

IPO PRICE FORMATION AND ANALYST COVERAGE

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ABSTRACT: We study analyst coverage of newly-public companies for a period subsequent to the early 2000s regulatory events affecting sell-side research analysts. Our focus is on re-visiting the relation between underpricing and coverage by analysts, with and without affiliations to the investment bank(s) underwriting the IPO. A key aspect of our design is to operationalize the insight that IPO underpricing is conditional on the offer price revision during / after the road show; and, as such, some underpricing is ‘expected’ and some is ‘unexpected’. We proxy the former with the offer price revision (a measure of institutional investor demand) and proxy the latter with the residual from regressing the first-day return on the offer price revision. We find no support for an association between underpricing, either expected or unexpected, and coverage by affiliated analysts. In contrast, we document strong, positive associations between both underpricing components, especially the offer price revision, and coverage by unaffiliated analysts. We then delve into three potential explanations for the relation between underpricing and unaffiliated analyst coverage. First, we suggest that IPOs with high underpricing are those with strong demand from institutional investors and analysts are drawn to cover such firms. Second, we suggest that IPOs with low underpricing are primarily firms that are burning cash and analysts tend to shun such firms. Lastly, we suggest that IPOs with high underpricing are those with high levels of ownership retention and pre-IPO owners forgo proceeds to attract analyst coverage. In general, our findings are most consistent with the view that analysts cover stocks they expect to have high recognition from institutional investors (i.e., the ‘anticipation hypothesis’) and suggest a rational reason for why issuers may not object to partial upward adjustment of their IPO offer price in response to strong demand from road show investors.

Keywords: Analyst coverage, initial public offerings, partial adjustment, price revision, underpricing

JEL codes: G24, G32, M13, M41

I. INTRODUCTION

Most companies that go public in a firm-commitment IPO do so via book-building, a process that begins when the issuer provides an initial price range within which it expects to sell a certain number of its shares. Following this disclosure, underwriters and company executives then conduct a marketing campaign (i.e., a road show), which involves meeting with select investors to solicit their non-binding indications of interest as input to pricing the shares. In a seminal paper, Benveniste and Spindt (1989) propose a book-building theory of IPO pricing. In their model, to induce road show investors to divulge strong demand, underwriters agree to only a partial adjustment to arrive at the IPO offer price. As a result, underpricing of IPO shares, along with allocating them in a discretionary manner, serves to compensate these ‘regular’ investors for revealing their favorable private information.

From an empirical perspective, Hanley (1993) was the first to document the strong, positive relation between offer price revisions (i.e., from the mid-point of the initial price range to the IPO offer price) and initial returns, consistent with a partial upward adjustment to road show investors’ strong demand. However, the statistical and economic significance of this association, in combination with subsequent literature that finds a partial adjustment to positive public information that arises during the road show (e.g., Bradley and Jordan, 2002; Loughran and Ritter 2002; Lowry and Schwert 2004), suggest this relation stems from more than just an inducement for the revelation of favorable private information by regular investors. Indeed, Ritter (2011) argues that agency conflicts between issuers and underwriters is the primary reason for the ‘partial adjustment phenomenon’ and, because of this, emphasizes the importance of interpreting IPO underpricing as being ‘conditional’ on the offer price revision.¹

The above poses a puzzle. Why is a partial adjustment of the offer price acceptable to issuers? Loughran and Ritter (2002) posit a behavioral explanation; if issuers anchor on the

¹ Per Ritter (2011, p.356), “[w]hen an IPO uses bookbuilding, the single variable that has the greatest explanatory power for first-day returns is the revision in the offer price from the midpoint of the original file price range ... [i]f the offer price is revised down, on average there is very little underpricing. But if the offer price is revised upwards, there is on average fairly severe underpricing. Thus, the adjustment of the offer price can be used to forecast the first-day return, a pattern that is known as the partial adjustment phenomenon.”

midpoint of the initial price range and offset the loss of proceeds to the company from the underpricing of primary shares with their personal wealth revaluation on retained and / or secondary shares, they will acquiesce to underwriters under-adjusting the offer price upward in response to favorable information; whether it be private or public. In this paper, we present findings in support of a non-mutually exclusive rational explanation: upward adjustment of the offer price following the road show attracts coverage by *unaffiliated* research analysts.

Whereas analyst coverage is important for a typical public company, it is arguably of particular importance for a newly-public company. Companies that go public are often not well known and have incentives to garner coverage by awarding the mandate to investment banks that bundle underwriting with the promise of analyst following. In a survey of chief financial officers (CFOs), Brau and Fawcett (2006, p. 400) “find that CFOs select underwriters based on overall reputation, quality of the research department and industry expertise.” Loughran and Ritter (2004) assert that IPO issuers during the late 1990s increasingly chose their lead underwriter on the basis of analyst coverage, a development they term ‘analyst lust’. They cite several studies in support of this and, upon examining a sample of 1980-2003 IPOs, attribute much of the extreme underpricing during this period to this non-price aspect of the issuer’s objective function. Also in support of this view, Cliff and Denis (2004) study a sample of 1993-2000 IPOs and report a strong, positive relation between underpricing and whether the lead underwriter employs an *Institutional Investor (II)* All-Star analyst in the issuer’s industry. They interpret this as issuers underpricing to compensate the lead underwriter for coverage. Aggarwal, Krigman and Womack (2002) also study the relation between extreme underpricing during the 1990s and coverage, though with a focus on analysts without affiliation to a lead underwriter. They argue that issuers underprice to attract coverage and, upon examining a sample of 1994-1999 IPOs, document a strong, positive relation between underpricing and recommendations by non-lead analysts around the time of lockup expiration. It is, however, important to note that the findings in this literature are somewhat mixed, as Bradley, Jordan and Ritter (2008, p. 101) study a sample of IPOs from 1999-2000 and conclude “[a]nalyst coverage in the first year is not affected by underpricing.”

In this paper, we re-examine the relation between underpricing and analyst coverage for a sample of IPOs from 2002 to 2013, a period quite different from those that the above literature examines. First, at an average initial return of around 15%, the level of underpricing is considerably lower; mostly because IPOs with extreme underpricing are much less prevalent.² Second, owing in large part to allegations of bias and conflicts of interest by analysts from bundling services during the Internet bubble, major changes have since taken place involving research analysts (e.g., NASD Rule 2711, NYSE Amended Rule 472, the Global Analyst Research Settlement). These new regulations limit interactions between sell-side analysts and their underwriting colleagues, prohibit analyst compensation from being directly linked to investment banking deals and bar analysts from attending IPO road shows.

In addition to examining a more-recent time period, a key aspect of our research design is to operationalize the insight that IPO underpricing (i.e., initial return) is conditional on the offer price revision; and, as such, some underpricing is arguably ‘expected’ and some is ‘unexpected’. As for the former, we suggest that the offer price revision is a plausible proxy for the revelation of institutional investor demand during the book building process. When the price revision is positive, institutional demand is more than underwriter / issuer expectations; when the revision is negative, institutional demand is less than their expectations; and when there is no price revision, this is because the underwriter and issuer were accurate in anticipating institutional demand. Based on this, and building on Ritter (2011), we suggest that a portion of an IPO’s first-day return is reflective of institutional demand during book-building, whereas the remainder is reflective of relatively unexpected enthusiasm (or the lack thereof) from retail and institutional investors. Thus, we split the actual initial return into two orthogonal components. The first is the price revision; our proxy for the expected portion that reflects latent institutional investor demand. The second is the residual from regressing initial returns on price revisions; our proxy for the unexpected portion that reflects a blend of retail and institutional demand.

² For example, in contrast to a 24% frequency in Aggarwal et al. (2002), less than 4% of our sample would classify as ‘extra-hot’ IPOs (i.e., underpricing greater than 60%, using the opening price on the first day)

Consistent with many prior studies, we report evidence, both descriptive and multivariate, of a strong, positive association between underpricing and analyst coverage as of the end of the issuer's first year public. New to the literature, our descriptive evidence shows that this relation is particularly strong for IPOs with final offer prices that well exceed the maximum of their initial price range; and especially among those for which unexpected underpricing is high. These are IPOs that sustain high first-day underpricing, even after taking into consideration a positive price revision. In other words, they were subject to a high degree of partial adjustment. Our multivariate evidence shows that this association primarily stems from a symmetric relation between the price revision and analyst coverage (i.e., from 'expected' underpricing rather than 'unexpected' underpricing). That is, we find that if the offer price revises upward, then analyst coverage is higher; and if it revises downward, then analyst coverage is lower. Thus, the price revision, observable prior to the IPO date, is a strong predictor of subsequent analyst coverage. As for economic significance, a one standard deviation decrease in offer price revision corresponds to 0.6 fewer analysts and a one standard deviation increase corresponds to 1.3 more analysts. This compares to 0.5 fewer analysts for a one standard deviation decrease in our proxy for unexpected underpricing (the coefficient representing an increase in unexpected underpricing is statistically insignificant).

We further investigate whether this effect varies by analyst affiliation. We find that the relation between underpricing, both expected and unexpected, and analyst coverage stems solely from analysts without affiliation to the investment bank(s) underwriting the IPO. We find no multivariate evidence of a relation between underpricing, either expected or unexpected, and affiliated analyst coverage. We also distinguish analysts by whether they are *II* All Stars. In contrast to extant literature, we find no support for a positive relation between underpricing and coverage by affiliated All Stars. The absence of a relation with affiliated analysts is consistent with the intent of the regulatory changes that took place since the start of our sample period. In contrast though, we do find evidence of a positive relation between the offer price revision and coverage by unaffiliated All Star analysts.

We conclude by studying certain alternative channels / explanations for the relation between underpricing and analyst coverage. Consistent with our arguments above, because the price revision derives, in large part, from road-show investor interest, we suggest that positive price revisions reflect strong institutional demand. Given this, if analysts follow firms for which they expect strong interest from institutional investors, we expect their coverage to increase with price revision (our proxy for expected underpricing). As for the unexpected portion of underpricing, it is less clear that analyst coverage relates to institutional demand.

The channels / explanations we investigate involve examining the extent to which the relations we document between underpricing and unaffiliated analyst coverage vary with issuer cash burn and ownership retention. This follows Willenborg, Wu and Yang (2015), which examines a recent IPO sample and finds that issuers with strong operating cash flow that offer small slices of ownership have positive price revisions. That is, they show that the ‘partial adjustment phenomenon’ concentrates among IPOs with these characteristics. However, while underwriters have incentives to engage in this behavior (e.g., to generate price momentum so as to allocate ‘hot’ IPOs to their clients), it is less clear why issuers go along with it. To study this, we conduct six two-way sorts of our sample. The first three of which partition total underpricing, expected underpricing and unexpected underpricing by quintile of pre-IPO operating cash flow; and the next three partition these underpricing measures by quintile of the percentage of ownership that pre-IPO owners retain.

With respect to the first three of these sorts, we find that unaffiliated analyst coverage increases with the extent to which the issuer generates operating cash flow; or, put another way, that analysts seem to shun high cash-burn IPOs. This aligns with Das, Guo and Zhang (2006), which finds analysts selectively cover IPOs based on their expectations of future performance and is also consistent with the view that, because coverage is costly to initiate, analysts avoid following firms likely to experience problems with viability (Lee and So, 2017). Upon splitting underpricing into expected and unexpected components, we find the relation between operating performance and coverage stems primarily from IPOs with negative offer price revisions. This

suggests analysts especially avoid IPOs by cash-burning issuers in which institutional investors show weak road-show interest. More importantly, we find that the positive association between offer price revision and coverage is manifest for all quintiles of operating cash flow. That is, regardless of whether an issuer is burning or generating cash, analyst coverage generally decreases as price revision decreases and increases as price revision increases. This pattern is not evident for our proxy for unexpected underpricing as, for most cash flow quintiles, coverage does not increase with unexpected underpricing. To the extent the offer price revision is a plausible proxy for institutional investor demand, this suggests analysts cover firms for which they have reason to expect high recognition from institutional investors, with the extent of cash burn reinforcing this relation.

With respect to the second three of these sorts, we find that unaffiliated analyst coverage also increases with ownership retention; and, consistent with Aggarwal et al. (2002), that IPOs selling the smallest slices tend to have high levels of underpricing and coverage. Upon splitting underpricing into expected and unexpected components, we find the relation between ownership retention and coverage stems primarily from IPOs with positive price revisions. This suggests that analysts are drawn to cover IPOs that portend strong demand from institutional investors, especially when the issuer has more ownership yet to sell. More importantly, we find that the positive association between offer price revision and coverage is manifest for all quintiles of ownership retention. That is, regardless of whether an issuer is selling a large or small amount of ownership, analyst coverage decreases as price revision decreases and increases as price revision increases. Again, this pattern is not evident for our proxy for unexpected underpricing as, for most ownership retention quintiles, coverage does not increase with unexpected underpricing. The only exception is an increase in unaffiliated analyst coverage for IPOs that retain a very high level of ownership and also sustain high unexpected underpricing. Overall, although cash burn and ownership retention explain some of the variation in analyst coverage, they do not subsume the relation we document between the offer price revision and unaffiliated analyst coverage.

Our paper contributes to the IPO literature and the analyst literature. With respect to the IPOs, our results are consistent with a benefit to issuers whose offer price revises upward, especially when it exceeds the maximum of the initial range. This suggests a rational reason why issuers go along with partial upward adjustment: that is, because it attracts unaffiliated analyst coverage. Rajan and Servaes (1997), which studies a sample of IPOs from 1975 to mid-1987, was the first to document a strong, positive association between underpricing and analyst coverage. They conclude “[o]verall these results suggest that firms that underprice attract analyst interest. Clearly, there could be a common omitted variable that drives both underpricing and analyst following, but it is not obvious what that is.” (p. 514) A plausible inference from our findings is that the offer price revision during / following the road show is such a variable.

With respect to the analyst literature, our results suggest that analysts cover stocks for which they have reason to expect high demand from institutional investors. In a recent paper, Li and You (2015) study the market reaction to analyst initiations and terminations. They find little support that coverage increases performance via monitoring or decreases information asymmetry but strong support that analysts provide value by increasing investor recognition; their primary proxy for which is the breadth of institutional ownership (i.e., the fraction of 13F filers holding the stock). They interpret this as “...consistent with the “value creation hypothesis” – investors react favorably (unfavorably) to coverage initiations (terminations) because they understand that analysts create value for firms by promoting the stocks to more investors. However, the results for the initiation sample are also consistent with an alternative explanation that analysts tend to initiate coverage on stocks that they expect to have higher investor recognition (the “anticipation hypothesis”).” (p. 142) In his discussion, Hansen (2016, p. 62) posits that such an alternative “suggests it is likely that initiations are somewhat predictable using observable indicators.” Following this, another inference from our findings is that, in the case of IPOs, analyst coverage is predictable and supportive of the ‘anticipation hypothesis’. In this sense, our findings that analysts tend to cover (not cover) IPOs that portend high (low) institutional demand is consistent with “... the business model for sell-side research, in which buy-side investors trade fees for

information; and to career interests, because analysts achieve status through buy-side recognition like the *Institutional Investor* surveys.” (Bradshaw, Ertimur and O’Brien 2016, p. 135)

Finally, our paper illuminates the roles cash burn and retained ownership play in analyst coverage decisions. We find that analysts tend to avoid cash burners, consistent with the view that they avoid following risky stocks because the opportunity costs of initiating coverage and then having the firm delist or otherwise fail are high. As for ownership retention, it is often seen as a positive signal of value (Leland and Pyle, 1977). Consistent with this, we show that analysts follow IPO’s with high ownership retention, which is important as it suggests that the increase in analyst following will increase liquidity in the event that the retained interests are sold.

II. LITERATURE AND MOTIVATION

Extant literature on the relation between IPO underpricing and analyst coverage mostly examines time periods prior to the regulatory events pertaining to investment banks and analysts in the early 2000s and does not separately examine analysts with versus without an affiliation to lead underwriters.³ While early papers in this literature generally find a positive relation between IPO underpricing and analyst coverage, later papers often report mixed evidence.

Rajan and Servaes (1997) is the first paper to document a positive relation between IPO underpricing and the extent of analyst coverage. They study IPOs from 1975 to mid-1987 and, after considering the potential for selection bias in the analyst’s decision to provide coverage, report a strong, positive association between IPOs with an ‘extreme’ level of underpricing (i.e., those with a greater than the median of IPOs with positive underpricing) and the number of analysts providing earnings forecasts to IBES during the issuer’s first post-IPO year.

Aggarwal, Krigman and Womack (2002) study a sample of Internet and matched IPOs from 1994 to 1999. They report a positive association between underpricing and the number of non-lead analyst recommendations on First Call within the first seven months. Aggarwal et al. interpret their findings as consistent with their theory that managers strategically underprice in

³ The latter distinction is important because the early 2000s regulatory events primarily pertain to affiliated analysts.

order to generate information momentum in the form of research coverage because they plan to sell their shares at the expiration of the lockup period.

Cliff and Denis (2004) address the question of whether IPO issuers underprice in order to ‘purchase’ analyst coverage from their lead underwriter(s). They examine a unique sample of IPOs from 1993 to 2000 that also issue an SEO from 1993 to 2001. They find a strong, positive association between underpricing and whether the lead underwriter has an *Institutional Investor* All-Star analyst in the same industry as the IPO issuer. In addition, after endogenizing the lead underwriter’s decision to provide coverage within one year, they also report a significant positive association between expected coverage and underpricing. Cliff and Denis (2004, p. 2871) interpret their findings as “... consistent with the [analyst lust] hypothesis that underpricing is, in part, compensation for expected post-IPO analyst coverage from highly ranked analysts.”

Das, Guo and Zhang (2006) use the IPO setting to study if analyst coverage decisions are, in part, reflective of their ability to identify firms with superior future prospects. They examine a sample of IPOs from 1986 to 2000 and also report evidence of a positive association between IPO underpricing and the extent of analyst coverage within the first six months.

Bradley, Jordan and Ritter (2008) examine a sample of IPOs from the height of the 1999-2000 Internet bubble and report a statistically-thin, positive association between underpricing and analyst coverage as of the first month (i.e., a time frame within which most following is by analysts with affiliation to a lead manager(s)); but that is no longer evident at the one-year mark. Bradley et al. (2008, p. 101) conclude that, for this period of time at the height of the Internet IPO bubble, “analyst following in the first year is *not* affected by underpricing.” (italics added)

Liu and Ritter (2011) develop and test a theory of underpricing that considers issuers’ preferences for both the price and non-price dimensions of underwriting services. In terms of issuers, they focus on those with venture capital backing; and, in terms of non-price dimensions, they focus on coverage by *II* All-Star analysts with an affiliation to a bookrunner. They examine a sample of IPOs from 1993-2008 and report a positive association between the presence of such

an analyst and underpricing during the earlier portion of their sample, particularly for venture backed IPOs, but not for the later portion from 2001-2008.

O'Brien and Tan (2015) use the IPO setting as a context to study how analyst geographic proximity affects their decision to provide coverage within two years. Among their covariates, they control for underpricing, on which they report a positive coefficient. However, because they examine 1996-2009 IPOs, it is unclear whether this finding is evident for the latter period(s) of the sample or whether the lack of such a relation, as Bradley et al. (2008) conclude, persists.

The above papers all specify underpricing as either a variable of interest or as a covariate and measure it as the return from the IPO offer price to either the opening or, more often, the closing price on the first trading day. However, a well-known aspect of the pricing of book-built IPOs is that, to a considerable extent, the first-day return is predictable from the offer price revision during / after the road show. That is, if the offer price revises upward then the first-day return is quite positive; and, if the offer price revises downward then the first-day return is often zero or negative. Ritter (2011) argues that this pattern of 'conditional' underpricing stems from an agency problem in which underwriters exploit a cognitive bias on the part of issuers resulting from their tendency to anchor on the mid-point of the initial price range. From an empirical perspective, this suggests that a portion of IPO underpricing is arguably 'expected', based on the offer price revision, whereas the remaining portion is 'unexpected'.

In terms of 'expected' underpricing, Willenborg, Wu and Yang (2015) examine a sample of IPOs from 2001-2013 and show that pre-IPO performance is a strong predictor of offer price revisions. They find that issuers with positive operating cash flow that retain large fractions of ownership have positive offer price revisions (i.e., 'partial adjustment' concentrates among IPOs with these characteristics). Willenborg et al. (2015) conclude this is because these issuers have lower incentives to bargain for the initial valuation and, as a consequence, are vulnerable to having the underwriter(s) low-ball their price range. However, while underwriters have rational incentives to engage in this behavior (e.g., to generate price momentum and allocate 'hot' IPOs to their clients), it is less clear why issuers would go along with it. In this sense, Willenborg et

al.'s (2015) findings also pose a puzzle: That is, bargaining incentives (or naïveté) aside, is there a benefit to issuers which acquiesce to having underwriters low-ball their initial valuation?

In this paper, for two reasons, we re-visit the relation between IPO underpricing and analyst coverage. For one, given the regulatory events in the early 2000s affecting sell-side analysts that we allude to in our Introduction, along with the sharp drop in the overall level of underpricing since the Internet bubble and the (lack of) findings in Bradley et al. (2008) and Liu and Ritter (2011), we wish to examine the persistence of the relation. For another, in doing so, we operationalize the insight that IPO underpricing is predicable from the offer price revision. To the extent the offer price revision is a reliable measure of institutional investor demand, this would suggest a mechanism underlying the underpricing / coverage association.

III. SAMPLE, VARIABLES AND DESCRIPTIVE STATISTICS

Sample

Panel A of Table 1 presents the sample. Using Thompson Financial's SDC database, we identify 1,102 firm-commitment IPOs by non-financial, domestic issuers from May 10, 2002 to December 31, 2013. The starting point is the date of SEC approval of NASD Rule 2711 and amendments to NYSE Rule 472. The majority of the extant literature examines samples that include segments of time prior to these regulatory changes, when analysts were subject to allegations of conflicts of interest. We focus on share IPOs and eliminate 140 offerings involving units. We also exclude 57 IPOs without necessary information, mostly issuers that undergo a change in legal form.⁴ Since our interest is analyst coverage and the price formation of book-built IPOs, we omit 13 IPOs sold via auction (Degeorge, Derrien and Womack 2010). Lastly, following Edelen and Kadlec (2005), we exclude 10 IPOs with a mid-point of their initial price range of \$5 or less and 4 IPOs for which the period of time from the date of the prospectus with the initial range to the date of the IPO exceeds one year. Our sample consists of 878 IPOs.

⁴ Because of this, we are unable to reliably determine the issuer's age. In addition, many of these issuers present financial statements pertaining to successor and predecessor entities and we cannot reliably compute average assets.

Variables and Descriptive Statistics

Panel B of Table 1 presents descriptive statistics. The mean (median) number of analysts covering an issuer, per I/B/E/S, within one year of going public (*Analyst-Total*) is 7.45 (7.00). Consistent with recent trends, less than 1% of the IPOs in our sample do not have some analyst coverage within by the first year.⁵ Because the distribution of *Analysts-Total* exhibits overdispersion, its variance of 22.10 (un-tabled) greatly exceeds its mean of 7.45, we use count data econometric techniques to estimate analyst coverage regressions (Rock, Sedo and Willenborg, 2000; Bradley et al. 2008). When we distinguish analysts by whether or not they have an affiliation with a lead manager(s), the majority of coverage is from unaffiliated analysts; as mean (median) *Analyst-UnAffil* of 5.28 (4.00) is at least double that of 2.17 (2.00) for *Analyst-Affil*.

Our design keys off of Ritter's (2011) characterization of IPO underpricing as conditional on both the direction and extent of the offer price revision. To operationalize this, we split underpricing into 'expected' and 'unexpected' components. To proxy for the former, we specify *PriceRevision* (i.e., the percentage change from the mid-point of the initial price range to the IPO offer price) and, to proxy for the latter, we specify *UE(InitialReturn)* as the residuals from regressing *InitialReturn* (i.e., the percentage change from the IPO offer price to the closing price on the first trading day) on *PriceRevision*. This split helps to identify the source(s) of demand, with *PriceRevision* measuring that of institutional investors with potential access to the shares at the IPO price and *UE(InitialReturn)* measuring a blend of institutional and retail investors with potential access to the shares at first-day trading prices.

Given the above, we focus on three variables of interest: *InitialReturn*, *PriceRevision* and *UE(InitialReturn)*. Per panel B of Table 1, mean (median) *InitialReturn* is 14.64% (9.09%), *PriceRevision* is -4.78% (0.00%) and *UE(InitialReturn)* is 0.00% (-3.34%). This average level of underpricing, while greater than Rajan and Servaes' (1997) 10.03% for IPOs from 1975 to mid-1987, is considerably less than either Aggarwal et al.'s (2002) 50.4% for IPOs from 1994 to

⁵ For example, Bradley, Jordan and Ritter (2003) study the initiation of analyst coverage at expiration of the 'quiet period' and report the percentage of IPOs with analyst coverage increases from 57.9% in 1996 to 95.6% in 2000.

1999 or Cliff and Denis' (2004) 27.5% for IPOs from 1993 to 2000. Consistent with these differences, the average *PriceRevision* for our sample is also lower than that of either of these two studies; at 13.6% for Aggarwal et al. (2002) and 3.1% for Cliff and Denis (2004).

In Section IV, we conduct multivariate analyses of the determinants of analyst coverage and, following the literature that we discuss in Section II, specify covariates pertaining to underwriter, issuer and the IPO shares. As for underwriter, we control for the number (*LeadMgrs*) and ranking (*UWRank*) of lead managers. As for issuer, we control for venture capital backing (*VC*), age (*Age*), high-technology industry membership (*HighTech*) and valuation (*Valuation*).⁶ As for the IPO shares, we control for cumulative abnormal returns (*CAR-3mo*), trading volume (*Volume-3mo*) and the number and fractional ownership of institutional investors (*Inst#-3mo* and *Inst%-3mo*); all of which we measure as of three-months post-IPO. Lastly, we specify fixed effects for IPO year.

Correlations

Table 2 presents Pearson correlations. Our variables of interest have unsurprising levels of correlation. The correlation between *InitialReturn* and *PriceRevision*, at 0.53, is high; and, by design, *PriceRevision* and *UE(InitialReturn)* are orthogonal. As for these variables and analyst coverage, while all have significant positive correlations with *Analysts-Total*, their relations are considerably stronger with *Analysts-UnAffil*. In particular, given that unaffiliated analysts have little to gain from underpricing, is interesting to note that the correlation between *InitialReturn* and *Analyst-UnAffil*, at 0.32, is much larger than that between *InitialReturn* and *Analyst-Affil*, at 0.08. Also of note, the correlation between *UE(InitialReturn)* and *Analysts-Affil* is zero. That is, prior to specifying covariates, the extent to which underpricing is associated with coverage by affiliated analysts stems entirely from *PriceRevision*, our proxy for 'expected' underpricing

⁶ When we specify *InitialReturn* as independent variable (as in equation (2)), we measure *Valuation* using the IPO price per share. When we specify *PriceRevision* as dependent variable (as in equations (3) and (4)), we measure *Valuation* using the mid-point of the initial price range. To do otherwise (e.g., measure *Valuation* using a post-IPO price per share, such as at the end of the first trading day) would subsume effects associated with our variables of interest (*InitialReturn*, *PriceRevision* and *UE(InitialReturn)*).

IV. EMPIRICAL ANALYSIS

IPO Price Formation and Analyst Coverage – Descriptive Analysis

We begin by presenting a series of one- and two-way descriptive sorts of our sample. Panels A–C of Table 3 are one-way sorts that supplement the Table 2 correlations. Panels D and E of Table 3 are two-way sorts that supplement the Tables 4 and 5 regressions.

In panel A of Table 3, following Rajan and Servaes (1997), we split the sample into four categories of *InitialReturn*. The first two are the 173 and 55 IPOs with an *InitialReturn* that is negative and zero, respectively (‘broken deals’) and, for the next two, we split the remaining 650 IPOs by their median *InitialReturn* of 15.51%. Analyst coverage manifests an increasing trend across these categories; as mean (median) *Analyst-Total* goes from 6.03 to 5.96 to 7.18 to 8.73 (from 5.00 to 5.00 to 6.00 to 8.00). Upon distinguishing analysts by whether they have an affiliation with a lead manager(s), we find this pattern stems from *Analyst-UnAffil*.

In panel B of Table 3, we use the initial price range (IPR) as a frame of reference and split the sample into seven categories of *PriceRevision*. The middle category is the 98 IPOs with *PriceRevision* of zero; those to either side of this category are the 106 and 133 IPOs with negative and positive revisions, yet within the IPR, respectively; the two left-most categories are IPOs with an offer price below the IPR minimum, split by the median -25.00% *PriceRevision* for these 314 IPOs; and the two right-most categories are IPOs with an offer price above their IPR maximum, split by the median $+16.67\%$ *PriceRevision* for these 227 IPOs. Going from left-to-right, while neither *Analyst-Affil* nor *Analyst-UnAffil* manifest a trend for the first three categories, they both increase from the middle group through to right-most group. As with panel A, this stems from unaffiliated analyst coverage; as mean (median) *Analyst-UnAffil* increasing from 4.77 to 5.67 to 6.18 to 9.08 (4.00 to 5.00 to 5.00 to 7.00) across the latter four categories.

In panel C of Table 3, we split the sample into quartiles of *UE(InitialReturn)*; our proxy for ‘unexpected’ underpricing. IPOs in quintile 1 have unexpectedly low *InitialReturn*, after

taking into consideration their *PriceRevision*.⁷ In contrast, IPOs in quintile 4 have unexpectedly high *InitialReturn*, after considering their *PriceRevision*.⁸ Affiliated analyst coverage is quite flat through all four quintiles. As for unaffiliated analyst coverage, while it too is flat through the first three quintiles, it increases for Quintile 4 IPOs as mean (median) *Analyst-UnAffil* rises to 6.11 (5.00). Particularly in contrast to those in Quintile 1, the IPOs in Quintile 4 cluster in the extremes of the distribution of *PriceRevision*, as many of them have IPO offer prices either below the minimum or above the maximum of the initial price range (see panel E of Table 3).

In panel D, we sort the sample by *PriceRevision* and *InitialReturn*. There are 28 cells in all, seven categories of *PriceRevision* (the ‘Full Sample’ column mirrors panel B) times four categories of *InitialReturn* (the ‘Full Sample’ row mirrors panel A). In each cell, we show the total number of IPOs and the number with analyst coverage by affiliation. Per the bottom-right, of the 878 IPOs in our sample, 835 (854) have coverage by at least one affiliated (unaffiliated) analyst within a year of going public. The cell counts in panel D are consistent with the strong, positive correlation between these variables. Again, affiliated analyst coverage shows little variation with either price revision or initial returns; though mean *Analyst-Affil* does increase from 1.63 for the 41 IPOs in the upper-left cell to 2.47 for the 98 IPOs in the lower-right cell. In contrast, unaffiliated analyst coverage generally increases as you move across a row (i.e., by *InitialReturn*) or down a column (i.e., *PriceRevision*), especially the latter. Of note, IPOs that price above the maximum of their initial range predominately reside in the highest *InitialReturn* category; particularly the 112 IPOs that price far above their maximum, of which 98 have an *InitialReturn* exceeding 15.51%. These IPOs garner considerably higher unaffiliated analyst coverage, with mean (median) *Analyst-UnAffil* of 9.21 (8.00).

⁷ For example, the IPOs in Quintile 1 of *UE(InitialReturn)* include those by Lumber Liquidators, Inc. (*PriceRevision* of -15.38% and *InitialReturn* of -11.27%) and Facebook Inc. (*PriceRevision* of +20.63% and *InitialReturn* of +0.61%).

⁸ For example, the IPOs in Quintile 4 of *UE(InitialReturn)* include those by Kintera, Inc. (*PriceRevision* of -22.22% and *InitialReturn* of +47.14%) and Noodles & Co. (*PriceRevision* of +28.57% and *InitialReturn* of +104.17%).

A concern with panel D is because *PriceRevision* is a strong predictor of *InitialReturn*, it does show their respective effects on analyst coverage. To address this, in panel E, we sort by *PriceRevision* and *UE(InitialReturn)*. Again there are 28 cells, seven categories of *PriceRevision* (the ‘Full Sample’ column mirrors panel B) and four categories of *UE(InitialReturn)* (the ‘Full Sample’ row mirrors panel C) and in each cell we show the total number of IPOs and the number with analyst coverage by affiliation. In this sort, only 55 of the 112 IPOs that price far above their maximum reside in Quintile 4 of *UE(InitialReturn)*. These are IPOs with high underpricing (mean (median) *InitialReturn* of 68.13% (63.57%) and *UE(InitialReturn)* of 35.30% (32.31%), respectively), after considering a very positive revision in their offer price (mean (median) *PriceRevision* of 30.29% (26.53%)).⁹ Put another way, these 55 IPOs were arguably subject to a high degree of partial adjustment. However, their unaffiliated analyst coverage (mean (median) *Analyst-UnAffil* of 10.16 (8.00)) is much higher than any of the other cells in panel E. This is consistent with a benefit accruing to IPO issuers who seemingly acquiesce to partial upward adjustment of their offer price in response to strong demand from road-show participants.

IPO Price Formation and Analyst Coverage – Regression Analysis

We begin by specifying a benchmark to assess the incremental effects of our IPO price formation variables of interest. To do this, we estimate equation (1a), which regresses total analyst following within one year of going public on determinants from the literature. As we discuss in Section III, we specify covariates pertaining to underwriter, issuer and IPO shares and also fixed effects for IPO year and use negative binomial models for estimation.¹⁰ Overall, equation (1a) should provide a reasonably stringent benchmark against which to compare the inclusion of our IPO price formation variables of interest (in equations (2a), (3a) and (4a)).

⁹ For comparison, the 39 IPOs in the adjacent cell above have mean (median) *PriceRevision* of 13.24% (13.33%), *InitialReturn* of 49.23% (44.86%) and *UE(InitialReturn)* of 25.24% (20.42%), respectively.

¹⁰ Because less than 1% of our sample (7 of 878 IPOs) have no analyst coverage whatsoever within one year, in contrast to other papers (e.g., two-thirds of Rajan and Servaes’ (1997) sample do not have coverage within twelve months post IPO), we do not consider a first-stage regression to address instances of no research coverage.

$$\begin{aligned} \text{Analysts-Total} = & \beta_0 + \beta_1 \text{LeadMgrs} + \beta_2 \text{UWRank} + \beta_3 \text{VC} + \beta_4 \text{LnAge} + \beta_5 \text{HighTech} + \\ & \beta_6 \text{LnValuation} + \beta_7 \text{CAR-3mo} + \beta_8 \text{LnVolume-3mo} + \beta_9 \text{LnInst\#-3mo} + \\ & \beta_{10} \text{Inst\%-3mo} + \sum \beta_t \text{Year} + \varepsilon \end{aligned} \quad (1a)$$

Column 1 of Table 4 reports the results of estimating equation (1a). Consistent with extant literature, IPO analyst coverage is positively associated with the number and rank of lead managers, high-technology industry, issue valuation and post-IPO returns and trading volume. In contrast to Cliff and Denis (2004), which report a positive coefficient on issuer age in a first-stage logit coverage regression, we find that, after controlling for other determinants, issuer age has a negative association with analyst coverage.

In equation (2a), we augment equation (1a) by adding *InitialReturn*. Then, in equation (3a), we specify *PriceRevision* and *UE(InitialReturn)* in place of *InitialReturn*. Finally, to assess the directional effect these proxies for expected and unexpected underpricing have on analyst coverage, we split them into negative and positive components in equation (4a).

$$\begin{aligned} \text{Analysts-Total} = & \beta_0 + \beta_1 \text{InitialReturn} + \beta_2 \text{LeadMgrs} + \beta_3 \text{UWRank} + \beta_4 \text{VC} + \beta_5 \text{LnAge} + \\ & \beta_6 \text{HighTech} + \beta_7 \text{LnValuation} + \beta_8 \text{CAR-3mo} + \beta_9 \text{LnVolume-3mo} + \\ & \beta_{10} \text{LnInst\#-3mo} + \beta_{11} \text{Inst\%-3mo} + \sum \beta_t \text{Year} + \varepsilon \end{aligned} \quad (2a)$$

$$\begin{aligned} \text{Analysts-Total} = & \beta_0 + \beta_1 \text{PriceRevision} + \beta_2 \text{UE(InitialReturn)} + \beta_3 \text{LeadMgrs} + \beta_4 \text{UWRank} + \\ & \beta_5 \text{VC} + \beta_6 \text{LnAge} + \beta_7 \text{HighTech} + \beta_8 \text{LnValuation} + \beta_9 \text{CAR-3mo} + \\ & \beta_{10} \text{LnVolume-3mo} + \beta_{11} \text{LnInst\#-3mo} + \beta_{12} \text{Inst\%-3mo} + \sum \beta_t \text{Year} + \varepsilon \end{aligned} \quad (3a)$$

$$\begin{aligned} \text{Analysts-Total} = & \beta_0 + \beta_1 \text{PriceRevision}^- + \beta_2 \text{PriceRevision}^+ + \beta_3 \text{UE(InitialReturn)}^- + \\ & \beta_4 \text{UE(InitialReturn)}^+ + \beta_5 \text{LeadMgrs} + \beta_6 \text{UWRank} + \beta_7 \text{VC} + \beta_8 \text{LnAge} + \\ & \beta_9 \text{HighTech} + \beta_{10} \text{LnValuation} + \beta_{11} \text{CAR-3mo} + \beta_{12} \text{LnVolume-3mo} + \\ & \beta_{13} \text{LnInst\#-3mo} + \beta_{14} \text{Inst\%-3mo} + \sum \beta_t \text{Year} + \varepsilon \end{aligned} \quad (4a)$$

Column 2 of Table 4 presents the results of estimating equation (2a). The coefficient on *InitialReturn* is significant and including this variable increases the pseudo R² above that of the equation (1a) baseline estimation. *InitialReturn*'s marginal effect suggests that a one standard deviation change in underpricing corresponds to a 0.5 change in the total number of analysts covering the issuer (0.0232 * 21.90). This is consistent with studies that examine IPO samples prior to / during the Internet bubble (e.g., Rajan and Servaes 1997; Aggarwal et al. 2002) and

updates Bradley et al.'s (2008) absence of such a finding for their sample of IPOs from 1999-2000; a period when average underpricing was at unprecedentedly high levels.

Column 3 of Table 4 presents the results of estimating equation (3a). The coefficients on *PriceRevision* and *UE(InitialReturn)*, at 0.0053 and 0.0022, respectively, are both significant. A test of the difference in these coefficients yields a chi-square of 8.36, significant beyond the 1% level. *PriceRevision*'s marginal effect suggests that a one standard deviation change in expected underpricing corresponds to a 0.9 change in analyst coverage ($0.0397 * 22.29$); whereas the marginal effect for *UE(InitialReturn)* suggests that a one standard deviation change in unexpected underpricing corresponds to a 0.4 change in analyst coverage ($0.0166 * 18.60$).¹¹

Column 4 of Table 4 presents the results of estimating equation (4a), which considers the directional change in our proxies for 'expected' and 'unexpected' underpricing. The coefficients on *PriceRevision*⁻ and *PriceRevision*⁺ are significant, and suggest a symmetry in the offer price revision / analyst coverage relation. The marginal effect for *PriceRevision*⁻ suggests a one standard deviation decrease in 'expected' underpricing corresponds to a 0.6 drop in analyst coverage ($0.0273 * 22.29$); whereas that for *PriceRevision*⁺ suggests a one standard deviation increase in our proxy for 'expected' underpricing corresponds to a 1.3 rise in analyst coverage ($0.0570 * 22.29$). The marginal effect for *UE(InitialReturn)*⁻ suggests a one standard deviation decrease in 'unexpected' underpricing corresponds to a 0.5 drop in analyst following ($0.0245 * 18.60$), though this interpretation has thin statistical support. Somewhat similarly, positive 'unexpected' underpricing has no discernable effect on post-IPO analyst coverage.

We next estimate the above regressions after taking into consideration whether or not an analyst has an affiliation with a lead manager underwriting the IPO. The only change to our

¹¹ A concern with our sample is that its latter portion contains a period of time subsequent to the Jumpstart Our Business Startups Act (JOBS Act), which relaxed certain restrictions on analysts with affiliations to IPO underwriters (Lattman and Craig, 2013; Dambra, Field, Gustafson and Pisciotta, forthcoming). To consider the effects on our findings of the JOBS Act, we re-ran equation (3a) after excluding IPOs following its April 5, 2012 date of passage. The results are similar to those we table. The coefficient and z-statistic on *PriceRevision* is 0.0054 and 8.20, respectively (versus 0.0053 and 8.68 in column 3 of Table 4) and the coefficient and z-statistic on *UE(InitialReturn)* is 0.0022 and 3.31, respectively (versus 0.0022 and 4.18 in column 3 of Table 4).

previous specifications pertains to the dependent variable. Whereas for the equations (1a) through (4a), the dependent variable is *Analysts-Total*, we specify *Analysts-Affil* for equations (1b) through (4b) and as *Analysts-UnAffil* for equations (1c) through (4c).

Table 5 presents the results. Per column 1, the extent of post-IPO coverage by affiliated analysts has a strong association with *LeadMgrs* and *UWRank*. The positive coefficient on *LeadMgrs* is consistent with Loughran and Ritter's (2004, p. 9-10) observation that "the number of managing underwriters in IPO syndicates has increased over time. Investment bankers note that co-managers are included in a syndicate almost exclusively to provide research coverage." Aside from these underwriter covariates, none of the other control variables manifest a consistent, significant association with affiliated analyst coverage. As for our variables of interest, the results in columns 2 through 4 also provide no statistical support for a relation between IPO price formation and affiliated analyst coverage.

In contrast, the drivers of post-IPO coverage by unaffiliated analysts are much different. Of particular note, and in contrast to the results of estimating equations (1b) through 4(b), the coefficient on *LnValuation* is positive and highly significant. In addition, the coefficients on three of the four covariates pertaining the IPO shares (*CAR-3mo*, *LnVolume-3mo* and *Inst%-3mo*) are also positive and significant. As for our IPO price formation variables of interest, per columns 6 through 8, all of the coefficients are greater than their counterparts in Table 4 (e.g., the 0.0067 and 0.0030 coefficients on *PriceRevision* and *UE(InitialReturn)* in column 7 of Table 5, respectively, exceed those of 0.0053 and 0.0022 in column 3 of Table 4). Overall, consistent with the descriptive sorts in Table 3, the findings in Table 5 show that the Table 4 findings stem from unaffiliated analysts coverage.

Collectively, these findings are consistent with the inference that sell-side security analysts consider institutional investor demand during the book-building process as a key input into their decision for whether to cover, or not cover, an IPO issuer. If these investors express weak demand for the shares, which we proxy with downward revision in the offer price, then the extent of unaffiliated analyst coverage is lower; if, these investors express strong demand, which

we proxy with upward revision, then unaffiliated analyst coverage is higher. The latter provides a rational explanation for why an IPO issuer may acquiesce to partial adjustment of their offer price in response to strong road show demand. We interpret the relative symmetry of the relation between IPO offer price revision and the extent of subsequent analyst coverage (i.e., decreases (increases) in coverage for IPOs with downward (upward) price revision) as support for the ‘anticipation hypothesis’ (Li and You 2015) that analysts choose to cover (not cover) IPO stocks that they have good reason to expect will have higher (lower) institutional investor recognition.

IPO Price Formation and All-Star Analyst Coverage

As we discuss in Section III, Cliff and Denis (2004) examine a sample of IPOs from 1993 to 2000 that also issue an SEO from 1993 to 2001 and report a positive association between underpricing and whether the lead underwriter has an *Institutional Investor (II)* Top 3 All-Star analyst in the issuer’s industry. They interpret this as support for the ‘analyst lust hypothesis’, that underpricing serves to compensate the lead underwriter(s) for providing post-IPO analyst coverage from its highly-ranked analysts. In this section, we re-examine this finding.

We use the All-America Research Team rank from the October issue of *II* magazine prior to the IPO year to designate all-star status and track analysts who issue recommendations during the one-year period following IPO date. As such, in contrast to Cliff and Denis (2004), we identify whether a given All-Star analyst covers a given IPO issuer. We then replicate the primary portions of Cliff and Denis’ (2004) Table IV, which presents their main findings. We supplement what they present with a broader categorization that considers whether an analyst receives a ‘Runner Up’ designation in *II*’s rankings as well as showing the frequency of coverage by unaffiliated All-Star analysts. In panel A, following Cliff and Denis (2004), we sort our sample into quintiles of *InitialReturn*; then, in panel B, we sort our sample into the seven categories of *PriceRevision* that we show in panels B, D and E of Table 3

Per panel A, as with Cliff and Denis (2004), both *UWRank* and the percent of IPOs with recommendations by affiliated and unaffiliated analysts increase with *InitialReturn*. However,

none of these patterns exhibit the same range in their sample. For example, whereas they report that the frequency of coverage by a lead (non-lead) analyst increases from 74.8% (81.4%) for IPOs in the lowest quintile of underpricing to 85.7% (96.7%) for those in the highest quintile; for our sample, affiliated coverage increases from 91.9% to 97.7% and unaffiliated coverage increases from 95.4% to 99.4%. This narrower range is consistent with studies that document an increase over time in post-IPO analyst coverage (e.g., Bradley et al. 2003; Bradley et al. 2008).

What is more interesting is that we do not find a pattern of increasing coverage by an All-Star affiliated analyst as underpricing increases. Whereas Cliff and Denis (2004) report that the frequency of whether a lead underwriter employs a Top 3 All-Star analyst increases from 15.7% for IPOs in the lowest underpricing quintile to 35.2% for IPOs in the highest quintile; for our sample, the percent of IPOs with actual coverage by an affiliated Top 3 All Star is 11.6% in the lowest underpricing quintile, 13.6% in the middle quintile and 11.4% in the highest quintile (i.e., an inverted-U pattern that remains evident if we broaden the definition of All-Star to encompass analysts with a ‘runner-up’ designation). In contrast, we do report some evidence that coverage by an unaffiliated All-Star increases with underpricing. For example, coverage by Top 3 All-Stars analyst increases from 1.7% in the lowest quintile to 5.7% in the highest quintile (a pattern that is linear with our broader definition). Overall, this lack of findings regarding the lack of an association between affiliated All-Star coverage and underpricing, along with those we report in columns 2 through 4 of Table 5 pertaining to affiliated coverage in general, are not supportive of the ‘analyst lust’ hypothesis. This may be because Cliff and Denis’ (2004) findings were derivative of conflicts of interest involving sell-side analysts and their underwriting colleagues and that the regulatory changes that have since taken place mitigate such conflicts.

Panel B presents All-Star analyst coverage by our seven categories of *PriceRevision*. As for the percent of IPOs with coverage by an affiliated Top 3 All Star, while it does increase from 7.6% for IPOs that price far below the minimum of their range to 12.5% for those that price far above the maximum (from 12.4% to 21.4% with our broader definition), the path between these two groups exhibits no obvious pattern across *PriceRevision* categories. This contrasts with the

percent of IPOs with coverage by unaffiliated All Star analysts, which generally increases with *PriceRevision* category (particularly so with our broader definition).¹²

Alternative Channels / Explanations

So far, the results of our analyses show positive associations between unaffiliated analyst coverage and both *PriceRevision* and *UE(InitialReturn)* and that the effects of the former exceed those of the latter. With respect to the former, we interpret this as consistent with a rational reason for why issuers may not object to ‘partial adjustment’; and, to the extent *PriceRevision* is a measure of institutional investor demand, that analysts cover stocks they have reason to expect will have high recognition from institutional investors. With respect to the latter, to the extent *UE(InitialReturn)* is a measure of institutional and retail demand, that ‘unexpected’ underpricing reflects this demand and also attracts unaffiliated analysts.

However, all of these analyses take the offer price revision as a given and do not consider its potentially endogenous nature. As we previously discuss, Willenborg et al. (2015) finds IPOs with strong operating performance that retain a high fraction of ownership have positive offer price revisions on average. Following this, an explanation for our *PriceRevision* results is that analysts choose (do not choose) to cover IPOs with strong (weak) historical performance because it portends strong (weak) future performance (Das, et al., 2006; Jung, Wong and Zhang, 2015). To consider this, we examine whether the *PriceRevision* / unaffiliated coverage relation varies with pre-IPO operating cash flow to average assets (*OCF/Assets*). In addition, and akin to Aggarwal et al. (2002), our analyses do not consider whether IPO issuers underprice to attract unaffiliated analyst coverage. Following this, an explanation for our *UE(InitialReturn)* results (e.g., the positive coefficient on *UE(InitialReturn)*– in column eight of Table 5) is that analyst coverage is lower because managers do not leave (an unexpected amount of) money on the table. To consider this, we examine whether the relation between *UE(InitialReturn)* and unaffiliated analyst coverage varies with the percentage of ownership retention (*Retain%*).

¹² The Pearson correlation between an indicator variable for this broader All-Star status and *PriceRevision* is 0.13 (significant beyond the 1% level) whereas that between this indicator and *UE(InitialReturn)* is an insignificant 0.03.

Table 7 presents a series of two-way sorts by quintile of *OCF/Assets* and our variables of interest: *InitialReturn* in panel A; *PriceRevision* in panel B; and *UE(InitialReturn)* in panel C. Within each cell, we present mean and median values of *Analysts-UnAffil*. Panel A shows that unaffiliated analyst coverage increases with the extent to which the issuer generates operating cash flow. Put another way, analysts appear to shun cash-burning IPOs. This aligns with Das et al. (2006), which finds analysts cover IPOs on the basis of their expectations about future performance. With respect to the analyst literature, it is consistent with the view that, because coverage is costly to initiate, analysts avoid following firms that may fail (Lee and So, 2017). Panel B sorts by *OCF/Assets* and *PriceRevision* and shows that the operating performance / coverage relation stems mostly from IPOs with negative price revisions. This suggests analysts especially avoid IPOs by cash-burning issuers for which institutional investors show weak road-show interest. More importantly, this sort shows that the positive association between price revision and coverage is manifest for all *OCF/Asset* quintiles. Using the '*PriceRevision = 0*' category as a reference point, coverage generally decreases as price revision decreases and increases as price revision increases. This pattern is not evident in panel C, which is a sort by *OCF/Assets* and *UE(InitialReturn)*. In this sort, for three of five *OCF/Asset* quintiles, coverage does not increase with *UE(InitialReturn)*. Overall, we interpret the findings in Table 7 as continuing to suggest that analysts choose to cover firms for which they have reason to expect high recognition from institutional investors, after considering the effect that pre-IPO operating performance has on their coverage decisions.

Table 8 presents a similar series of two-way sorts by quintile of *Retain%* and variables of interest: *InitialReturn* in panel A; *PriceRevision* in panel B; and *UE(InitialReturn)* in panel C. Again, within each cell, we present mean and median values of *Analysts-UnAffil*. Panel A shows that unaffiliated analyst coverage also increases with ownership retention; and, consistent with Aggarwal et al. (2002), that IPOs offering the smallest ownership slices tend to have high levels of underpricing and coverage. In panel B, we sort by *Retain%* and *PriceRevision*. This shows that the ownership retention / coverage relation stems mostly from IPOs with positive price

revisions. This suggests that analysts are drawn to cover IPOs that portend strong demand from institutional investors, especially when the issuer has more ownership yet to sell. More importantly, this sort shows that the positive association between price revision and coverage is manifest across all *Retain%* quintiles. Using the '*PriceRevision = 0*' category as a reference point, coverage generally decreases as price revision decreases and increases as price revision increases. Once again, this pattern is not evident in panel C, which sorts by *Retain%* and *UE(InitialReturn)*. In this sort, for four of five *Retain%* quintiles, coverage does not increase with *UE(InitialReturn)*. The exception is quintile 5, which shows a sharp increase in coverage for IPOs that retain a high level of ownership and sustain high unexpected underpricing. This suggests that the effect Aggarwal et al. (2002) document holds after considering the effect of price revision on underpricing. Overall, the findings in Table 8 suggest that analysts choose to cover firms for which they have reason to expect high recognition from institutional investors, after considering any effects that ownership retention may have on their coverage decisions.

V. CONCLUSION

In this paper, we re-visit the origin of analyst following by re-examining the association between IPO underpricing and analyst coverage. The main focus of our analysis highlights that a portion of IPO underpricing is expected, as it likely reflects revealed institutional demand; while a portion is unexpected, as it likely reflects retail demand and residual institutional demand. We find that the expected portion of underpricing is highly, positively correlated with unaffiliated analyst following, and posit that this relationship provides a potential rational explanation for why IPO's do not fully-upwardly price adjust.

We also provide evidence on other indicators at the IPO date that portend increased analyst following. Specifically, we find that analysts tend to follow IPO's that have relatively larger retained ownership and to avoid cash burners. These results reinforce the idea that IPOs with larger retained ownership are more likely to be better performers in the future, and that cash burners represent riskier companies, which analysts tend to avoid.

Our results are likely to be important to the broad set of papers analyzing factors affecting analysts' decisions to follow firms, as well as factors affecting owners' incentives to underprice. In the IPO setting, there is a clear delineation as to the timing of events. Firm characteristics, like retained ownership and cash burn, are provided to market participants prior to the revelation of investor demand. Then during the book building process, analysts can observe the revealed demand of institutional investors, followed by the revelation of retail demand on IPO date. These features of the IPO market provide a nice setting to investigate whether analyst following derives from institutional or retail demand.

Researchers have long debated why owners are willing to 'leave money on the table' by allowing underwriters to offer a relatively low IPO price. Our paper suggests that a portion of this underpricing reflects unexpectedly large institutional demand that occurs during the road show, and this institutional demand is accompanied by analyst following, which seems likely to ultimately benefit the owners.

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TABLE 1
Sample and Descriptive Statistics

Panel A: Sample

Firm commitment IPOs by non-financial, U.S. companies from May 10, 2002 to December 31, 2013	1,102
Less: Unit IPOs	140
Necessary financial statement information not available	57
Issued via auction mechanism	13
Initial price range mid-point \leq \$5.00	10
Days from initial range date to IPO date exceed 365	4
Full Sample	878

Panel B: Descriptive statistics

Variable	Mean	Median	Standard deviation
<i>Analysts-Total</i>	7.45	7.00	4.70
<i>Analysts-Affil</i>	2.17	2.00	1.46
<i>Analysts-UnAffil</i>	5.28	4.00	4.03
<i>InitialReturn</i>	14.64	9.09	21.90
<i>PriceRevision</i>	-4.78	0.00	22.29
<i>UE(InitialReturn)</i>	0.00	-3.34	18.60
<i>LeadMgrs</i>	2.31	2.00	1.42
<i>UWRank</i>	7.97	8.50	1.43
<i>VC</i>	0.53	1.00	0.50
<i>Age</i>	20.01	10.00	25.14
<i>HighTech</i>	0.27	0.00	0.45
<i>Valuation</i>	855.06	370.12	2,658.67
<i>CAR-3mo</i>	4.21	3.77	28.03
<i>Volume-3mo</i>	351.17	149.70	1,630.43
<i>Inst#-3mo</i>	40.23	36.50	31.65
<i>Inst%-3mo</i>	32.48	27.28	24.15

Variable definitions (data source in parentheses):

- Analysts-Total* = Number of analysts issuing recommendations for the issuer within 12 months post IPO (IBES)
- Analysts-Affil* = Number of analysts with affiliation to a lead manager that issue a recommendation for the issuer within 12 months post IPO (IBES)
- Analysts-UnAffil* = Number of analysts without affiliation to a lead manager that issue a recommendation for the issuer within 12 months post IPO (IBES)
- InitialReturn* = $(\text{Closing price on first trading day} - \text{IPO price}) \div \text{IPO price}$, in percentage (CRSP and final prospectus)
- PriceRevision* = $(\text{IPO price} - \text{Mid-point of initial price range}) \div \text{Mid-point of initial price range}$, in percentage (Final prospectus and prospectus disclosing the initial price range)
- UE(InitialReturn)* = Residuals from regressing *InitialReturn* on *PriceRevision*
- LeadMgrs* = Number of lead managers (SDC)
- UWRank* = Underwriter rank (Carter, Dark and Singh (1998) and Loughran and Ritter (2004))
- VC* = One if issuer has venture capital backing (SDC), zero otherwise
- Age* = Number of years from founding or incorporation to IPO year (Final prospectus)
- HighTech* = One if issuer is a high technology company (SDC), zero otherwise

Variable definitions (data source in parentheses):

<i>Valuation</i>	=	Mid-point of initial price range * Number of post-IPO shares outstanding, in millions of dollars (Prospectus disclosing the initial price range)
<i>CAR-3mo</i>	=	Cumulative abnormal return (per the value-weighted market return) from 2 nd post-IPO day to 3 months post IPO, in percentage (CRSP)
<i>Volume-3mo</i>	=	Average daily volume during the first 3 months post IPO, in thousands of shares (CRSP)
<i>Inst#-3mo</i>	=	Number of institutional investors holding the issuer's shares within 3 months post IPO (Thompson Reuters)
<i>Inst%-3mo</i>	=	Percentage of issuer's shares held by institutional investors within 3 months post IPO (Thompson Reuters)

TABLE 2
Pearson Correlations

	<i>UE</i>														
	<i>Analysts- Total</i>	<i>Analysts -Affil</i>	<i>Analysts- UnAffil</i>	<i>Initial Return</i>	<i>Price Revision</i>	<i>UE (Initial Return)</i>	<i>Lead Mgrs</i>	<i>UW Rank</i>	<i>VC</i>	<i>Ln Age</i>	<i>High Tech</i>	<i>Ln Valuation</i>	<i>CAR -3mo</i>	<i>LnVolume -3mo</i>	<i>LnInst# -3mo</i>
<i>Analysts-Affil</i>	0.58 (<0.00)														
<i>Analysts- UnAffil</i>	0.96 (<0.00)	0.32 (<0.00)													
<i>InitialReturn</i>	0.30 (<0.00)	0.08 (0.02)	0.32 (<0.00)												
<i>PriceRevision</i>	0.38 (<0.00)	0.14 (<0.00)	0.39 (<0.00)	0.53 (<0.00)											
<i>UE (InitialReturn)</i>	0.12 (<0.00)	0.00 (0.90)	0.14 (<0.00)	0.85 (<0.00)	0.00 (1.00)										
<i>LeadMgrs</i>	0.54 (<0.00)	0.90 (<0.00)	0.30 (<0.00)	0.05 (0.13)	0.09 (0.01)	0.01 (0.85)									
<i>UWRank</i>	0.37 (<0.00)	0.29 (<0.00)	0.32 (<0.00)	0.14 (<0.00)	0.19 (<0.00)	0.04 (0.19)	0.21 (<0.00)								
<i>VC</i>	-0.02 (0.54)	-0.16 (<0.00)	0.03 (0.30)	0.15 (<0.00)	-0.01 (0.87)	0.18 (<0.00)	-0.18 (<0.00)	0.10 (<0.00)							
<i>LnAge</i>	0.04 (0.25)	0.25 (<0.00)	-0.04 (0.19)	-0.08 (0.02)	0.02 (0.52)	-0.11 (<0.00)	0.25 (<0.00)	0.12 (<0.00)	-0.49 (<0.00)						
<i>HighTech</i>	0.20 (<0.00)	0.00 (0.98)	0.23 (<0.00)	0.16 (<0.00)	0.22 (<0.00)	0.05 (0.11)	-0.05 (0.16)	0.13 (<0.00)	0.19 (<0.00)	-0.15 (<0.00)					
<i>LnValuation</i>	0.67 (<0.00)	0.64 (<0.00)	0.55 (<0.00)	0.12 (<0.00)	0.22 (<0.00)	0.01 (0.76)	0.65 (<0.00)	0.51 (<0.00)	-0.21 (<0.00)	0.25 (<0.00)	0.01 (0.81)				
<i>CAR-3mo</i>	0.07 (0.04)	0.03 (0.37)	0.07 (0.04)	0.04 (0.26)	-0.07 (0.05)	0.09 (0.01)	0.01 (0.80)	0.05 (0.12)	-0.00 (0.93)	-0.03 (0.43)	0.03 (0.32)	-0.01 (0.85)			
<i>LnVolume-3mo</i>	0.64 (<0.00)	0.51 (<0.00)	0.56 (<0.00)	0.28 (<0.00)	0.47 (<0.00)	0.04 (0.29)	0.49 (<0.00)	0.40 (<0.00)	-0.19 (<0.00)	0.20 (<0.00)	0.09 (<0.00)	0.74 (<0.00)	0.08 (0.02)		
<i>LnInst#-3mo</i>	0.35 (<0.00)	0.27 (<0.00)	0.31 (<0.00)	0.25 (<0.00)	0.37 (<0.00)	0.07 (0.05)	0.24 (<0.00)	0.33 (<0.00)	-0.13 (<0.00)	0.19 (<0.00)	0.05 (0.15)	0.44 (<0.00)	0.04 (0.23)	0.47 (<0.00)	
<i>Inst%-3mo</i>	0.19 (<0.00)	0.24 (<0.00)	0.14 (<0.00)	0.01 (0.70)	0.06 (0.06)	-0.02 (0.47)	0.25 (<0.00)	0.17 (<0.00)	-0.24 (<0.00)	0.26 (<0.00)	-0.09 (0.01)	0.27 (<0.00)	0.01 (0.80)	0.23 (<0.00)	0.55 (<0.00)

Observations are 878 firm-commitment share IPOs from May 10, 2002 to December 31, 2013 by non-financial, U.S. companies. To accord with the regression specifications, we present correlations for the natural logarithm of *Age*, *Valuation*, *Volume-3mo*, and *Inst#-3mo*. See Table 1 for variable definitions.

TABLE 3
Analyst Coverage by IPO Price Formation

Panel A: Analyst Coverage by *InitialReturn* (categories per Rajan and Servaes, 1997)

		<i>InitialReturn</i> < 0	<i>InitialReturn</i> = 0	0 < <i>InitialReturn</i> ≤ 15.51%*	15.51%* < <i>InitialReturn</i>	Full Sample
n		173	55	325	325	878
<i>InitialReturn</i>	mean	-6.72	0.00	6.67	36.45	14.64
	median	-5.00	0.00	6.25	28.90	9.09
<i>Analysts-Total</i>	mean	6.03	5.96	7.18	8.73	7.45
	median	5.00	5.00	6.00	8.00	7.00
<i>Analysts-Affil</i>	mean	2.01	1.76	2.29	2.20	2.17
	median	2.00	2.00	2.00	2.00	2.00
<i>Analysts-UnAffil</i>	mean	4.02	4.20	4.89	6.54	5.28
	median	3.00	4.00	4.00	5.00	4.00

Panel B: Analyst Coverage by *PriceRevision* (categories per the Initial Price Range, IPR)

		<u>IPO price < Initial Price Range</u> -25.00%** ≤		<u>IPO price is within Initial Price Range</u>		<u>Initial Price Range < IPO price</u> IPR maximum <		Full	
		<i>PriceRevision</i> < -25.00%**	<i>PriceRevision</i> < IPR minimum	IPR minimum ≤ <i>PriceRevision</i> < 0	<i>PriceRevision</i> = 0	0 < <i>PriceRevision</i> ≤ IPR maximum	<i>PriceRevision</i> ≤ 16.67***	<i>PriceRevision</i> > 16.67***	Sample
n		145	169	106	98	133	115	112	878
<i>PriceRevision</i>	mean	-40.25	-18.38	-7.36	0.00	6.48	12.69	28.61	-4.78
	median	-37.14	-18.75	-6.90	0.00	6.67	13.33	23.76	0.00
<i>Analysts-Total</i>	mean	5.37	6.70	5.74	6.79	8.14	8.52	11.55	7.45
	median	5.00	6.00	5.00	6.00	7.00	8.00	10.00	7.00
<i>Analysts-Affil</i>	mean	1.78	2.22	1.84	2.02	2.47	2.34	2.47	2.17
	median	2.00	2.00	1.50	2.00	2.00	2.00	2.00	2.00
<i>Analysts-UnAffil</i>	mean	3.59	4.48	3.90	4.77	5.67	6.18	9.08	5.28
	median	3.00	4.00	3.00	4.00	5.00	5.00	7.00	4.00

Panel C: Analyst Coverage by *UE(InitialReturn)* quartile

		Quartile 1	Quartile 2	Quartile 3	Quartile 4	Full Sample
n		220	219	220	219	878
<i>UE(InitialReturn)</i>	mean	-19.23	-7.54	2.17	24.67	0.00
	median	-16.96	-7.58	2.39	19.49	-3.33
<i>Analysts-Total</i>	mean	7.21	7.32	7.01	8.26	7.45
	median	6.00	7.00	6.00	7.00	7.00
<i>Analysts-Affil</i>	mean	2.30	2.23	1.99	2.15	2.17
	median	2.00	2.00	2.00	2.00	2.00
<i>Analysts-UnAffil</i>	mean	4.91	5.09	5.03	6.11	5.28
	median	4.00	4.00	4.00	5.00	4.00

TABLE 3
Analyst Coverage by IPO Price Formation

Panel D: Analyst Coverage by *PriceRevision* and *InitialReturn*

		<i>InitialReturn</i> < 0		<i>InitialReturn</i> = 0		0 < <i>InitialReturn</i> ≤ 15.51%*		15.51%* < <i>InitialReturn</i>		Full Sample	
<i>PriceRevision</i> < -25.00%**	n	41		20		58		26		145	
	<i>Analyst-n</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>
	n	36	40	18	20	53	56	26	25	133	141
	mean	1.63	3.17	1.55	4.35	1.83	3.47	2.08	3.96	1.78	3.59
	median	2.00	3.00	2.00	3.00	2.00	3.00	2.00	3.50	2.00	3.00
-25.00%** ≤ <i>PriceRevision</i> < IPR minimum	n	57		16		84		12		169	
	<i>Analyst-n</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>
	n	56	55	16	16	77	81	11	12	160	164
	mean	2.26	4.12	2.25	4.56	2.31	4.63	1.42	5.00	2.22	4.48
	median	2.00	3.00	2.50	4.50	2.00	4.00	1.00	4.50	2.00	4.00
IPR minimum ≤ <i>PriceRevision</i> < 0	n	36		13		38		19		106	
	<i>Analyst-n</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>
	n	32	34	11	12	37	35	18	19	98	100
	mean	1.64	3.33	1.54	3.77	2.11	4.08	1.89	4.68	1.84	3.90
	median	1.00	3.00	1.00	3.00	2.00	4.00	1.00	4.00	1.50	3.00
<i>PriceRevision</i> = 0	n	19		2		46		31		98	
	<i>Analyst-n</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>
	n	16	17	1	1	45	44	30	31	92	93
	mean	2.16	4.95	1.00	2.00	2.15	4.96	1.81	4.55	2.02	4.77
	median	2.00	5.00	1.00	2.00	2.00	5.00	2.00	4.00	2.00	4.00
0 < <i>PriceRevision</i> ≤ IPR maximum	n	9		3		56		65		133	
	<i>Analyst-n</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>
	n	9	9	3	3	54	55	63	63	129	130
	mean	3.00	6.78	2.00	3.00	2.88	5.86	2.08	5.48	2.47	5.67
	median	2.00	6.00	2.00	4.00	2.00	5.00	2.00	5.00	2.00	5.00
IPR maximum < <i>PriceRevision</i> ≤ 16.67***	n	6		1		34		74		115	
	<i>Analyst-n</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>
	n	6	6	1	1	33	34	72	74	112	115
	mean	3.00	6.00	2.00	9.00	2.21	5.71	2.35	6.38	2.34	6.18
	median	2.50	5.00	2.00	9.00	2.00	5.00	2.00	5.00	2.00	5.00
<i>PriceRevision</i> > 16.67***	n	5		0		9		98		112	
	<i>Analyst-n</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>
	n	4	4	0	0	9	9	98	98	111	111
	mean	1.40	4.00	.	.	3.11	10.44	2.47	9.21	2.47	9.08
	median	1.00	4.00	.	.	2.00	5.00	2.00	8.00	2.00	7.00
Full Sample	n	173		55		325		325		878	
	<i>Analyst-n</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>
	n	159	165	50	53	308	314	318	322	835	854
	mean	2.01	4.02	1.76	4.20	2.29	4.89	2.20	6.54	2.17	5.28
	median	2.00	3.00	2.00	4.00	2.00	4.00	2.00	5.00	2.00	4.00

TABLE 3
Analyst Coverage by IPO Price Formation

Panel E: Analyst Coverage by *PriceRevision* and *UE(InitialReturn)*

		Quartile of <i>UE(InitialReturn)</i>								Full Sample	
		Quartile 1		Quartile 2		Quartile 3		Quartile 4		Full Sample	
<i>PriceRevision</i> < -25.00%**	n	6		16		57		66		145	
	<i>Analyst-</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>
	n	6	6	14	15	51	56	62	64	133	141
	mean	2.00	2.83	1.56	3.63	1.65	3.75	1.92	3.52	1.78	3.59
	median	2.00	2.50	2.00	4.00	2.00	3.00	2.00	3.00	2.00	3.00
-25.00%** ≤ <i>PriceRevision</i> < IPR minimum	n	37		79		39		14		169	
	<i>Analyst-</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>
	n	37	37	74	75	36	38	13	14	160	164
	mean	2.32	4.27	2.34	4.51	2.18	4.38	1.43	5.14	2.22	4.48
	median	2.00	3.00	2.00	4.00	2.00	3.00	1.00	4.50	2.00	4.00
IPR minimum ≤ <i>PriceRevision</i> < 0	n	51		26		19		10		106	
	<i>Analyst-</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>
	n	45	48	25	23	18	19	10	10	98	100
	mean	1.71	3.57	1.62	3.85	2.37	4.42	2.10	4.70	1.84	3.90
	median	1.00	3.00	1.50	3.00	2.00	4.00	1.50	4.00	1.50	3.00
<i>PriceRevision</i> = 0	n	43		18		23		14		98	
	<i>Analyst-</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>
	n	38	40	18	16	23	23	13	14	92	93
	mean	2.26	4.58	1.78	5.11	1.87	4.87	1.86	4.71	2.02	4.77
	median	2.00	4.00	1.50	5.00	2.00	4.00	2.00	4.50	2.00	4.00
0 < <i>PriceRevision</i> ≤ IPR maximum	n	39		40		33		21		133	
	<i>Analyst-</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>
	n	39	38	38	40	31	31	21	21	129	130
	mean	3.10	5.85	2.45	5.95	1.85	5.03	2.33	5.81	2.47	5.67
	median	2.00	5.00	2.00	5.00	2.00	4.00	2.00	5.00	2.00	5.00
IPR maximum < <i>PriceRevision</i> ≤ 16.67***	n	26		25		25		39		115	
	<i>Analyst-</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>
	n	25	26	25	25	24	25	38	39	112	115
	mean	2.31	5.81	2.72	6.72	2.00	6.08	2.33	6.15	2.34	6.18
	median	2.00	5.00	2.00	7.00	2.00	5.00	2.00	5.00	2.00	5.00
<i>PriceRevision</i> > 16.67***	n	18		15		24		55		112	
	<i>Analyst-</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>
	n	17	17	15	15	24	24	55	55	111	111
	mean	2.39	8.22	2.60	6.87	2.46	8.63	2.47	10.16	2.47	9.08
	median	2.00	5.50	3.00	7.00	2.00	6.00	2.00	8.00	2.00	7.00
Full Sample	n	220		219		220		219		878	
	<i>Analyst-</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>	<i>Affil</i>	<i>UnAffil</i>
	n	207	212	209	209	207	216	212	217	835	854
	mean	2.30	4.91	2.23	5.09	1.99	5.03	2.15	6.11	2.17	5.28
	median	2.00	4.00	2.00	4.00	2.00	4.00	2.00	5.00	2.00	4.00

Observations are 878 firm-commitment share IPOs from May 10, 2002 to December 31, 2013 by non-financial, U.S. companies. IPR refers to Initial Price Range. Within each cell of panels D and E, the first (second) ‘n’ corresponds to the number of IPOs (number of IPOs with analyst coverage, by affiliation). See Table 1 for variable definitions.

* 15.51% is the median value of *InitialReturn* for the 650 IPOs with *InitialReturn* > 0.

** -25.00% is the median value of *PriceRevision* for the 314 IPOs with *PriceRevision* < IPR minimum.

*** 16.67% is the median value of *PriceRevision* for the 227 IPOs with *PriceRevision* > IPR maximum.

TABLE 4
IPO Price Formation and Analyst Coverage

Variable	Eq (1a)	Eq (2a)	Eq (3a)	Eq (4a)
Constant	-1.180 (-4.87)a	-1.043 (-4.26)a	-0.832 (-4.11)a	-0.837 (-4.05)a
<i>InitialReturn</i>		0.0031 (8.55)a [0.0232]		
<i>PriceRevision</i>			0.0053 (8.68)a [0.0397]	
<i>PriceRevision</i> ⁻				0.0037 (8.22)a [0.0273]
<i>PriceRevision</i> ⁺				0.0077 (5.13)a [0.0570]
<i>UE(InitialReturn)</i>			0.0022 (4.18)a [0.0166]	
<i>UE(InitialReturn)</i> ⁻				0.0033 (1.70)c [0.0245]
<i>UE(InitialReturn)</i> ⁺				0.0001 (0.93) [0.0074]
<i>LeadMgrs</i>	0.044 (3.55)a	0.054 (4.33)a	0.057 (4.81)a	0.057 (4.88)a
<i>UWRank</i>	0.073 (3.63)a	0.072 (3.38)a	0.072 (3.31)a	0.072 (3.33)a
<i>VC</i>	0.048 (1.29)	0.027 (0.79)	0.023 (0.70)	0.014 (0.44)
<i>LnAge</i>	-0.068 (-3.70)a	-0.061 (-3.34)a	-0.060 (-3.40)a	-0.058 (-3.20)a
<i>HighTech</i>	0.150 (4.21)a	0.137 (3.87)a	0.126 (3.40)a	0.126 (3.45)a
<i>LnValuation</i>	0.221 (11.42)a	0.215 (10.96)a	0.209 (10.33)a	0.211 (10.04)a
<i>CAR-3mo</i>	0.002 (4.86)a	0.002 (4.46)a	0.002 (4.63)a	0.002 (5.11)a
<i>LnVolume-3mo</i>	0.091 (4.11)a	0.077 (3.17)a	0.068 (2.99)a	0.067 (2.85)a
<i>LnInst#-3mo</i>	0.011 (0.65)	-0.003 (-0.16)	-0.009 (-0.50)	-0.009 (-0.51)
<i>Inst%-3mo</i>	0.001 (1.37)	0.001 (1.61)	0.001 (1.91)c	0.001 (1.98)b
Pseudo R ²	16.71%	17.32%	17.49%	17.60%

Observations are 878 firm-commitment share IPOs from May 10, 2002 to December 31, 2013 by non-financial, U.S. companies. The dependent variable is *Analysts-Total*. *UE(InitialReturn)*⁻ (*UE(InitialReturn)*⁺) is *UE(InitialReturn)* when non-positive (positive) and zero otherwise. *PriceRevision*⁻ (*PriceRevision*⁺) is *PriceRevision* when non-positive (positive) and zero otherwise. *LnValuation* uses the IPO offer price for equations (1) and (2) and, per its Table 1 definition, uses the mid-point of the initial price range for equations (3) and (4). Specifications include year fixed effects. Estimation is negative binomial with z-statistics using standard errors clustered by year in parentheses and marginal effects in brackets. See Table 1 for other variable definitions.

a,b,c Significant at or beyond the 1%, 5% and 10% levels, respectively (two-sided tests).

TABLE 5
IPO Price Formation and Analyst Coverage – by Affiliation

Variable	Affiliated Analysts				Unaffiliated Analysts			
	Eq (1b)	Eq (2b)	Eq (3b)	Eq (4b)	Eq (1c)	Eq (2c)	Eq (3c)	Eq(4c)
Constant	-0.976 (-6.42)a	-0.959 (-6.15)a	-0.903 (-5.70)a	-0.898 (-5.94)a	-2.125 (-6.60)a	-1.933 (-5.63)a	-1.688 (-5.56)a	-1.689 (-5.56)a
<i>InitialReturn</i>		0.0005 (1.12) [0.0010]				0.0039 (9.36)a [0.0206]		
<i>PriceRevision</i>			0.0008 (0.98) [0.0017]				0.0067 (8.65)a [0.0357]	
<i>PriceRevision</i> ⁻				0.0009 (0.77) [0.0020]				0.0052 (5.97) [0.0274]
<i>PriceRevision</i> ⁺				0.0002 (0.23) [0.0005]				0.0092 (5.07)a [0.0488]
<i>UE-InitialReturn</i>			0.0002 (0.27) [0.0004]				0.0030 (4.79)a [0.0159]	
<i>UE(InitialReturn)</i> ⁻				-0.0014 (-0.85) [-0.0031]				0.0053 (2.24)b [0.0281]
<i>UE(InitialReturn)</i> ⁺				0.0012 (0.78) [0.0025]				0.0011 (0.85) [0.0057]
<i>LeadMgrs</i>	0.221 (9.84)a	0.222 (9.73)a	0.224 (10.04)a	0.225 (10.04)a	-0.053 (-3.44)a	-0.039 (-2.56)b	-0.035 (-2.32)b	-0.035 (-2.28)b
<i>UWRank</i>	0.109 (7.12)a	0.109 (7.08)a	0.109 (7.14)a	0.109 (6.99)a	0.056 (1.98)b	0.056 (1.88)c	0.056 (1.86)c	0.055 (1.86)c
<i>VC</i>	-0.054 (-1.64)c	-0.056 (-1.72)c	-0.056 (-1.68)c	-0.055 (-1.62)	0.090 (1.86)c	0.063 (1.37)	0.057 (1.29)	0.048 (1.07)
<i>LnAge</i>	0.006 (0.33)	0.006 (0.40)	0.007 (0.41)	0.008 (0.48)	-0.105 (-4.16)a	-0.097 (-3.89)a	-0.096 (-3.94)a	-0.095 (-3.87)a
<i>HighTech</i>	0.027 (1.38)	0.025 (1.30)	0.021 (1.14)	0.022 (1.11)	0.203 (4.47)a	0.185 (3.93)a	0.173 (3.52)a	0.172 (3.58)a
<i>LnValuation</i>	0.004 (0.18)	0.004 (0.16)	-0.002 (-0.09)	-0.002 (-0.07)	0.322 (13.03)a	0.314 (12.41)a	0.308 (11.83)a	0.309 (11.84)a
<i>CAR-3mo</i>	0.001 (1.19)	0.001 (1.17)	0.001 (1.33)	0.001 (1.37)	0.003 (3.89)a	0.003 (3.69)a	0.003 (3.86)a	0.003 (4.01)a
<i>LnVolume-3mo</i>	0.024 (1.23)	0.022 (1.15)	0.021 (1.16)	0.017 (0.85)	0.115 (3.90)a	0.096 (2.87)a	0.085 (2.67)a	0.087 (2.63)a
<i>LnInst#-3mo</i>	0.018 (0.89)	0.016 (0.79)	0.014 (0.73)	0.016 (0.80)	0.012 (0.60)	-0.001 (-0.27)	-0.011 (-0.52)	-0.013 (-0.59)
<i>Inst%-3mo</i>	-0.000 (-0.40)	-0.000 (-0.32)	-0.000 (-0.22)	-0.000 (-0.30)	0.001 (1.78)c	0.001 (2.00)b	0.001 (2.09)b	0.001 (2.17)b
Pseudo R ²	18.08%	18.09%	18.09%	18.11%	13.03%	13.57%	13.70%	13.79%

Observations are 878 firm-commitment share IPOs from May 10, 2002 to December 31, 2013 by non-financial, U.S. companies. The dependent variable is *Analysts-Affil* for equations (1b) – (4b) and *Analysts-UnAffil* for equations (1c) – (4c). Specifications include fixed effects for year. Estimation is negative binomial with z-statistics using standard errors clustered by year in parentheses and marginal effects in brackets. See Tables 1 and 4 for variable definitions.

a,b,c Significant at or beyond the 1%, 5% and 10% levels, respectively (two-sided tests).

TABLE 6
All-Star Analyst Coverage by IPO Price Formation

Panel A: All-Star analyst coverage by *InitialReturn* (quintiles per Cliff and Denis, 2004)

	<i>InitialReturn</i>	<i>UWRank</i>	Percent with an Affiliated Analyst Recommendation	Percent with an Affiliated All-Star Analyst		Percent with an Unaffiliated Analyst Recommendation	Percent with an Unaffiliated All-Star Analyst	
				Top 3	Top 3 and Runners Up		Top 3	Top 3 and Runners Up
Low	-6.73	7.65	91.9	11.6	15.6	95.4	1.7	2.3
Q2	1.04	7.81	92.7	11.2	16.9	96.6	5.6	6.2
Q3	9.07	8.04	95.5	13.6	18.8	96.0	5.1	9.1
Q4	20.35	8.11	97.7	11.4	18.3	98.9	5.1	8.6
High	49.30	8.21	97.7	11.4	17.1	99.4	5.7	10.2

Panel B: All-Star analyst coverage by *PriceRevision* (categories per the Initial Price Range, IPR)

	<i>PriceRevision</i>	<i>UWRank</i>	Percent with an Affiliated Analyst Recommendation	Percent with an Affiliated All-Star Analyst		Percent with an Unaffiliated Analyst Recommendation	Percent with an Unaffiliated All-Star Analyst	
				Top 3	Top 3 and Runners Up		Top 3	Top 3 and Runners Up
<i>PriceRevision</i> < -25.00%*	-40.25	7.67	91.7	7.6	12.4	97.2	2.1	2.8
-25.00%* ≤ <i>PriceRevision</i> < IPR minimum	-18.38	8.04	94.7	14.2	19.5	97.0	4.1	4.7
IPR minimum ≤ <i>PriceRevision</i> < 0	-7.36	7.28	92.5	9.4	14.2	94.3	3.8	5.7
<i>PriceRevision</i> = 0	0.00	7.89	93.9	10.2	16.3	94.9	4.1	6.1
0 < <i>PriceRevision</i> ≤ IPR maximum	6.48	8.16	97.0	16.5	22.6	97.7	6.0	9.0
IPR maximum < <i>PriceRevision</i> ≤ 16.67**	12.69	8.22	97.4	11.3	13.9	100.0	7.8	12.2
<i>PriceRevision</i> > 16.67**	28.61	8.45	99.1	12.5	21.4	99.1	5.4	12.5

Observations are 878 firm-commitment share IPOs from May 10, 2002 to December 31, 2013 by non-financial, U.S. companies. IPR refers to Initial Price Range. See Table 1 for variable definitions.

* -25.00% is the median value of *PriceRevision* for the 314 IPOs with *PriceRevision* < IPR minimum.

** 16.67% is the median value of *PriceRevision* for the 227 IPOs with *PriceRevision* > IPR maximum.

TABLE 7
Unaffiliated Analyst Coverage by OCF/Assets and IPO Price Formation

Panel A: Unaffiliated analyst coverage by OCF/Assets and InitialReturn

<i>OCF/</i>			<i>InitialReturn</i>	<i>InitialReturn</i>	<i>0 < Initial</i>	<i>15.51% <</i>	
<i>Assets</i>	<i>Quintile</i>		<i>< 0</i>	<i>= 0</i>	<i>Return ≤</i>	<i>InitialReturn</i>	<i>Full Sample</i>
					<i>15.51%</i>		
1	n		55	16	68	37	176
	<i>Analysts-</i>	mean	2.98	3.25	3.18	4.97	3.50
	<i>UnAffil</i>	median	3.00	2.50	3.00	5.00	3.00
2	n		34	10	56	75	175
	<i>Analysts-</i>	mean	3.62	3.20	4.38	6.55	5.09
	<i>UnAffil</i>	median	3.00	3.00	4.00	6.00	4.00
3	n		36	9	85	46	176
	<i>Analysts-</i>	mean	4.61	3.33	5.40	6.59	5.44
	<i>UnAffil</i>	median	4.50	4.00	5.00	5.00	5.00
4	n		22	12	74	67	175
	<i>Analysts-</i>	mean	5.09	7.33	5.73	6.69	6.13
	<i>UnAffil</i>	median	4.00	4.50	5.00	6.00	5.00
5	n		26	8	42	100	176
	<i>Analysts-</i>	mean	5.04	3.63	5.83	6.98	6.27
	<i>UnAffil</i>	median	4.00	3.50	5.00	6.00	5.00
Total	n		173	55	325	325	878
	<i>Analysts-</i>	mean	4.02	4.20	4.89	6.54	5.28
	<i>UnAffil</i>	median	3.00	4.00	4.00	5.00	4.00

TABLE 7
Unaffiliated Analyst Coverage by OCF/Assets and IPO Price Formation

Panel B: Unaffiliated analyst coverage by OCF/Assets and PriceRevision (categories per the Initial Price Range, IPR)

OCF/ Assets Quintile			IPO price < Initial Price Range -25.00%** ≤		IPO price is within Initial Price Range			Initial Price Range < IPO price IPR maximum <		Full Sample
			PriceRevision < -25.00%**	PriceRevision < IPR minimum	IPR minimum ≤ PriceRevision < 0	PriceRevision = 0	0 < PriceRevision ≤ IPR maximum	PriceRevision ≤ 16.67***	PriceRevision > 16.67***	
1	n		69	26	29	18	17	8	9	176
	Analysts- UnAffil	mean	2.83	3.04	2.62	4.94	4.71	4.63	6.67	3.50
		median	2.00	3.00	2.00	5.00	5.00	3.50	6.00	3.00
2	n		29	36	16	20	28	20	26	175
	Analysts- UnAffil	mean	3.76	4.36	3.19	3.70	5.57	6.15	8.50	5.09
		median	3.00	3.00	3.00	4.00	5.00	5.00	8.00	4.00
3	n		17	48	22	22	34	17	16	176
	Analysts- UnAffil	mean	3.71	4.27	5.00	5.23	5.76	7.94	8.38	5.44
		median	3.00	4.00	4.00	5.50	4.50	8.00	6.00	5.00
4	n		18	37	21	22	29	30	18	175
	Analysts- UnAffil	mean	5.28	5.19	4.76	5.64	6.38	6.47	10.11	6.13
		median	4.00	4.00	4.00	5.00	6.00	5.00	8.00	5.00
5	n		12	22	18	16	25	40	43	176
	Analysts- UnAffil	mean	4.92	5.64	4.22	4.06	5.48	5.55	9.77	6.27
		median	5.50	5.50	3.00	5.00	4.00	5.00	7.00	5.00
Total	n		145	169	106	98	133	115	112	878
	Analysts- UnAffil	mean	3.59	4.48	3.90	4.77	5.67	6.18	9.08	5.28
		median	3.00	4.00	3.00	4.00	5.00	5.00	7.00	4.00

TABLE 7
Unaffiliated Analyst Coverage by OCF/Assets and IPO Price Formation

Panel C: Unaffiliated analyst coverage by OCF/Assets and UE(InitialReturn)

<i>OCF/Assets</i> Quintile		Quartile of <i>UE(InitialReturn)</i>					Full Sample
		Quartile 1	Quartile 2	Quartile 3	Quartile 4		
1	n	43	39	44	50	176	
	<i>Analysts-UnAffil</i>	mean	3.49	3.33	3.27	3.84	3.50
		median	3.00	3.00	3.00	3.00	3.00
2	n	43	44	37	51	175	
	<i>Analysts-UnAffil</i>	mean	4.05	4.98	5.54	5.75	5.09
		median	3.00	5.00	4.00	4.00	4.00
3	n	54	52	45	25	176	
	<i>Analysts-UnAffil</i>	mean	5.00	5.52	4.76	7.48	5.44
		median	5.00	5.00	4.00	6.00	5.00
4	n	41	48	50	36	175	
	<i>Analysts-UnAffil</i>	mean	6.29	6.02	5.70	6.67	6.13
		median	5.00	5.00	4.00	5.00	5.00
5	n	39	36	44	57	176	
	<i>Analysts-UnAffil</i>	mean	5.87	5.28	5.86	7.47	6.27
		median	5.00	5.00	5.00	6.00	5.00
Total	n	220	219	220	219	878	
	<i>Analysts-UnAffil</i>	mean	4.91	5.09	5.03	6.11	5.28
		median	4.00	4.00	4.00	5.00	4.00

OCF/Assets is pre-IPO annualized operating cash flow (per the most recent, pre-IPO Statement of Cash Flows) ÷ average assets. See Table 1 for sample details and other variable definitions.

TABLE 8
Unaffiliated Analyst Coverage by Ownership Retention and IPO Price Formation

Panel A: Unaffiliated analyst coverage by *Retain%* and *InitialReturn*

<i>Retain%</i> Quintile			<i>InitialReturn</i> < 0	<i>InitialReturn</i> = 0	0 < <i>InitialReturn</i> ≤ 15.51%	15.51% < <i>InitialReturn</i>	Full Sample
1	n		39	8	87	42	176
	<i>Analysts- UnAffil</i>	mean	3.49	3.63	4.24	4.67	4.15
		median	2.00	4.00	3.00	4.00	4.00
2	n		36	23	65	51	175
	<i>Analysts- UnAffil</i>	mean	3.81	3.70	4.58	4.75	4.35
		median	3.00	3.00	4.00	4.00	4.00
3	n		33	8	66	69	176
	<i>Analysts- UnAffil</i>	mean	3.97	4.25	4.30	6.10	4.94
		median	4.00	4.50	4.00	5.00	4.00
4	n		36	10	58	71	175
	<i>Analysts- UnAffil</i>	mean	4.69	6.10	5.95	6.00	5.72
		median	4.50	4.00	5.00	6.00	5.00
5	n		29	6	49	92	176
	<i>Analysts- UnAffil</i>	mean	4.24	3.67	5.98	9.12	7.26
		median	3.00	3.50	5.00	8.00	6.00
Total	n		173	55	325	325	878
	<i>Analysts- UnAffil</i>	mean	4.02	4.20	4.89	6.54	5.28
		median	3.00	4.00	4.00	5.00	4.00

TABLE 8
Unaffiliated Analyst Coverage by Ownership Retention and IPO Price Formation

Panel B: Unaffiliated analyst coverage by *Retain%* and *PriceRevision* (categories per the Initial Price Range, IPR)

<i>Retain%</i> Quintile			IPO price < Initial Price Range -25.00%** ≤		IPO price is within Initial Price Range			Initial Price Range < IPO price IPR maximum <		Full Sample
			<i>PriceRevision</i> < -25.00%**	<i>PriceRevision</i> < IPR minimum	IPR minimum ≤ <i>PriceRevision</i> < 0	<i>PriceRevision</i> = 0	0 < <i>PriceRevision</i> ≤ IPR maximum	<i>PriceRevision</i> ≤ 16.67***	<i>PriceRevision</i> > 16.67***	
1	n		28	41	23	27	28	23	6	176
	<i>Analysts- UnAffil</i>	mean	3.07	3.80	3.30	4.74	4.86	4.74	6.50	4.15
		median	3.00	3.00	3.00	4.00	4.50	5.00	6.50	4.00
2	n		34	36	30	16	25	22	12	175
	<i>Analysts- UnAffil</i>	mean	2.91	5.06	4.00	3.75	5.04	5.64	4.25	4.35
		median	2.50	4.00	3.00	4.00	4.00	5.00	4.00	4.00
3	n		42	30	15	16	27	28	18	176
	<i>Analysts- UnAffil</i>	mean	3.76	3.80	3.07	4.75	6.56	5.64	7.83	4.94
		median	3.00	3.50	3.00	4.50	6.00	5.00	7.00	4.00
4	n		22	35	21	24	25	18	30	175
	<i>Analysts- UnAffil</i>	mean	4.59	4.60	4.67	5.25	5.60	7.06	8.27	5.72
		median	3.00	5.00	5.00	5.00	5.00	7.50	6.50	5.00
5	n		19	27	17	15	28	24	46	176
	<i>Analysts- UnAffil</i>	mean	4.05	5.33	4.29	5.13	6.25	8.04	11.70	7.26
		median	4.00	5.00	3.00	5.00	5.00	8.00	9.00	6.00
Total	n		145	169	106	98	133	115	112	878
	<i>Analysts- UnAffil</i>	mean	3.59	4.48	3.90	4.77	5.67	6.18	9.08	5.28
		median	3.00	4.00	3.00	4.00	5.00	5.00	7.00	4.00

TABLE 8
Unaffiliated Analyst Coverage by Ownership Retention and IPO Price Formation

Panel C: Unaffiliated analyst coverage by *Retain%* and *UE(InitialReturn)*

<i>Retain%</i> Quintile		Quartile of <i>UE(InitialReturn)</i>					Full Sample
		Quartile 1	Quartile 2	Quartile 3	Quartile 4		
1	n	51	59	40	26	176	
	<i>Analysts- UnAffil</i>	mean median	4.10 3.00	4.36 4.00	3.98 3.00	4.04 3.50	4.15 4.00
2	n	47	44	51	33	175	
	<i>Analysts- UnAffil</i>	mean median	4.53 4.00	4.34 4.00	4.57 4.00	3.79 3.00	4.35 4.00
3	n	32	49	55	40	176	
	<i>Analysts- UnAffil</i>	mean median	5.22 5.00	4.27 4.00	5.47 5.00	4.83 3.50	4.94 4.00
4	n	46	36	37	56	175	
	<i>Analysts- UnAffil</i>	mean median	5.76 5.00	6.17 6.00	5.00 4.00	5.88 6.00	5.72 5.00
5	n	44	31	37	64	176	
	<i>Analysts- UnAffil</i>	mean median	5.16 3.50	7.61 6.00	6.16 5.00	9.16 8.00	7.26 6.00
Total	n	220	219	220	219	878	
	<i>Analysts- UnAffil</i>	mean median	4.91 4.00	5.09 4.00	5.03 4.00	6.11 5.00	5.28 4.00

Retain% is One – (number of shares to be sold in the IPO ÷ number of post-IPO shares outstanding (both from the final prospectus)). See Table 1 for sample details and other variable definitions.