

The IPO and first seasoned equity sale: Issue proceeds, owner/managers' wealth, and the underpricing signal

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Abstract

Recent models of IPO underpricing suggest that high-quality firms underprice their IPOs to differentiate themselves from low-quality firms and, thus, receive a more favorable market response to subsequent equity offerings. We test this suggestion for 172 industrial firms that made an initial public offering during 1987-1991 and made a subsequent seasoned equity offering within three years of their IPO. We examine two measures of the impact of the hypothesized underpricing signal net of the cost of employing that signal. Inconsistent with the underpricing signal hypothesis, we find no evidence that firms recover the cost of an underpriced IPO in either higher issue proceeds or in greater wealth for the firm's initial owners.

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1. Introduction

A number of recent models of IPO underpricing suggest that owner/managers of high-quality firms choose to underprice their initial public offering in order to differentiate themselves from low-quality firms and, thus, receive a more favorable market reaction to subsequent seasoned equity offerings.¹ Most empirical tests of this signaling hypothesis have examined the relation between IPO underpricing and the probability of a subsequent seasoned offerings and have produced mixed results. Jegadeesh et al. (1993) find a positive relation between IPO underpricing and the likelihood of a subsequent seasoned equity offering. In contrast, Carter (1992) finds that higher reputation for the IPO underwriter is associated with less underpricing at the IPO and with a greater likelihood of a subsequent offering of either debt or common equity. Garfinkel (1993) finds that IPO underpricing is unrelated to the probability of a subsequent seasoned equity offering after controlling for other variables associated with underpricing.

In contrast to the previous empirical studies that examine the correlation between IPO underpricing and the probability of a subsequent offering, Slovin et al. (1994) examine the relation between IPO underpricing and the stock price reaction to the announcement of the firm's first seasoned equity issue. They find that greater IPO underpricing is associated with a less negative share price response to the announcement of a subsequent seasoned equity offering and they conclude this is evidence consistent with the underpricing signal hypothesis. However, Slovin et al. (1994, p. 208) also note that focusing on the stock price reaction to the seasoned offering announcement may not provide a sufficient characterization of the trade-offs implied by an IPO underpricing signal: "... the gain in market value obtained at the first seasoned equity issue as a result of underpricing the IPO is small relative to the loss in gross proceeds due to underpricing the IPO."

The purpose of this study is to test the signaling hypothesis more precisely. We develop two empirical measures of the impact of the hypothesized IPO underpricing signal net of the cost of employing that signal. The first is a measure of cash flows to the firm. The firm's net proceeds from the two equity sales are combined to test whether reduced proceeds due to underpricing at the IPO are made up by increased proceeds from the first seasoned equity sale. The second measure is the wealth change for the firm's insiders as a result of the two equity sales. Distinguishing the firm from its initial owner/managers is important because the owner/managers bear the cost of the underpricing in two ways. First, selling new shares for less than their true value results in a wealth transfer from

¹ See Allen and Faulhaber (1989), Grinblatt and Hwang (1989), Welch (1989), and Chemmanur (1993).

insiders to the new shareholders. Second, if the owner/managers participate by selling personal shares in the initial offering, then there is the additional cost of reduced proceeds from that secondary sale. We use our insider wealth change measure to test whether wealth lost due to underpricing at the IPO is recovered by increased wealth gains by the time of the first seasoned equity offering.

Using a sample of 172 industrial firms that made an initial public offering during the period 1987–1991 and made a subsequent seasoned equity offering within three years of their IPO, we document that greater IPO underpricing does not result in larger net cash flows to the firm. The combined issue net proceeds are a significantly negative function of the IPO initial return. Further, the wealth change for the firm's officers and directors is unrelated to IPO underpricing. These results are inconsistent with the signaling hypothesis and they persist even after controlling for variables previously shown to be associated with IPO underpricing.

2. Sample selection

The sample consists of firms that made an initial public offering during the period 1987–1991 and made a subsequent seasoned common equity offering within three years of the IPO. Because our specific objective is to test whether firms recover the cost of an IPO underpricing signal with increased value for their subsequent seasoned equity offering, we do not choose a general sample of IPOs. Instead, we follow the methodology of Slovin et al. (1994) and choose IPO firms that also make a seasoned equity offerings during the sample period. In addition, we choose a relatively short window between the initial and subsequent seasoned equity offering to focus on firms most likely to fit the scenario described in the signaling models – firms that choose to make a partial sale at the time of the initial offering with the anticipation of a subsequent seasoned offering.

The sample is identified by examining common equity offerings reported in *Investment Dealers' Digest Corporate Securities Offerings*. To be retained in the sample, observations must meet the following criteria: (1) The firm is an industrial operating firm based on its Standard Industrial Classification (SIC) code – financial firms (SIC codes 6000–6999) and utilities (SIC codes 4900–4999) are excluded; (2) both the initial and seasoned offerings are for common stock only – joint offerings with other securities and unit offerings such as stock-warrant packages are excluded; (3) the firm has only one class of common stock outstanding; (4) the firm is listed on the CRSP daily NYSE/Amex or NASDAQ tape following the initial public offering; and (5) the initial and seasoned offering prospectuses are available from the Securities and Exchange Commission via Disclosure Information Services. The offering prospectuses are the source

Table 1
Distribution of the sample by years of offerings

IPO year	Year of first seasoned equity offering								Total
	1987	1988	1989	1990	1991	1992	1993	1994	
1987	2	8	10	3					23
1988		1	11	4	3				19
1989			2	7	17	3			29
1990				2	17	4	2		25
1991					12	38	21	5	76
Total	2	9	23	16	49	45	23	5	172

The sample includes firms that make both an initial public offering and a subsequent seasoned common equity offering. The initial offering occurred during the period January 1987–December 1991, as reported in the *Investment Dealers' Digest Corporate Securities Offerings*. To be retained in the sample, observations must meet the following criteria: (1) The firm made a subsequent seasoned equity offering within three calendar years of its initial offering; (2) the firm is an industrial operating firm; (3) both the initial and seasoned offering are for common stock only; (4) the firm has only one class of common stock outstanding; (5) the firm is listed on the CRSP daily NYSE/Amex or NASDAQ tape following the initial public offering; and (6) the initial and seasoned offering prospectuses are available from the Securities and Exchange Commission.

for the number of primary and secondary shares offered, offering prices, underwriting costs, and shareholdings of the owner/managers prior to and after each offering.

The resulting sample consists of 172 pairs of equity offerings, 130 by NASDAQ-listed firms and 42 by exchange-listed firms. The sample includes industrial firms with 82 different 4-digit SIC codes and 70 different 3-digit SIC codes. The distribution of the sample by calendar year of the offerings is presented in Table 1. Note that the majority of the offerings, both initial and seasoned offerings, occur in the later part of the sample period, with 76 of the 172 initial offerings occurring in 1991.

Sample descriptive statistics are presented in Table 2. IPO characteristics are presented in panel A. At the initial offering, the mean and median gross proceeds to the firm are \$31.0 million and \$18.3 million, respectively. In addition, the firms' officers and directors received gross proceeds averaging \$6.1 million from secondary share sales at the IPO (the median is \$0.2 million).² This average IPO size is larger than that of a general sample of IPOs. For comparison, the mean IPO size reported by Ritter (1991) is \$13.81 million. This size difference is probably due to our sample selection requirement that the firms survive

² A zero value for gross proceeds to the firm indicates a purely secondary sale and a zero value for gross proceeds to owners indicates a purely primary sale. There are two firms for which both the IPO and the first seasoned offering were purely secondary sales. While these are the only cases of purely secondary sales at the IPO, purely secondary sales are more common at the seasoned offering, occurring in 28 of the 172 cases.

to make a subsequent seasoned equity offering and, perhaps, the impact of a more recent sampling period. Our average IPO size is also larger than the \$16.2 million mean size reported by Slovin et al. (1994) for a sample of 175 IPO-seasoned offering pairs over the period 1973–1988. This probably reflects the fact that our sample contains both exchange-listed and NASDAQ-listed IPOs, while Slovin et al. include only NASDAQ-listed IPOs which tend to be smaller firms. In addition, the time period of this study, 1987–1994, is more recent which may reflect historically increasing market values.

The mean IPO initial return for our sample, defined as the return from purchasing shares at the initial offer price and selling at the closing price on the day of the offering, is 10.0%. This is less than the average initial return found in many prior IPO studies but is greater than the average initial returns reported by Carter et al. (forthcoming and Barry and Jennings (1993)). The average firm size prior to the IPO, estimated as the number of shares outstanding prior to the IPO multiplied by the IPO offer price, is \$105.7 million and insiders retain an average of 41.6% of the firm's shares after the initial offering.

Characteristics of our seasoned equity offerings are presented in panel B of Table 2. The mean and median gross proceeds to the firm as a result of the seasoned offering are \$26.1 million and \$18.9 million, respectively. Officers and directors own 36.4% of the firm's outstanding shares prior to the seasoned offering and they receive gross proceeds averaging \$22.1 million from secondary share sales at the seasoned offering (the median is \$5.3 million). Thus, the mean secondary sale by officers and directors is much larger at the seasoned equity offering than at the initial offering. These insider sales represent an average sale of 4.0% of the firm's total shares outstanding before the seasoned offering.

A description of the interim period between the IPO and subsequent seasoned equity offering is presented in panel C of Table 2. Many of the sample firms returned to the public equity market very quickly. Two of the seasoned offerings occurred only three months after the initial offering and 71 of the sample firms made seasoned equity offerings within a year of their initial public offering. The average time between the two offerings is 337 trading days, about 1.3 years, and the median time is 300 trading days, about 1.2 years. The sample firms experienced significant stock price appreciation prior to their seasoned offerings. Accounting for stock splits and stock dividends, the mean stock price appreciation for the sample firms is 63.8%, while the mean return on the CRSP value-weighted NASDAQ index for the matching calendar period is 12.8%. These results are in marked contrast to the performance of a more general sample of IPOs. For example, Ritter (1991) reports that a sample of 1526 firms that went public during 1975–1984 underperformed the NASDAQ value-weighted index during a three-year post-IPO holding period. Thus, the sample IPO firms that quickly return to the market with a seasoned equity offering are not the typical IPO firms with respect to their post-issue performance. The post-IPO

Table 2
Descriptive statistics for initial and first seasoned equity offerings

	Mean	Median	Minimum	Maximum
<i>Panel A: IPO characteristics</i>				
Gross proceeds to the firm (\$M)	31.0	18.3	0.0	450.0
Gross proceeds to owners (\$M)	6.1	0.2	0.0	101.5
Initial return (%)	10.0	4.4	-8.3	75.0
Firm size prior to IPO (\$M)	105.7	59.1	5.9	1207.5
^a Shares retained by insiders (%)	41.6	43.9	0.5	94.9
Underwriter quality	8.2	8.8	3.0	9.0
<i>Panel B: Seasoned equity offering characteristics</i>				
Gross proceeds to the firm (\$M)	26.1	18.9	0.0	200.0
Gross proceeds to owners (\$M)	22.1	5.3	0.0	468.6
Firm size prior to offering (\$M)	253.1	146.0	8.5	3050.0
^a Insider shares before offering (%)	36.4	33.8	0.0	93.1
^a Insider shares sold (%)	4.0	0.7	0.0	43.3
Underwriter quality	8.3	8.8	1.0	9.0
<i>Panel C: Interim period characteristics</i>				
Trading days between issues	337	300	63	760
Stock price appreciation (%)	63.8	52.8	-90.6	472.5
Market index appreciation (%)	12.8	14.2	-30.6	51.8
Abnormal return (%)	51.1	37.6	-106.8	453.0

^a Based on the 164 firms with data available for officer/director shareholdings at both offerings. Sample descriptive statistics for selected offering and interim period characteristics for 172 industrial firms that made an initial public offering during the period January 1987–December 1991 and made a subsequent seasoned equity offering within three years of the initial offering. Gross proceeds to the firm (owners) is the offer price multiplied by the number of primary (secondary) shares sold. Initial return is the percentage change from the IPO offer price to the closing price on the first day of trading. Firm size prior to an offering is estimated as the offer price multiplied by the number of shares outstanding prior to the offering. Insiders are defined to be all officers and directors of the firm. Underwriter quality is measured using the Carter–Manaster (Carter and Manaster, 1990) rank as updated in Carter et al. Stock price appreciation is the percentage change from the IPO closing price to the seasoned issue offer price (adjusted for any stock splits or dividends) and market index appreciation is the percentage change in the CRSP value-weighted NASDAQ index over the same calendar period.

performance of this sample is, however, quite similar to that reported by Slovin et al. (1994) for their sample of IPO-seasoned offering pairs.

3. Methodology for measuring the impact of the equity offering pair

To assess the impact of IPO underpricing as a signal of firm quality, we need to measure the net result of trading reduced IPO proceeds against more favorable performance at the subsequent seasoned equity offering. To do this, we de-

velop two simple empirical metrics for the impact of the equity offering pair. The first measures net proceeds for the firm and the second measures the change in personal wealth for the firm's owner/managers. This section concludes with summary statistics from applying these two measures to our sample of IPO-seasoned offering pairs.

3.1. Firm cash flow measure

This section develops a simple empirical measure of the cash flows from the initial and subsequent seasoned equity offerings. The process is based largely on the theoretical model of Chemmanur (1993) in that the objective of the firm is to maximize the expected present value of proceeds from the initial public offering and the subsequent seasoned equity offering.

At time 0, the firm has a capital budget requiring an investment of C dollars in new activities. The owner/managers and the selected underwriter set the per-share price for the IPO and, jointly, determine the number of shares that must be sold to raise the needed proceeds, C . Additional shares are sold in a seasoned offering at time t . The objective of the firm is to maximize the expected present value of total cash proceeds from the two issues:

$$N_{p1} (P^* - D - f_{p1}) + N_{p2} (P_2 - f_{p2}) e^{-rt}, \quad (1)$$

where

N_{p1} = number of shares sold at the initial public offering,

N_{p2} = number of shares sold at the seasoned equity offering,

P^* = the "true" per-share value of the initial offering,

D = dollar underpricing per share at the initial offering ($D = P^* - P_1$, where

P_1 is the offer price per share at the initial offering),

P_2 = offer price per share for the seasoned offering,

f_{p1} = per-share underwriting spread plus selling costs for the initial offering,

f_{p2} = per-share underwriting spread plus selling costs for the seasoned offering,

r = continuously compounded interest rate, and

t = time between the initial and seasoned offerings.

Under this model, the firm will choose to underprice its initial public offering only when it expects to obtain the benefit of selling seasoned shares at a higher price. Thus, Eq. (1) implies a tradeoff of the proceeds from the initial offering against the present value of proceeds from the seasoned offering. The empirical prediction of the signaling models is that IPO underpricing is directly related to the present value of the combined proceeds from the two offerings.

3.2. Insider wealth measure

The above cash flow measure does not distinguish the flow of funds to the firm from the flow of funds to its owner/managers. As discussed in Barry (1989), this distinction is important because the firm's original owner/managers bear the potential cost of the underpricing both as a wealth transfer to new shareholders when new shares are sold for less than their true value, and as reduced proceeds for any personal shares that they sell in the offering. If the signaling models are correct, then owner/managers of high-quality firms who use IPO underpricing as a signal of firm quality will not want to sell their secondary shares at the IPO. Rather, they will choose to sell shares at a later date in order to benefit from the IPO underpricing signal. In contrast, owner/managers of low-quality firms will not choose IPO underpricing as a mechanism for signaling firm quality and, all else being equal, have a greater incentive to sell personal shares at the time of the IPO. Because maximizing the net proceeds to the firm may not be equivalent to maximizing the wealth of the original owner/managers, we focus here on the role of insider choice in the initial-seasoned offering pricing relationship. Specifically, we examine the impact of pricing choices on the personal wealth of owner/managers.

The objective of the owner/manager is to maximize the expected present value of his or her wealth change from the two issues:

$$\Delta W_1 + \Delta W_2 e^{-rt}, \quad (2a)$$

where

ΔW_1 = owner/manager's wealth change from the initial public offering,

ΔW_2 = owner/manager's wealth change from the seasoned offering,

r = continuously compounded interest rate, and,

t = time between the initial and seasoned equity offerings.

The owner/managers are endowed with an investment of V_0 , represented by N_0 shares with an unobservable initial market value of P^* per share, and a capital budget that will cost C to implement. As in the net proceeds measure, the insider group and their chosen underwriter decide the initial offer price (P_1) and, jointly, the number of new, or primary, shares to sell (N_{p1}). In addition, owner/managers decide how many personal, or secondary, shares to sell (N_{s1}). The firm receives the proceeds from the primary shares sold and the owner/managers receive the proceeds from the secondary shares they sell. The new number of shares outstanding will be $(N_0 + N_{p1})$ and the owner/manager group will own $(N_0 - N_{s1})$ of those shares. At the seasoned equity offering,

the owner/manager group again decides how many secondary shares to sell.³ The owner/managers' wealth change at the initial public offering is:

$$\Delta W_1 = N_{s1} (P^* - D - f_{s1}) + (N_0 - N_{s1}) P_1^c - N_0 P^* \quad (2b)$$

and the wealth change at the seasoned equity offering is

$$\Delta W_2 = N_{s2} (P_2 - f_{s2}) + N_{sf} (P_2) - (N_0 - N_{s1}) P_1^c, \quad (2c)$$

where

N_{s1} = number of shares sold by owner/managers at the initial offering,
 N_{s2} = number of shares sold by owner/managers at the seasoned offering,
 N_{sf} = number of shares owned by owner/managers after the seasoned offering ($N_{sf} = N_0 - N_{s1} - N_{s2}$),
 P^* = the (unobservable) "true" per-share market value of the initial offering (derived from the post-IPO market price),
 D = dollar underpricing per share at the initial offering ($D = P^* - P_1$, where P_1 is the initial offer price per share),
 P_1^c = post-IPO closing market price per share,
 C = net proceeds from primary shares sold at the initial offering ($C = N_{p1}(P_1 - f_{p1})$),
 P_2 = offer price per share for the seasoned offering,
 f_{s1} = per-share underwriting spread plus selling costs for the initial offering, and
 f_{s2} = per-share underwriting spread plus selling costs for the seasoned offering.

The first term in Eq. (2b) is the proceeds from secondary shares sold at the initial public offering and the second term is the value of the shares retained by the owner/managers. Thus, the wealth change is the difference between these two terms and the initial investment of $V_0 = N_0 P^*$. For empirical tests, the unobservable true market value of the pre-IPO shares is derived from the post-IPO closing market price as follows: If the true pre-IPO value per share is P^* , then the value of the owner/managers initial shares is $N_0 P^*$ and the value of the firm after the initial public offering is the sum of that initial value and the proceeds from the primary portion of the offering ($N_0 P^* + C = N_0 P^* + N_{p1} P_1$). Dividing by the number of shares outstanding in the newly public firm gives the per-share value of the retained shares, assumed equal to the post-IPO closing market price ($P_1^c = (N_0 P^* + N_{p1} P_1) / (N_0 + N_{p1})$). Thus

³ For simplicity, we assume that there are no open market sales or purchases of shares or exercises of stock options in the intervening time period between the IPO and subsequent seasoned offering. An alternative interpretation is that we value all such sales or purchases at the seasoned offering price.

the post-IPO closing market price is a weighted average of the true market value (P^*) and the initial offer price (P_1).

Note that underpricing affects the change in wealth at the initial offering (ΔW_1) in two ways. Greater underpricing means smaller proceeds from the sale of the N_{s1} shares, a smaller first term, and also means that more primary shares must be sold to generate the required investment of C dollars. A larger N_{p1} means greater dilution of the value of the newly formed public firm and, thus, less value for the owner/managers' retained shares, a smaller second term. Under the signaling models, only the owner/managers of high-quality firms will choose to bear this cost, and will be rewarded with greater price appreciation prior to the seasoned offering, a greater ΔW_2 .

Thus, we have developed an empirical measure to test whether IPO underpricing is consistent with maximization of the change in owner/managers' wealth.⁴ The empirical prediction of this measure is similar to that of the firm net proceeds measure in Eq. (1), except that the focus is on the original owners, not on the firm. Eq. (2a) implies a tradeoff of the wealth change from the initial public offering against the present value of the wealth change from the seasoned equity offering. The empirical prediction is that IPO underpricing is directly related to the present value of the combined wealth change from the two offerings.

3.3. *Applying these measures to the sample*

Table 3 contains summary statistics for our two measures of the impact of the IPO-seasoned offering pairs. Applying the net proceeds measure to the sample firms produces the summary statistics reported in panel A.⁵ The mean net proceeds from the initial public offering is \$28.7 million, with a median of \$16.7 million. The mean net proceeds from the subsequent seasoned offering is \$24.7 million, with a median of \$17.7 million. Assuming a zero discount rate, the mean combined impact of the equity offering pair is a net proceeds of \$53.4 million.⁶ Standardizing by size shows that the mean combined net proceeds is 65.7% of the estimated pre-IPO equity value of the firm.

⁴ A numerical example that applies this measure is available from the authors.

⁵ The two firms, described in footnote #2, for which both the IPO and the seasoned offering were sales of existing shares only are omitted from the net proceeds analysis as they result in zero net proceeds to the firm. Including them in the regressions does not change the primary results of that analysis.

⁶ Because of the short average time between the IPO and seasoned offering, assuming a zero discount rate has little impact on our empirical results. We have repeated the analysis assuming discount rates of 4%, 6%, or 8% and the regressions results are qualitatively identical to those presented with the zero discount rate, so they are not reported.

Table 3
Issue net proceeds and wealth change measures

	Mean	Median	Minimum	Maximum
<i>Panel A: Issue net proceeds measure ^a</i>				
IPO net proceeds (\$M)	28.7	16.7	2.3	423.8
Seasoned offering net proceeds (\$M)	24.7	17.7	0.0	191.6
Combined net proceeds (\$M)	53.4	37.6	3.4	561.2
IPO net proceeds (% of pre-IPO equity value ^b)	30.2	25.9	2.0	212.1
Seasoned offering net proceeds (%)	35.6	31.2	0.0	151.9
Combined net proceeds (%)	65.7	58.7	2.0	230.5
<i>Panel B: Wealth change measure for all officers and directors ^a</i>				
IPO wealth change (\$M)	-1.9	-0.5	-23.1	3.0
Seasoned offering wealth change (\$M)	33.7	12.8	-74.4	448.6
Combined wealth change (\$M)	31.7	11.7	-84.1	428.1
IPO wealth change (% of pre-IPO investment ^c)	-3.0	-2.2	-21.4	4.5
Seasoned offering wealth change (%)	57.8	44.7	-90.3	362.8
Combined wealth change (%)	54.8	38.9	-90.6	361.2
<i>Panel C: Wealth change measure for the primary shareholder ^a</i>				
IPO wealth change (\$M)	-0.8	-0.2	-6.3	1.6
Seasoned offering wealth change (\$M)	15.2	4.7	-6.1	211.8
Combined wealth change (\$M)	14.4	4.4	-7.2	207.4
IPO wealth change (% of pre-IPO investment ^d)	-3.0	-2.1	-24.8	4.5
Seasoned offering wealth change (%)	62.5	47.5	-76.8	344.8
Combined wealth change (%)	59.5	41.8	-86.8	343.0

^a The sample sizes for Panels A, B and C are 170, 164 and 133.

^b The pre-IPO equity value is the number of shares outstanding prior to the IPO (N_0) multiplied by the "true value" (P^*), where P^* is derived from the offer price (P_1), the post-IPO closing market price (P_1^c), the number of existing shares (N_0), and the number of new shares issued (N_{p1}), according to the following expression: $P_1^c = (N_0 P^* + N_{p1} P_1) / (N_0 + N_{p1})$.

^c The value of the officers/directors' pre-IPO equity investment is the number of shares owned by officers and directors prior to the IPO multiplied by P^* .

^d The value of the primary shareholder's pre-IPO equity investment is the number of shares owned by the primary shareholder prior to the IPO multiplied by P^* .

Sample distribution statistics for our empirical measures of the impact of IPO-seasoned equity offering pairs for industrial firms that made an initial public offering during the period January 1987-December 1991 and made a subsequent seasoned equity offering within three years of the IPO. The issue net proceeds measure is computed using Eq. (1), the wealth change measure in Panel B is computed using Eq. (2a) for the shareholdings of all officers and directors combined, and the wealth change measure in Panel C is computed using Eq. (2a) for the shareholdings of the primary shareholder. Each equation is evaluated with a zero discount rate.

Applying the insider wealth change measure to the sample firms produces the summary statistics reported in panels B and C of Table 3. Insider shareholdings are available from the prospectuses for 164 of the 172 sample firms. In panel B, the wealth change measure is computed for all officers and directors. Because the wealth change at the initial public offering explicitly accounts

for the negative impact of selling underpriced shares, it is not surprising that the wealth change at the IPO is negative on average. The mean wealth change for all officers and directors is $-\$1.9$ million at the time of the initial offering and $\$33.7$ million at the seasoned equity offering. Assuming a zero discount rate, the combined impact is a mean wealth change of $\$31.7$ million. This represents 54.8% of the estimated market value of the insiders' pre-IPO equity investment.

The wealth change measure reported above is computed for all officers and directors as a group. In particular, we cannot determine from those statistics whether the selling shareholders at the initial offering are the same as the selling shareholders at the seasoned offering. Because the signaling theories are based on a partial sale of ownership at the initial offering followed by additional share sales at the secondary offering, we also measure the change in wealth for the individual shareholder with the largest stake in the firm at the time of the initial public offering. This individual is typically the president and CEO of the firm and is referred to here as the primary shareholder. The offering prospectus is used to identify the individual's name and shareholdings prior to and after both the initial offering and seasoned equity offering. Thirty one of the sample firms either have only corporate or institutional owners at the time of the initial offering, or it was not possible to track the individual with the largest shareholding across both offerings. These firms are omitted and the resulting sample of primary insider shareholdings consists of 133 firms. Statistics analogous to those found in panel B are presented for the primary shareholder in panel C of Table 3. The percentage wealth gains for the primary individual owner are quite similar to those for all officers and directors as a group. The mean combined wealth change for the primary owner represents 59.5% of his or her pre-IPO equity investment in the firm.

4. Empirical results for the equity offering pairs

4.1. IPO underpricing and secondary share sales

Because the wealth change measure depends on the owner/manager's decision to sell secondary shares, we first present some summary statistics about the incidence of secondary share sales and the relation between IPO underpricing and secondary share sales. Since underpricing is common and well known at the IPO, it would appear that few insiders would choose to sell secondary shares at the IPO. This is especially true if the signaling models are correct since these insiders would gain much more wealth by delaying their sales until the seasoned equity offering. In fact, Grinblatt and Hwang (1989) include insider ownership retention as a joint signal with IPO underpricing in their model.

A summary of secondary sales by our sample firms is presented in Table 4. Panel A presents results for the full sample and for subsamples based on IPO underpricing and on pre-IPO firm size, while panel B describes the interaction of pre-IPO firm size and IPO underpricing on the incidence of secondary share sales. The overall incidence of secondary share sales is quite high. From panel A of Table 4, we see that 75% of the full sample has a secondary sale either at the IPO, the seasoned offering or both, and 50% of the full sample has a secondary sale at the initial public offering. In addition, this secondary selling activity is more common among the firms that have underpriced initial offerings; 76.5% of the firms with underpriced IPOs have some secondary share sales, while only 71.7% of the firms with non-underpriced IPOs have secondary share sales. If we focus on secondary share sales at the initial offering, 51.3% of the firms with underpriced IPOs have a secondary share component of the initial sale. The corresponding number for firms with non-underpriced IPOs is 47.2%. These differences in percentages across the two underpricing subsets are not, however, statistically significant at conventional levels.

Because the reason for selling secondary shares may be quite different for insiders in larger, more mature firms going public than for insiders in smaller, start-up firms, we also segment the sample based on the median pre-IPO firm size. The overall incidence of secondary share sales is almost identical across these two firm size categories. Firms below the median size have secondary sales in 74.4% of the cases, while 75.6% of the larger firms have secondary share sales. The incidence of secondary sales at the IPO is also quite similar across the firm size categories – 48.8% of the smaller firms and 51.2% of the larger firms have secondary sales at the IPO. The difference between the two firm size categories is that the larger firms are less likely to have a secondary sale at the IPO and not follow that with an additional secondary sale at the seasoned offering. For the smaller firms, 15.1% have secondary sales at the IPO and not at the seasoned offering. For the larger firms, the corresponding value is only 4.7%. These differences in percentages across the two firm size subsets are significant at the 0.10 level.

The pattern presented in panel A provides little support for the theory of signaling with underpricing. Underpricing should be more prevalent among firms that have secondary share sales at the seasoned offering after the signal has been realized, but not at the initial offering. Of the 43 firms in this category, 30 ($30/43 = 70\%$) are firms with underpriced IPOs, which is essentially identical to the overall incidence of IPO underpricing in the sample ($119/172 = 69\%$). In addition, IPO underpricing is more prevalent among the firms that have secondary share sales at the initial offering, but not at the seasoned offering. An even higher percentage of the firms in this category ($15/17 = 88\%$) are firms with underpriced IPOs and these are the owner/managers who would, intuitively, not choose IPO underpricing. One possible explanation for this finding is that secondary share selling at the initial offering exacerbates the problem of

Table 4
Secondary share sales

	Full sample (<i>n</i> = 172)	Underpriced IPOs (<i>n</i> = 119)	Non-underpriced IPOs (<i>n</i> = 53)	Below median firm size (<i>n</i> = 86)	At or above med- ian firm size (<i>n</i> = 86)
<i>Panel A:</i> Number of sample firms selling secondary shares (percentage of column total is in parentheses)					
Firms with secondary shares sold at the IPO but not at the seasoned offering	17 (9.9%)	15 (12.6%)	2 (3.8%)	13 (15.1%)	4 (4.7%)
Firms with secondary shares sold at the seasoned offering but not at the IPO	43 (25.0%)	30 (25.2%)	13 (24.5%)	22 (25.6%)	21 (24.4%)
Firms with secondary shares sold at both the IPO and seasoned offering	69 (40.1%)	46 (38.7%)	23 (43.4%)	29 (33.7%)	40 (46.5%)
Firms with no secondary shares sold at either the IPO or seasoned offering	43 (25.0%)	28 (23.5%)	15 (28.3%)	22 (25.6%)	21 (24.4%)
	Below median firm size		At or above median firm size		
	All firms (<i>n</i> = 86)	Underpriced IPOs (<i>n</i> = 58)	Non-under- priced IPOs (<i>n</i> = 28)	All firms (<i>n</i> = 86)	Underpriced IPOs (<i>n</i> = 61)
<i>Panel B:</i> Number of firms selling secondary shares – underpricing and pre-IPO firm size (percentage of column total in parentheses)					
Firms with secondary shares sold at the IPO but not at the seasoned offering	13 (15.1%)	11 (19.0%)	2 (7.1%)	4 (4.7%)	0 (0.0%)
Firms with secondary shares sold at the seasoned offering but not at the IPO	22 (25.6%)	16 (27.6%)	6 (21.4%)	21 (24.4%)	7 (28.0%)
Firms with secondary shares sold at both the IPO and seasoned offering	29 (33.7%)	17 (29.3%)	12 (42.9%)	40 (46.5%)	11 (44.0%)
Firms with no secondary shares sold at either the IPO or seasoned offering	22 (25.6%)	14 (21.4%)	8 (28.6%)	21 (24.4%)	7 (28.0%)

dilution of ownership and is itself a signal of firm value, as described by Leland and Pyle (1977).

Panel B summarizes the interaction between pre-IPO firm size and IPO underpricing for the incidence of secondary share sales. The relationships between underpricing and secondary share sales described above for the full sample in panel A are also seen for both of the firm size subsets in panel B. In addition, the percentages for the underpriced IPOs are not statistically different from the percentages for the non-underpriced IPOs in either of the two firm size subsets.

4.2. IPO underpricing and the impact of the equity offering pair

We estimate cross-sectional ordinary least squares regressions to analyze the impact of IPO underpricing and other issue characteristics on our measures of the impact of the IPO-seasoned equity offering pairs. The variable UNDP is the IPO initial return, calculated as the percentage change from the IPO offering price to the closing market price on the first day of trading. If the signaling models are correct and managers of high-quality firms choose IPO underpricing to differentiate themselves from low-quality firms and, thus, receive a more favorable market response to their subsequent seasoned equity offering, then UNDP should be positively related to our measures of the impact of the equity offering pair.

In the signaling model, we expect the owners of high-quality firms to retain a higher proportion of firm equity at the IPO and to refrain from selling their personal shares in the initial offering. However, they may be expected to liquidate a portion of their investment during the interim period or as a part of the first seasoned equity offering. To test for these predicted relations, we include the following variables: iRETAIN is the fraction of shares retained by officers and directors following the IPO; iINSELL is the fraction of the firm's outstanding shares that are sold by officers and directors in the IPO; and sINSELL is the fraction of the firm's outstanding shares that are sold by officers and directors in the seasoned equity offering. In addition, the value of the IPO signal should be inversely related to the time that elapses between the IPO and subsequent seasoned offering, so we include the variable Ln(DAYS) which is the natural logarithm of the number of trading days between the two offerings.

To test the robustness of the estimated relations, we also include two variables that have been used in previous empirical studies as proxies for the ex ante uncertainty of the IPO. The first is SIGMA, the after-market standard deviation of returns following the IPO, measured over trading days 2–20. The second is iSIZE, the gross proceeds of the initial offering.

The results of the regression analysis are presented in Table 5. In models (1) through (3), the dependent variable is the combined issue net proceeds, standardized by the estimated pre-IPO equity market value of the firm. The

Table 5
Regression results: IPO underpricing and impact of the equity offering pair

	Combined issue net proceeds ($n = 170$)			Wealth change for officers and directors ($n = 164$)		
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
UNDP	-0.97 (-4.57 ***)	-0.99 (-4.48 ***)	-1.05 (-4.54 ***)	-0.57 (-1.43)	-0.64 (-1.53)	-0.82 (-1.89 *)
iRETAIN		-0.02 (-0.16)	-0.04 (-0.26)		0.28 (1.05)	0.23 (0.82)
iINSELL		-0.69 (-1.30)	-0.63 (-1.16)		-0.16 (-0.17)	0.03 (0.03)
sINSELL		-0.53 (-0.93)	-0.53 (-0.90)		-0.37 (-0.34)	-0.30 (-0.27)
Ln (DAYS)		1.05 (0.21)	1.39 (0.28)		-3.36 (-0.36)	-2.74 (-0.29)
SIGMA			2.19 (1.02)			7.26 (1.82 *)
iSIZE			-0.02 (-0.38)			-0.10 (-0.85)
Constant	75.49 (20.76 ***)	74.71 (2.51 **)	67.42 (2.10 **)	60.72 (8.77 ***)	70.73 (1.27)	49.80 (0.83)
Adj R^2	0.1051	0.1122	0.1090	0.0063	-0.0107	0.0070
F-statistic	20.86 **	5.27 **	3.95 **	2.03	0.65	1.16

*, **, or *** denote significance at the 10%, 5%, or 1% level.

Cross-sectional ordinary least squares regressions where the dependent variable is either the combined issue net proceeds or the wealth change for officers and directors (both standardized by pre-IPO equity values). Estimated regression coefficients are presented with t -statistics in parentheses. UNDP is the IPO initial return. iRETAIN is the fraction of shares retained by insiders following the IPO, iINSELL is the fraction of the firm's outstanding shares sold by insiders in the IPO, and sINSELL is the fraction of the firm's outstanding shares sold by insiders in the seasoned offering. Ln (DAYS) is the natural logarithm of the number of trading days between the IPO and seasoned offering. SIGMA is the after-market standard deviation of returns following the IPO (trading days 2-20) and iSIZE is the size of IPO in millions.

dependent variable in models (4) through (6) is the wealth change for all officers and directors, standardized by the estimated pre-IPO market value of the officers' and directors' equity investment in the firm. Substituting the wealth change of the primary individual owner for the wealth change of all officers and directors provides qualitatively identical regression results, hence they are not reported in Table 5.⁷

When our measure of the impact of the equity offering pair is the combined issue net proceeds, there is no evidence of the predicted positive relation between IPO underpricing and the impact of the offering pair. The estimated coefficient for UNDP is significantly negative in all three models, so net proceeds are inversely related to IPO initial return. These results are inconsistent with the signaling model of underpricing and, in fact, suggest that IPO underpricing makes firms even worse off. This result is robust with respect to the inclusion of other issue characteristic variables.

In regression models (4) through (6), our measure of the impact of the equity offering pair is the wealth change for officers and directors as a result of the offerings. There is much more dispersion in this dependent variable and the regression models used here do not provide a good explanation of that variation. In particular, there is no evidence of a positive relation between IPO underpricing and the wealth change for officers and directors. The estimated coefficient for UNDP is negative in all three regression models; it is significantly negative only in model (6). This evidence is also inconsistent with the signaling model hypothesis that firms use underpricing to signal higher firm quality. The only other significant variable is SIGMA in model (6). In this model, higher after-market standard deviation of returns following the IPO are associated with a greater wealth change for officers and directors. This result may simply reflect the sample selection criterion; since we choose firms that are able to make a subsequent seasoned offering relatively soon after their IPO, it is not surprising that, *ex post*, the riskier firms provided higher returns to their inside investors.

The descriptive statistics in Tables 2 and 3 indicate wide variation in some of the variables. Lacking an *ex ante* motivation for censoring the data, we did not eliminate any of these observations from our analysis. We did, however, investigate the impact of potential outliers on the results of our regression analysis. Based on Cook's distance measure, there are no influential outlier observations in the three wealth change models and only one in the three net proceeds models. Eliminating this one observation from models (1)–(3) leads to slightly better explanatory power for each of these models. The only notable change in the

⁷ At the suggestion of a referee, we also did these regressions using dollar values for the dependent variables and including pre-IPO equity values as standardizing variables. This approach leads to some differences in significance levels of coefficients, but does not change the main conclusions of our analysis, so we do not report those additional results here.

results is that the coefficient on *sINSELL* in models (2) and (3) becomes significantly negative, suggesting that firms with more selling of shares by officers and directors at the seasoned offering have lower combined issue net proceeds. More important, the coefficient for *UNDP* is still negative and significant at the 1% level which is inconsistent with the signaling model of underpricing.

4.3. *The role of IPO underwriter quality*

Carter and Manaster (1990) demonstrate a significantly negative relation between underwriter quality and underpricing. In their study, firms that employed a high-quality underwriter for their IPO experienced lower initial returns. Bhabra and Pettway (1996) find that *ex ante* high-quality firms do employ high-quality underwriters. Thus, it appears that the underwriter quality dimension is in direct opposition to the signaling model prediction that high-quality firms deliberately accept higher levels of underpricing to signal that they are high quality. To empirically address these conflicting indications of firm quality, it is important to control for underwriter quality in a test of the signaling hypothesis. We, therefore, include underwriter quality – measured by Carter et al. (forthcoming, who update through 1991 the methodology and values of the Carter and Manaster (1990) underwriter ranking – as a control variable in the regression analysis. For the firms in our sample, the median IPO underwriter rank is 8.75 and firms with an IPO underwriter at or below the median rank do have slightly higher median underpricing than firms with an IPO underwriter above the median rank. The median IPO initial return for the lower-ranked underwriter subset is 4.9%, while the median IPO initial return for firms with an underwriter above the median rank is 3.9%.

We control the role of underwriter quality in the regression analysis found in Table 6 by adding two variables. *RK* is a dummy variable assigned the value one if the rank of the IPO underwriter is greater than the sample median rank of 8.75. *PATRG* is a dummy variable assigned the value one when the firm uses the same lead underwriter for both the IPO and the seasoned equity offering. In models (1) through (3), the dependent variable is the combined issue net proceeds, standardized by the estimated pre-IPO equity market value of the firm. The dependent variable in models (4) through (6) is the wealth change for all officers and directors, standardized by the estimated pre-IPO market value of the officers' and directors' equity investment in the firm. Substituting the wealth change of the primary individual owner for the wealth change of all officers and directors provides qualitatively identical regression results, hence they are not reported in Table 6.

The relations detected in the previous regressions are still seen when we control the impact of underwriter quality. In models (1) through (3), the estimated coefficient for *UNDP* is significantly negative, so net proceeds are inversely re-

Table 6
Regression results: Controlling for IPO underwriter quality

Dependent variable	Combined issue net proceeds ($n = 170$)			Wealth change for officers and directors ($n = 164$)		
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
UNDP	-0.79 (-2.74 **)	-0.76 (-2.60 **)	-0.83 (-2.75 ***)	-0.87 (-1.62)	-0.81 (-1.47)	-1.03 (-1.85 *)
RK	-10.93 (-1.52)	-10.84 (-1.49)	-10.81 (-1.46)	6.43 (0.46)	9.24 (0.65)	12.40 (0.87)
(UNDP*RK)	-0.35 (-0.83)	-0.42 (-0.99)	-0.43 (-1.01)	0.60 (0.75)	0.48 (0.60)	0.52 (0.66)
iRETAIN		-0.09 (-0.64)	-0.08 (-0.54)		0.39 (1.42)	0.34 (1.22)
iINSELL		-0.80 (-1.52)	-0.73 (-1.36)		0.05 (0.05)	0.28 (0.32)
sINSELL		-0.35 (-0.60)	-0.40 (-0.68)		-0.66 (-0.60)	-0.61 (-0.55)
Ln (DAYS)		0.52 (0.10)	1.24 (0.25)		0.35 (0.04)	1.38 (0.15)
PATR		-0.34 (-0.48)	-0.43 (-0.61)		-2.33 (-1.77 *)	-2.53 (-1.93 *)
SIGMA			2.34 (1.10)			8.20 (2.06 **)
iSIZE			0.02 (0.25)			-0.13 (-1.06)
Constant	80.61 (16.69 ***)	85.45 (2.84 ***)	73.23 (2.25 **)	57.73 (6.32 ***)	42.44 (0.74)	15.65 (0.26)
Adj R^2	0.1303	0.1352	0.1309	0.0056	0.0055	0.0337
F-statistic	9.44 **	4.30 **	3.55 **	1.31	1.11	1.57

*, **, or *** denote significance at the 10%, 5%, or 1% level.

Cross-sectional ordinary least squares regressions where the dependent variable is either the combined issue net proceeds or the wealth change for officers and directors (both standardized by pre-IPO equity value). Estimated regression coefficients are presented with t -statistics in parentheses. UNDP is the IPO initial return, RK is a dummy variable equal to one if the rank of the IPO underwriter is greater than the sample median rank. iRETAIN is the fraction of shares retained by insiders following the IPO, iINSELL is the fraction of the firm's outstanding shares sold by insiders in the IPO, and sINSELL is the fraction of the firm's outstanding shares sold by insiders in the seasoned offering. Ln (DAYS) is the natural logarithm of the number of trading days between the two offerings. PATRG is a dummy variable equal to one if the firm uses the same underwriter for both the IPO and seasoned offering. SIGMA is the after-market standard deviation of returns following the IPO (trading days 2-20) and iSIZE is the size of IPO, in millions.

lated to the IPO initial return for firms with an IPO underwriter of below median rank. For firms with an IPO underwriter at or above median rank, the estimated slope on the underpricing variable is the sum of the coefficients on UNDP and (UNDP*RK). These values are also negative and significant at the 1% level. The estimated coefficient on the underwriter patronage variable is not statistically significant in any of these models. So, even after controlling for the role of underwriter quality, our results are strongly inconsistent with the signaling models of underpricing.⁸

In models (4) through (6), our measure of the impact of the equity offering pair is the wealth change for officers and directors. The coefficient on PATRG is significantly negative at the 10% level in models (5) and (6), suggesting that there is a less positive wealth change for officers and directors of firms that retain the same underwriter for both the IPO and the subsequent seasoned equity offering. The results with respect to IPO underpricing are, however, unchanged by the addition of the underwriter quality variables. In particular, there is still no evidence of a positive relation between IPO underpricing and the wealth change for officers and directors for firms of either underwriter quality subset.

5. Summary and conclusions

It has been suggested in a number of recent models of IPO underpricing that firms choose to underprice their initial offerings to signal that they are high quality and, thus, receive a more favorable market reaction to their subsequent seasoned equity offering. The clear implication is that the combined net proceeds from the initial and seasoned equity sales should be higher, on average, for firms that signal with greater underpricing of their initial offerings. Furthermore, the signaling models of Allen and Faulhaber (1989), Grinblatt and Hwang (1989), Welch (1989), and Chemmanur (1993) do not distinguish the firm from its owner/managers. However, a new set of owners are added at the initial public offering. Thus, maximization of the firm's proceeds may not be equivalent to maximizing the wealth of the original owner/managers. Owner/managers of high-quality firms who choose underpricing as a signal of firm quality would, logically, not choose to sell their personal shares at the time of the initial public offering. Instead, they would wait to sell their shares at a later date in order to benefit from the signal. This paper reexamines the signaling

⁸ Eliminating two influential outliers (based on Cook's distance measure) from models (1)–(3) produces the same changes described previously for Table 5. In addition, the coefficient on RK becomes significantly negative. As in Table 5, however, the coefficient on UNDP is still negative and highly significant, a finding that is inconsistent with the signaling model of IPO underpricing.

model predictions both from the perspective of the new firm and from the perspective of its original owner/managers.

We measure the impact of initial and seasoned equity sales for 172 industrial firms that made an initial equity offering during the period 1987–1991 and then made a subsequent seasoned equity sale within three years of their IPO. For this sample, we find no evidence to support the hypothesis that firms choose IPO underpricing to signal firm quality. We find that insiders do sell their personal shares at the IPO in half of all cases and this insider selling is slightly more common among the subset of firms with underpriced IPOs. Thus, insiders appear not to value the suggestions of the signaling models as they do not wait to realize the benefit of their underpricing signal. Regression analysis reveals that the combined issue net proceeds is significantly negatively related to the IPO initial return, while the wealth change for officers and directors of the issuing firms is unrelated to IPO underpricing. These results persist even after controlling for other variables, including underwriter choice variables. More underpricing at the IPO does not result in more favorable treatment at the seasoned offering, either in terms of the net proceeds from the two issues or in terms of additional wealth for the original owners of these firms.

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