.61	1.30	1.65	1.44
	(0.001)	(0.001)	(0.001)	(0.003)
Proceeds($10–$25)	− 1.29	− 1.01	− 0.81	− 0.82
	(0.001)	(0.001)	(0.001)	(0.001)
Proceeds($50–$75)	− 0.77	− 0.44	− 0.53	− 0.56
	(0.001)	(0.084)	(0.035)	(0.032)
Proceeds($75–$100)	− 2.15	− 1.51	− 1.75	− 1.94
	(0.001)	(0.001)	(0.001)	(0.001)
Proceeds($100–$125)	− 3.38	− 13.29	− 3.54	− 13.89
	(0.001)	(0.001)	(0.001)	(0.001)
Proceeds($125 or more)	− 4.98	− 4.52	− 5.08	− 5.17
	(0.001)	(0.001)	(0.001)	(0.001)
Volatility	9.23	− 5.79	− 4.15	− 2.42
	(0.038)	(0.287)	(0.452)	(0.675)
Secondary	1.58	0.96	1.56	1.48
	(0.001)	(0.079)	(0.001)	(0.010)
EBIT/proceeds		− 1.39	− 1.17	− 1.29
		(0.001)	(0.001)	(0.001)
Debt/capital		− 1.02	− 0.88	− 0.88
		(0.006)	(0.018)	(0.024)
C-M rank		0.18	0.24	0.28
		(0.001)	(0.001)	(0.001)
Time				0.37
				(0.001)
Number	1,987	1,499	1,499	1,499
χ^2	417	276	323	366
	(0.001)	(0.079)	(0.001)	(0.010)
Pseudo R^2	0.19	0.20	0.21	0.24

is detrended by regressing it on the time trend variable. Second, the detrended variables are used in estimating the logit model. Model 3 reports the detrended regression estimates. They too show significant concavity of 7% use, and that users are likely to have more secondary sales, poorer earnings, and less leverage, and to employ more-reputable underwriters. In Model 4 the inclusion of a positive time trend indicates migration towards 7% over time that is not accounted for by the other independent variables. All other coefficients remain basically the same.

In sum, adjusting for size, insider selling, and time, 7% IPOs have lower earnings and less debt and hire more reputable banks. Thus, risk factors associated with IPO placement difficulty explain 7% contract use.

4.2. Underpricing

On the one hand, 7% is an unusually low spread. On the other hand, 7% users are more speculative and they use more expensive underwriters. Here, I investigate the efficient contracting implication that these facts are reconciled by adjustments in underpricing. I consider a prediction from explicit collusion later. The implicit collusion story does not address underpricing so it makes no underpricing predictions.

4.2.1. The level of underpricing

Under efficient contracting, underpricing should be higher in 7% than in non-7% IPOs. Existing evidence shows that underpricing is a large part of the cost of going public. For example, it has averaged 8.08% per IPO from 1979 through 1991 (Carter et al., 1998) and 12.05% from 1991 through 1994 (Lee et al., 1996). Following the earlier studies, I focus primarily on underpricing as measured by the first closing stock price after the offer reported on the CRSP files, relative to the offer price, less one. Mean underpricing for non-7% IPOs is 10.50% (median 5.6%) and for 7% IPOs it is 16.54% (median 10.0%). The 6.04% mean difference is statistically significant (p-value of 0.0001). The Wilcoxon statistic also indicates that median underpricing is significantly different ($p\text{-value} = 0.001$). These results are consistent with the efficient contract theory.

4.2.2. Cross-sectional behavior of underpricing

In non-7% IPOs, a number of qualitative differences are priced in the spread (Panel A, Table 3). In contrast, the efficient contract theory predicts that in 7% IPOs the qualitative differences will be priced in underpricing, which suggests the following. First, underpricing in the 7% contract should increase for costlier IPOs. Thus, underpricing should be higher for more speculative issuers and for issuers that use more-reputable banks. Second, non-7% contract underpricing should be less sensitive to these qualitative differences.

I construct a three-variable base model of underpricing from extant studies. I then add to the model those characteristics relevant to the underwriter and the valuation of the firm. The base model includes proceeds, the portion secondary, and return volatility. If larger offers have more adverse selection cost or require more marketing effort, the issuer must bear these costs through more underpricing. Prior studies report mixed evidence of the effect of proceeds on underpricing. Beatty and Ritter (1986) and Dunbar (1995) report a negative effect in very small IPOs; Barry et al. (1991) and Jegadeesh et al. (1993) report a positive effect in larger IPOs that are more like sample IPOs; and Booth and Chua (1996) and Megginson and Weiss (1991) report no effect. The effect of secondary on underpricing is ambiguous as insider sales can signal poor future performance or coincide with better times. Jegadeesh et al. (1993) report that insider selling has no effect on underpricing. As a proxy for pre-offer uncertainty about market price, return volatility (measured after stabilization) should raise underpricing. A number of studies report that underpricing is higher when stock return volatility is higher (Ritter, 1984; Barry et al., 1990, 1991; Jegadeesh et al., 1993). However, Habib and Ljungqvist (1999) note that volatility measured during stabilization is likely to be biased downwards in less underpriced IPOs, introducing a spurious positive underpricing–volatility relation.[5]

An important implication of the efficient contracting theory is that with a 7% spread, the issuer through increased underpricing must absorb the additional cost of hiring a more-reputable underwriter. In contrast, earlier studies show that hiring more-reputable underwriters lowers underpricing. Those studies differ from this study in that they examine mixed samples that are mostly non-7% IPOs.[6] In contrast, I will focus separately on the two contract types.

[5] Trying to identify the empirical determinants of underpricing has generated an impressive literature. Studies sometimes include the inverse of the offer price and the spread in underpricing regression analyses (Beatty and Welch, 1996; Booth and Chua, 1996; Jegadeesh et al., 1993; Habib and Ljungqvist, 1999). However, the offer price is endogenous, and so is the spread when it is not fixed at 7%, which can introduce spurious correlation into the evidence. Some authors have also used age with mixed results (Barry et al., 1991; Megginson and Weiss, 1991; James, 1987; Jegadeesh et al., 1993). Age, measured by the date of incorporation as found in *Moody's Industrials Manual*, often seems to have considerable errors; many firms have unusual histories. Moreover, *Moody's Industrials Manual* did not have age data at the time of this writing for IPOs in 1997 and 1998. Using available data, I find that the underpricing versus age relation is not statistically significant. Studies use sales (Barry et al., 1991; Jegadeesh et al., 1993). I use earnings before interest and taxes instead of sales because SDC underreports sales leading to additional missing values. However, qualitatively similar results are obtained when using sales. Underpricing might also include stabilization costs to the extent that they are paid in the spread in non-7% IPOs. However, Ellis et al. (2000) suggest this does not appear to be the case.

[6] Studies that report evidence of a negative effect of reputation on IPO underpricing [with sample beginning and ending years in brackets] include Megginson and Weiss 1983–87] (1991), Hanley [1980–87] (1993), Jegadeesh et al. [1980–86] (1993), Dunbar [1980–83] (1995), Booth and Chua [1977–88] (1996), and Carter et al. [1979–91] (1998).

C-M rank is used to reflect underwriter reputation. Beatty and Welch (1996) examine IPOs over the 1992–94 period, when the 7% contract is more widely used, and report a positive underpricing–reputation relation.

The model is augmented with two company operating variables to register valuation difficulty. The first is pre-tax earnings relative to proceeds. Larger earnings signal better and more measurable cash flows, which should lower underpricing. The second is the debt ratio. When growth options are fewer, as measured by a larger debt ratio, there should be less demand for certification, thereby reducing underpricing. To the extent that the firm's debt to capital ratio is influenced by bank debt, then the ratio also has the complementary monitoring interpretation in which debt users are more scrutinized by lending banks at the time of the IPO (see James, 1987). I am unable to determine to what extent bank debt is used.

Because underpricing is truncated by stabilization, I analyze it using tobit regression. I follow Prabhala and Puri (1998) and set negative underpricing to zero. I also report results another way using ordinary least squares when the unadjusted underpricing is measured two weeks after the offer date.

Columns 1–4 in Table 5 report three tobit models and the ordinary least squares model of underpricing. Model 1 includes all five issuer variables. Larger offers have more underpricing, consistent with greater adverse selection cost being associated with larger offerings. The insignificance of volatility could arise because put option risk is small and mostly paid for in the spread, and because the standard deviation is not a good proxy for the error in valuing issuers. Insider selling is unrelated to underpricing. Higher earnings have a significantly negative effect on underpricing, as does leverage.

One concern with these results is that there might be a positive bias in the underpricing–proceeds relation. When information of strong offer demand is discovered in the preselling period, the offer price, and sometimes the number of shares, is revised upwards, raising proceeds. But due to the partial adjustment of the offer price, underpricing increases (Hanley, 1993). The result could be positive spurious correlation between underpricing and proceeds that would overstate the proceeds coefficient. However, the parameter estimates for each of the independent variables are not different after removing proceeds from the tobit model, which suggests that this bias is not a significant concern, so I do not report these estimates.

Model 2 includes all six variables. C-M rank has a significantly positive effect on underpricing. The results are consistent with higher underpricing for more speculative offers, and when more expensive underwriters are employed. To check for robustness of the positive underpricing–reputation relation, I examine the Beatty and Welch (1996) reputation measure and find results similar to those reported in Table 5. These results are not included here.

Another concern raised by the evidence of a strong underpricing–reputation relation is that the estimated regressions are biased to the extent that reputation

Table 5

Examined are determinants of underpricing in 7% initial public offerings (IPOs) and whether measures of initial public offering (IPO) market power increase underpricing for industrials primary IPOs (Standard Industrial Classification not in the 6,000s or the 4,000s) during the 1990s. Reported are tobit tests and Chi-square statistics and an ordinary least squares (OLS) test and t-statistic for the underpricing dependent variable, the market closing price divided by the offer price, less one. In the tobits, first market price is the first closing price within five days of the offer date, and negative underpricing is set to zero. In the OLS estimation, the dependent variable is the market closing price ten trading days after offer date. There are eight independent variables: ln(proceeds) is the logarithm of proceeds. Volatility is the common stock rate of return standard deviation over 100 trading days following 30 days after the offer. Secondary is the fraction of the IPO that represents sales of shares by insiders. EBIT/proceeds is the ratio of earnings before interest and taxes to proceeds. Debt/capital is the firm's leverage ratio. C-M rank is the Carter and Manaster (1990) bank ranking, as reported in Carter et al. (1998). Missing ranks are replaced by the method devised by Booth and Chua (1996). I first estimate a prediction model using known rankings, yielding C-M rank = 0.997 + 0.8063ln(proceeds underwritten) + 0.0979(mean offer price), where proceeds underwritten is the bank's 1990s' total IPO proceeds underwritten and mean offer price is the average of those IPOs (all coefficients have $p = 0.01$, adjusted R^2 is 0.60). Missing ranks are then replaced by their predicted ranks using the prediction model. The last two are Herfindahl – the Herfindahl – Hirschman index – which is the sum of the lead banks' squared annual share of the value of IPOs, and Top4, the top four banks' annual share of the value of IPOs. Both constructed with market share data reported in Investment Dealer's Digest annual IPO League Table's (p-values are in parentheses).

Independent variable	IPO sample and estimation method					
	7% IPOs, tobit (1)	7% IPOs, tobit (2)	7% IPOs, OLS (3)	Non-7% IPOs, tobit (4)	7% IPOs, tobit (5)	7% IPOs, tobit (6)
Intercept	− 3.66 (0.001)	− 3.79 (0.001)	− 0.33 (0.001)	− 2.47 (0.001)	− 4.04 (0.001)	− 4.06 (0.001)
ln(proceeds)	0.66 (0.001)	0.61 (0.001)	0.15 (0.001)	0.15 (0.089)	0.60 (0.001)	0.60 (0.001)
Volatility	1.84 (0.448)	1.98 (0.406)	− 1.37 (0.370)	3.69 (0.483)	2.20 (0.353)	2.24 (0.368)
Secondary	0.31 (0.131)	0.26 (0.197)	0.12 (0.041)	0.09 (0.847)	0.26 (0.199)	0.26 (0.203)
EBIT/proceeds	− 0.41 (0.001)	− 0.43 (0.004)	− 0.74 (0.831)	0.06 (0.801)	− 0.42 (0.005)	− 0.41 (0.006)
Debt/capital	− 1.11 (0.001)	− 1.06 (0.001)	− 0.28 (0.001)	− 0.71 (0.018)	− 1.07 (0.001)	− 1.07 (0.001)
C-M rank		4.32 (0.001)	1.04 (0.001)	1.16 (0.719)	6.02 (0.001)	6.07 (0.001)
Herfindahl					0.00 (0.834)	
Top4						− 0.33 (0.792)
Number	1,195	1,195	1,190	304	1,195	1,195
Log likelihood	1,337	1,337		334	1,337	1,337
Adjusted R^2			0.10			

is not a predetermined variable but is instead linked to the choice of underwriter. Underpricing is set just prior to going public, which is typically well after the time the underwriter is chosen. However, that choice might depend to some degree on the anticipated underpricing that is associated with the bank. There is no theoretical or empirical literature on underwriter reputation to suggest how to empirically model both underpricing and investment bank reputation. Nevertheless, to examine this possibility, I investigate a system of two simultaneously estimated equations, one in which underpricing depends on reputation and one in which reputation depends on underpricing. Although not reported here, the results of the underpricing–reputation relation in this system of equations is similar to the results reported in this section.

Model 3 reports ordinary least squares estimates for Model 2, in which the dependent variable is unadjusted underpricing measured relative to the closing price ten trading days after the IPO to reduce the influence of stabilization. The estimates are qualitatively similar to the Model 2 tobit estimates, although earnings before interest and taxes are less significant.

To test the second hypothesis, Model 2 is estimated for non-7% IPOs. The Model 4 estimates show that non-7% underpricing is independent of most of the quality factors. By contrast, 7% IPO underpricing shows greater sensitivity to these factors. These results are consistent with greater underpricing adjustments to absorb a greater portion of placement costs in 7% IPOs, as predicted by the efficient contract theory. The evidence that risk and other qualities of the IPO are priced in the 7% contract's total price also seems to argue against a resale price maintenance explanation for the 7% spread. That notion would suggest that issuers have a tendency to free ride on their bank's pre-IPO services by switching to another bank in the eleventh hour to fetch a better contract price, which would undermine the competitive supply of services in the IPO market. However, having a 7% spread on all IPOs would not effectively curb this eleventh hour incentive because it does not halt the competition in the IPO's total price.

5. Further tests for abnormal profit

The evidence thus far favors the efficient contract theory over the cartel theory. Nevertheless, there remains the important prospect that a subtler form of collusion is present that is undetectable by the above tests. I now consider three explanations for why the tests could have missed the hypothesized profits.

5.1. Extensive collusion

Perhaps the collusion is far-flung, so that profit from 7% is diffused over many revenue sources and invisible to the above tests. Table 2 shows similar

IPO and SEO market structures, as does *Investment Dealer's Digest* 1998 League Tables, whose top 15 lead banks are the same for IPOs and SEO. Thus, a far-flung collusion should be evident in the SEO market. Note, however, that similar market structures are also predicted by competition, since a market leader that excels with one product should succeed with similar products. IPOs and SEOs are similar transactions, and a bank's capital and its reputation share common ground. Thus, one hypothesis is that a fixed spread contract is also used in the SEO market. Alternatively, a fixed spread contract would not occur in the SEO market if it evolved uniquely to suit IPOs.

I examine matched mean spreads paid in 1990s industrial primary SEOs. Each IPO is matched with the mean spread for the portfolio of SEOs in the same offer year and in the same proceeds size category (as reported in Table 1). Four of the 117 year-size SEO portfolios are empty and their missing mean spreads are replaced with the mean in the prior year's same size portfolio. Fig. 5 reports the matched SEO spreads. A fixed spread, at 7% or another rate, is not evident in SEOs in the 1990s. It does not seem as though a subtle broad collusion is present.

5.2. Indirect profiting

Perhaps there is a collusion among investment banks in the IPO market that is extraordinary in that it requires a fixed 7% spread while profiting circuitously through a different route. One potential profit route is underpricing. Underwriters are legally required to sell all new shares at no more than the offer price. However, perhaps they allocate a significant portion of those shares to repeat customers who effectively return the 7% IPO profit by purchasing other products and services from the lead bank at extracompetitive prices. Thus, one hypothesis is that lead banks earn abnormal profits from 7% IPOs circuitously in the underpricing. Alternatively, underpricing under competition does not provide abnormal profit.

Typically, profit, even if collected circuitously, will be correlated with concentration. Thus, if underpricing holds the profit then it should be positively correlated with concentration in the IPO market. I augment Model 2 in Table 5 with the Herfindahl-Hirschman index and the market share of the top four banks, both measured using *Investment Dealer's Digest* annual League Tables. The Model 5 estimates show that underpricing is independent of the Herfindahl-Hirschman index. The Model 6 estimates show that underpricing is independent of the top four banks' market share. These results are not consistent with the theory that profit is in the underpricing, and do not support the cartel theory.

Another potential profit route is fees paid to lead banks by IPO firms in their subsequent, first SEO. One hypothesis is that underwriters charge excessive spreads in IPO firms' first SEO. Alternatively, the efficient contract theory

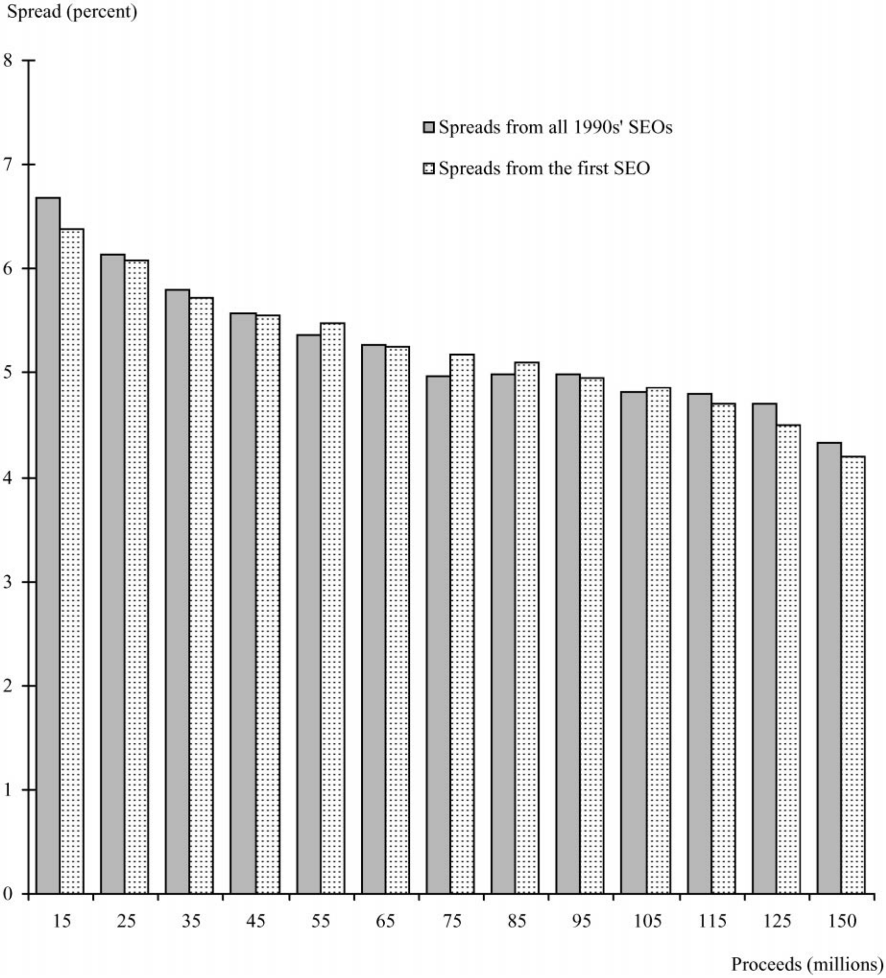


Fig. 5. Matched mean spreads in two samples of industrial primary seasoned equity offerings (SEOs) in the 1990s. In the first sample, each IPO is matched with the mean spread for the portfolio of SEOs in the same offer year and in the same proceeds size category ($15 denotes proceeds from $10 to $20 million, $25 denotes proceeds from $20 to $30 million, etc.). The second sample is spreads paid by IPO firms in their first SEO within five years of going public. Column heights portray mean spreads.

predicts that first SEO spreads behave like other SEO spreads. I examine issuers' first SEOs within five years of the IPO. Because some SEOs occur after five years and five years have not lapsed for IPOs late in the sample period, this understates first SEOs. The first SEO spreads are reported in

Fig. 5 and are quite similar to other SEO spreads. These results are inconsistent with the theory that profit is in future SEO spreads, and thus argue against collusion.

6. Conclusions

This paper examines two theories for the widespread use of a 7% spread in IPOs. The cartel theory is that there is collusion, which could be explicit or implicit, to earn monopoly profit from the 7% spread. The efficient contract theory is that the 7% contract is a competitive innovation of the firm commitment contract that best suits the IPO.

The results of this study show that the IPO market is unconcentrated, entry into the market has been strong, and 7% does not contain abnormal profits relative to other IPOs. Moreover, the 7% contract has persisted despite the Department of Justice investigation of collusion allegations, arguing strongly against collusion. There is no evidence of monopoly profit in underpricing or unusual charges in subsequent SEOs, nor does a fixed spread contract appear to be used in the closely related SEO market. The results are thus consistent with competition among investment banks in the pricing of 7% IPOs on the basis of their reputations, placement service, and underpricing to complement the 7% spread. While I cannot rule out that a persistent collusion exists that cannot be detected by the above tests, the results from the well-known tests for collusion, as well as from the newer tests, argue against collusion.

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