

IPO PRICE FORMATION AND ANALYST COVERAGE

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ABSTRACT:

In this paper, given market (and especially) regulatory changes over the past two decades, we re-examine the relation between IPO pricing and coverage by sell-side stock analysts. Our research design builds on the well-documented finding of the partial adjustment phenomenon, in that the offer price revision following the IPO road show is highly predictive of the first-day return. We provide new insights to the literature on IPO analyst coverage / recommendations. With respect to coverage, we find no evidence to suggest that the decisions of affiliated analysts vary with IPO pricing. As for unaffiliated analysts, our results indicate that their coverage decisions are driven more so by the offer price revision following book building than by the return on the first-trading day; consistent with the effects that the interest of institutional investors has on their incentives. With respect to recommendations, our findings suggest that, for IPOs after the JOBS Act of 2012, lead underwriters bring on co-managers that seemingly pre-commit to provide very favorable recommendations; particularly, for those IPOs that do not experience an increase in their offer prices after the road show or an increase in their share price on the first trading day.

Keywords: Analyst coverage, IPOs, partial adjustment, price revision, underpricing

JEL codes: G24, G32, M13, M41

August 15, 2022

If securities or industry analysts do not publish research or publish inaccurate or unfavorable research about our business, our stock price and trading volume could decline.
(New Relic, Inc. IPO Prospectus December 11, 2014)

1. INTRODUCTION

Whereas analyst coverage is important for a typical public company, it is arguably of particular importance for a newly-public company; such that disclosures alerting investors of the risk of *not* attaining coverage are very common (e.g., New Relic, Inc.). Companies that go public have strong incentives to garner coverage, some of which they can attain by awarding the mandate to banks that bundle underwriting with the promise of analyst following. In this regard, Brau and Fawcett (2006, p. 400) report survey results that CFOs "... select underwriters based on overall reputation, quality of the research department and industry expertise". Consistent with this, the findings of Loughran and Ritter (2004) and Cliff and Denis (2004) suggest that issuers during the late 1990's underpriced their IPO to compensate their lead underwriter(s) for providing coverage (i.e., 'analyst lust'). Aggarwal, Krigman and Womack (2002) study Internet-era IPOs and report a positive relation between underpricing and the number of non-lead analysts. In terms of recommendations, James and Karceski (2006) examine IPOs from 1996-2000 and find that, as of the one-year post-IPO mark, lead analysts provide the most favorable recommendations, especially for IPOs whose price does not increase on the first day. However, there have been important changes in the U.S. IPO market with respect to both market conditions and regulatory restrictions (both their imposition and subsequent relaxation) on the activities of sell-side stock analysts since the periods that these (and most others) papers examine.

Drawing motivation from these changes, we re-examine the relation between IPO pricing and analyst coverage for a sample of domestic, commercial IPOs from mid-2002 through 2020, a period quite different than that which much of the extant literature studies. First, at an average initial return of around 19%, underpricing is arguably at a more 'normal' level, mainly because IPOs with 'extreme' underpricing are much less prevalent than during the late-1990's.¹ Second,

¹ For example, in contrast to a 24% frequency in Aggarwal et al. (2002), 6% of our sample classify as 'extra-hot' IPOs (i.e., an initial return greater than 60% using the opening price on the first day).

stemming from allegations of bias and conflicts of interest pertaining to their bundling of investment banking services during the Internet era, starting mid-2002, major regulatory changes were imposed on sell-side analysts (e.g., NASD Rule 2711, NYSE Amended Rule 472, the Global Analyst Research Settlement; hereafter Global Settlement). Among other restrictions, these changes limited communication between research analysts and their underwriting colleagues, prohibited analyst compensation from being linked to investment banking deals and banned analysts from attending pitch meetings and road shows. Subsequently, in mid-2012, certain of these restrictions regarding analyst participation in IPOs were lifted by the Jumpstart Our Business Startups Act (JOBS Act). Examining a more-recent period with these market and regulatory differences enables us to assess whether underpricing continues to influence analyst coverage of IPO firms, and whether it has a differential effect on affiliated versus unaffiliated analysts, in ways that are similar to those which the extant literature documents.

In addition to these market / institutional differences, an innovation of our paper is that its design adopts a book-building view of IPO pricing. The extant literature on analyst following of IPOs primarily focuses on the influence of underpricing and has yet to explicitly consider the offer price revision. We focus on the offer price revision for the following reasons. One, a book-building view emphasizes the price revision as a key antecedent of the initial return; or, put another way, because of the ‘partial adjustment’ phenomenon, IPO underpricing is, in essence, ‘conditional’ on the price revision (Benveniste and Spindt 1989; Hanley 1993; Ritter 2011). Two, since direct demand information is not publicly available, the offer price revision is a proxy for the revelation of institutional investor demand (Cornelli and Goldreich 2003; Qian, Ritter and Shao 2022); which, per Brown, Call, Clement and Sharp (2015), is the paramount determinant of analysts’ coverage decisions. Taken together, because of partial adjustment, the price revision is positively associated with the initial return; and, because it is reflective of institutional investor demand, the price revision should also be positively associated with analyst coverage.

Our empirical analysis consists of three aspects. We first examine the role of initial returns and offer price revisions in the analyst coverage decision. We then examine their effects

on analyst recommendations. Lastly, we investigate the mechanism(s) through which the price revision and the initial return influence analyst coverage decisions.

Consistent with many prior studies, we begin by documenting a strong, positive relation between initial return and total analyst coverage as of 12-months post-IPO. However, as an update to the literature, we find that this association now pertains solely to analysts without an affiliation to a lead manager or co-manager underwriting the IPO (i.e., unaffiliated analysts). That is, our findings provide no support that the coverage decisions of affiliated analysts vary with IPO underpricing. While we concede that other factors may also be at play, our results are consistent with the view that the change in the relation between underpricing and affiliated coverage stems from those IPOs with a lead manager that was party to the Global Settlement.

Also new to the literature, we document a strong, positive association between the offer price revision and coverage by unaffiliated analysts. This relation is evident in our descriptive and multivariate analyses and is primarily due to higher coverage of IPOs with offer prices that rise above the maximum of their initial price range (IPR). We also examine the relation between analyst coverage and the offer price revision and the residual from regressing initial returns on price revisions. This specification does not pit the price revision against the initial return, but rather acknowledges that the former precedes the latter and averts effects of their collinearity. The results show that the underpricing / unaffiliated coverage relation stems, in large part, from the price revision. Moreover, we find that the relation between the price revision and unaffiliated coverage is more important than that between the initial return and unaffiliated coverage.² Our results suggest a one-standard-deviation change in the price revision corresponds to 0.6 additional unaffiliated analysts (the unconditional mean (median) for which is 2.45 (2.00)) versus an increase of 0.2 unaffiliated analysts for a comparable change in the initial return.

² That is, while most literature (e.g., Rajan and Servaes, 1997) suggests that an IPO issuer that goes public at \$20 per share and ends the first trading day at a price of, say, \$28 will receive higher analyst coverage than if the closing price is, say, \$21; we show that it is arguably more important to understand how the issue arrived at the \$20 IPO price (i.e., whether the offer price moved up or down from the IPR mid-point and, if so, by what extent).

We next compare the stock recommendations of affiliated analysts to those of unaffiliated analysts. We find that affiliated analysts issue more favorable recommendations as of 3-months post-IPO but, unlike James and Karceski (2006), that this difference is no longer evident at the one-year mark because the incremental recommendations of unaffiliated analysts are increasingly favorable (McNicols and O'Brien 1997). Several aspects of this initial difference in recommendations are also new to the literature: one, it is evident whether offer prices move down or up following the road show as well as whether initial returns are negative, zero or positive; two, consistent with the notion of a 'booster shot' (James and Karceski 2006), this initial difference is strongest for IPOs that do not experience a positive price revision and also for those that do not increase in price on the first day; three, it is due, in large part, from the very favorable recommendations of co-manager affiliated analysts, even more so than those of their lead-manager counterparts; and four, it primarily emerges for issuers that go public after the JOBS Act which, as we mention above, relaxes certain restrictions on analyst participation in IPOs. Taken collectively, our findings are consistent with the view that lead underwriters bring on co-managers that seemingly pre-commit to provide (the most-) favorable recommendations.

A challenge for our paper is whether our finding that price revision is more important than initial return in explaining the variation in unaffiliated coverage is 'new'. As, after all, one may view it as derivative of papers that find analyst coverage is a function of underpricing (e.g., Rajan and Servaes 1997) along with those that show underpricing is a function of price revision (e.g., Hanley 1993). To this, we emphasize that the relation between unaffiliated coverage and price revision persists after controlling for initial return. In addition, the above does not consider that arguably no benefits of underpricing accrue to unaffiliated analysts nor does it view the price revision as proxy for institutional investor demand. To examine this empirically, we focus on sub-samples in which price revision and underpricing are not positively correlated (i.e., IPOs with negative revisions but positive initial returns, or positive revisions but non-positive initial returns). When we estimate our coverage regressions for these 'off-diagonal IPOs', we continue to find a positive association between the offer price revision and unaffiliated coverage. This

suggests that price revision has a distinct association with unaffiliated coverage, one that is not contingent on initial return, and that our finding cannot be explained by the existing literature.

We interpret our findings as consistent with the view that unaffiliated analysts choose to cover those newly-public companies for which they have reason to expect greater post-IPO interest from institutional investors. However, this interpretation neglects the endogenous nature of the price revision, as some of its determinants have plausible connections to analyst coverage. For example, studies find that the price revision varies with road-show market returns and issuer / issue characteristics such as operating performance and ownership retention (e.g., Lowry and Schwert 2004; Willenborg, Wu and Yang 2015). Given this, analysts may be drawn to cover companies that go public when conditions are favorable, or are less likely to have problems with future viability, or with more ownership yet to sell, and the price revision is a proxy for these incentives. To assess this, we regress the price revision on its determinants and parse it into ‘expected’ and ‘unexpected’ components. When we do this, we find that the relation between the offer price revision and unaffiliated coverage primarily stems from the ‘unexpected’ price revision; an arguably better proxy for institutional investor demand.

The above analyses control for issuer / issue characteristics as of disclosure of the IPR, as well as the return on the IPO day and other variables that we measure after the IPO day (stock returns, trading volume, institutional ownership) and show a positive association between price revision and unaffiliated coverage. However, it is possible that price revision affects coverage through additional paths, such as the initial return and / or these post-IPO variables. To examine this, we conduct a path analysis. The results indicate both a direct-positive association between price revision and unaffiliated coverage and an indirect-positive association between price revision and such coverage via the mediating effects of initial return and post-IPO trading volume. The indirect effect of price revision on unaffiliated coverage via volume is consistent with analysts’ incentives. Of note, this analysis also shows that the total effect of price revision on unaffiliated coverage is greater than the total effect of initial return on unaffiliated coverage.

Our paper contributes to the IPO and analyst literatures. With respect to IPOs, our findings suggest that partial adjustment attracts coverage by unaffiliated analysts. Rajan and Servaes (1997, p. 514) was the first to document a positive association between underpricing and (total) analyst coverage, which they interpret as suggesting 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." One interpretation of our findings is that the offer price revision is such a variable. Our paper also extends Aggarwal et al. (2002, p. 106) which asserts that "analysts provide more recommendations and research reports for the hottest IPOs" and reports a positive relation between "extra-hot" IPOs and non-lead analyst recommendations for an Internet-era sample. Our findings suggest that the results in Aggarwal et al. are neither specific to IPOs with such underpricing nor to underpricing, per se, but also to its antecedent, the offer price revision. Our findings also extend the results in James and Karceski (2006), as they suggest that, following the JOBS Act, lead managers bring on co-managers that seem to pre-commit to provide very favorable recommendations regardless of whether the price moves up or down after book building or whether it moves up or down on the first trading-day. Overall, we see our paper as contributing because the literature has yet to explicitly consider an important piece of the story; that it is not just underpricing that attracts sell-side analyst coverage, but also the institutional demand that offer price revisions manifest.

As for the analyst literature, our results show that unaffiliated analysts are more likely to initiate coverage on IPOs with positive price revisions, in part because it foreshadows higher trading volume. Li and You (2015) study the market reaction to analyst initiations / terminations and find little support that coverage increases firm performance or decreases information asymmetry, but support that analysts provide value by increasing investor recognition; their primary proxy for which is the fraction of 13F filers holding the stock. Li and You (2015, p. 142) 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, their findings are also

consistent with an ‘anticipation hypothesis’ that analysts cover stocks they expect to have higher investor recognition, a rationale they argue is unlikely to explain their results. In his discussion, Hansen (2015, p. 62) discusses this explanation and suggests it implies “initiations are somewhat predictable using observable indicators.” In this sense, we see our finding that analysts cover IPOs that portend higher volume as consistent with the ‘anticipation hypothesis’ and 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)

2. LITERATURE AND MOTIVATION

2.1 IPO Underpricing and Analyst Coverage

The extant literature on IPO pricing and analyst coverage focuses on the effects of the first-day return and primarily studies periods prior to the regulatory events affecting investment banks and analysts in the early 2000s and / or does not separately examine analysts with versus without affiliation to the underwriter(s).³ While early papers report a positive relation between the initial return and coverage, some later papers report mixed or inconclusive evidence.

Rajan and Servaes (1997) was the first to document a positive relation between underpricing and analyst coverage. They examine a sample of IPOs from 1975 to mid-1987 and, after considering the selection bias in the coverage decision, report a positive association between IPOs with an “extreme” level of underpricing (i.e., greater than the median of IPOs with positive underpricing) and the total number of analysts (affiliated and unaffiliated) providing earnings forecasts to IBES during the issuer’s first post-IPO year. They interpret this as IPOs that underprice to this extent “attract” the interest of analysts. In another paper that also focuses on the effects of “extreme” underpricing, Aggarwal et al. (2002) study a sample of Internet and matched IPOs from 1994 to 1999 and report a positive association between underpricing and the

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

number of recommendations by non-lead analysts on First Call within the first seven months. They interpret this as managers strategically underpricing to generate information momentum in the form of research coverage in an attempt to boost the price at which they could sell shares at expiration of the lockup period.⁴

Loughran and Ritter (2004) argue that IPO issuers during the late 1990s increasingly chose their lead underwriter(s) on the basis of coverage (“analyst lust”). They examine IPOs from 1980-2003 and attribute much of the extreme underpricing during this period to this aspect of the issuer’s objective function. In another paper that focuses on affiliated analysts, Cliff and Denis (2004) study whether issuers underprice to buy coverage from their lead underwriter(s). They examine IPOs from 1993 to 2000 that also issue an SEO from 1993 to 2001 and report a positive association between underpricing and whether a lead underwriter employs an *Institutional Investor (II)* All-Star analyst in the issuer’s industry. In addition, after endogenizing the lead underwriter’s decision to provide coverage within one year, they report a positive relation between expected analyst 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.”

In contrast, Bradley, Jordan and Ritter (2008) examine IPOs from 1999-2000 and report a positive association between underpricing and total analyst coverage as of the first month (when most following is by analysts affiliated with a lead manager), but that is no longer evident at the one-year mark. Bradley et al. (2008, p. 101) conclude that, for this period at the height of the Internet IPO bubble, “analyst following in the first year is not affected by underpricing.” In another paper that documents a similar sensitivity of findings to time period, Liu and Ritter (2011) advance and test a theory of underpricing that considers issuers’ preferences for price and non-price aspects of underwriting services. In terms of issuers, they focus on those that are venture backed; and, in terms of non-price services, on coverage by *II* All-Star analysts with an

⁴ In another paper, Das, Guo and Zhang (2006) examine a sample of 1986-2000 IPOs and also report a positive association between IPO underpricing and total analyst coverage within the first six months.

affiliation to a bookrunner. They study IPOs from 1993-2008 and report a positive association between underpricing and the presence of *II* All-Stars during 1993-1998, but not for 1999-2008. They interpret their findings for this earlier period as reflective of rents to underwriters with market power when IPO issuers covet coverage from their analysts.⁵

Another branch of literature examines analyst recommendations. Michaely and Womack (1999) examine 1990-1991 IPOs and report that analysts with lead underwriter affiliation issue more favorable recommendations and that the market does not fully adjust to this apparent bias. Bradley et al. (2003, p. 2) examine 1996-2000 IPOs and, while they find that initial coverage appears favorable, they conclude that their results indicate "... after controlling for the number of analysts initiating, the presence or absence of the lead underwriter makes no difference."

James and Karceski (2006) examine a sample of IPOs from November 1996-August 2000 and focus on the relation between underpricing and the "strength" of analyst coverage. They find that analysts affiliated with a lead or co-lead underwriter provide the most-favorable recommendations as of one-year, post-IPO; particularly for IPOs with initial returns that are zero or negative (i.e., "booster shots" for "broken deals"). That is, whereas most of the extant literature finds that the likelihood / extent of analyst coverage is positively associated with underpricing; they document that the strength of coverage is negatively associated with underpricing, especially for lead analysts.

2.2 Regulatory Changes Affecting Analysts and IPOs

The majority of the extant literature examines samples from time periods that are either prior to, or overlap with, the series of investigations into analyst conflicts of interest after the Internet bubble burst in April of 2000. In 2001, the U.S. Congress held hearings entitled "Analyzing the Analysts" and New York State Attorney General Spitzer began an investigation of Merrill Lynch, that concluded with a settlement agreement in May of 2002. Also at this time, the

⁵ O'Brien and Tan (2015) study the effect of geographic proximity on analyst decisions to provide coverage within two years of a company's IPO. They control for underpricing and report that it has a positive association with total analyst coverage. However, because their sample spans 1996-2009, it is unclear if this relation is evident for the later period(s) of their sample or if, as with Bradley et al. (2008) and Liu and Ritter (2011), it is no longer evident.

Securities and Exchange Commission (SEC) approved new rules of the National Association of Securities Dealers (Rule 2711) and the New York Stock Exchange (Amended Rule 472), the intent of which were to sever the ties between investment banking and research departments at U.S. brokerage houses.⁶ Also at this time, AG Spitzer joined with the SEC, NASD, NYSE and other state regulators to expand the investigation of analyst conflicts of interest to other investment banks. The culmination of this was the Global Settlement, announced in April 2003, with ten (ultimately twelve) investment banks. Among other structural reforms, the Global Settlement requires a physical separation of investment banking and research (including their legal / compliance staffs), mandates that investment bankers have no input into analyst compensation or what companies they cover and bans analysts from participating in efforts to attain investment banking business, including attendance at pitch meetings and roadshows.

Approximately one decade later, in April of 2012, certain restrictions regarding analyst participation in IPOs were lifted by the JOBS Act, which ushered in major revisions to the U.S. IPO market. The primary changes allow “emerging growth companies” (EGCs) – primarily defined as those with total revenues of less than \$1 billion during their most-recent fiscal year – access to an ‘IPO on-ramp’ via a variety of reductions in regulatory requirements (e.g., to confidentially file their registration statement with the SEC, to ‘test-the-waters’ and gauge the interest of qualified investor and to reduce the extent of financial and executive compensation disclosures). In addition, the JOBS Act also relaxes some of the restrictions on analysts affiliated with the underwriting syndicate of an EGC issuer. As Dambra, Field, Gustafson and Pisciotta (2018, p. 307) elaborate, the JOBS Act includes provisions with the intent to “reintegrate EGC affiliated analysts into the IPO process” by permitting them to have pre-IPO conversations (as arranged by investment bankers) with prospective investors and to once again attend pitch and due diligence meetings with management and their underwriting colleagues.⁷

⁶ Title V of the Sarbanes-Oxley Act of 2002 addresses analyst conflicts of interest and specifies similar restrictions.

⁷ Of these, the ability to attend pitch meetings may be particularly problematic as “... some analysts say Wall Street is slipping back into its old ways. Today, companies routinely interview analysts when selecting bankers to underwrite their I.P.O’s. During these meetings, the analysts say, they increasingly feel pressure to say the right

2.3 IPO Price Revision and Analyst Coverage

Historically, most companies that go public in the U.S. in a firm-commitment IPO do so via bookbuilding; a process that begins when the issuer provides an initial price range (IPR) within which it expects to sell a certain number of its shares. Following this disclosure, underwriters and company executives conduct a marketing campaign / 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 participants to divulge strong demand, underwriters agree to a partial upward adjustment to arrive at the IPO offer price. As a result, underpricing of IPO shares, in concert with allocating them in a discretionary manner, serves to compensate these ‘regular’ investors for revealing their favorable *private* information.

Hanley (1993) was the first to document the strong, positive relation between offer price revisions (i.e., from IPR mid-point to IPO price) and underpricing, consistent with a partial adjustment to road-show investors’ demand. However, the strength of this relation, along with papers that report a similar adjustment to positive *public* information that arises during the road show (Bradley and Jordan 2002; Loughran and Ritter 2002; Lowry and Schwert 2004), suggest it stems from more than just an inducement for the revelation of favorable private information from regular investors. Following this, Ritter (2011) argues that the presence of agency conflicts between issuers and underwriters is the primary reason for the ‘partial-adjustment phenomenon’ and emphasizes interpreting IPO underpricing as ‘conditional’ on the offer price revision.⁸

As we discuss in Section 2.1, the literature on IPO pricing and analyst coverage focuses on underpricing; the return from the IPO offer price to the opening or, more often, closing price

things to curry favor with a company’s management and owners. They also see themselves as participating in their banks’ efforts to win business, a potential breach of government regulations.” (Lattman and Craig, 2013, p. B1).

⁸ 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.” This is also consistent with the earlier view of Ritter and Welch (2002, p. 1803) that “the solution to the underpricing puzzle has to lie in focusing on the setting of the offer price, where the normal interplay of supply and demand is suppressed by the underwriter.”

on the first trading day. However, a well-known aspect of book-built IPOs is that the first-day return is highly predictable from the offer price revision. That is, if the price revises upward during the pre-IPO period then the first-day return is often highly positive; and if the price revises downward, then the first-day return is often much less positive (or zero or negative). Loughran and Ritter (2002) and Ritter (2011) argue that such a 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 IPR.

We advance the offer price revision as a proxy for the revelation of institutional investor demand during the roadshow.⁹ Given analysts incentives (e.g., to generate trading volume by covering stocks of interest to institutional investors), the offer price revision should have a positive relation with analyst coverage. To the extent that the price revision is reflective of institutional investor demand and underpricing is associated with analyst coverage, this suggests one rationale for the association between underpricing and analyst coverage that is distinct from underpricing serving as a compensation for underwriter provision of analyst coverage. That is, because of partial adjustment, the price revision should be positively associated with the initial return; and, because it proxies for institutional investor demand, the price revision should also be positively associated with analyst coverage.

In this paper, given market and regulatory changes since most of the extant literature, along with a focus on price formation, we re-examine the relations between IPO pricing and analyst coverage and recommendations.

⁹ Per Qian, Ritter and Shao (2022, p. 16), “Price revision is naturally a proxy for investor demand when the direct demand information is not publicly available for bookbuilding IPOs. There is evidence that price revision becomes insignificant when demand information is directly controlled for (see Cornelli and Goldreich (2003) for a sample of international bookbuilding IPOs underwritten by European banks; Qian, Ritter and Yan (2014) for a sample of U.S. bookbuilding IPOs).” There is anecdotal support of the price revision as a proxy for institutional investor demand. On his website (<https://site.warrington.ufl.edu/ritter/ipo-data/>), Professor Ritter provides institutional investor data for eight book-built IPOs from 1997-2000. Using these data, we calculate a variable equal to the number of shares demanded by institutional investors divided by the number of shares offered in the prospectus disclosing the initial price range. The Pearson correlation between this variable and the offer price revision is 0.92 (p-value < 0.00).

3. SAMPLE, VARIABLES AND CORRELATIONS

3.1 Sample

Panel A of Table 1 presents the sample. Using the Thomson Financial SDC database, we identify 1,851 firm-commitment IPOs by non-financial, domestic issuers from May 10, 2002 to December 31, 2020. The starting point is the date of SEC approval of NASD Rule 2711 and the amendments to NYSE Rule 472. As we discuss, the majority of the extant literature examines samples that include segments of time prior to these regulatory changes when sell-side analysts were subject to allegations of conflicts of interest. We focus on share IPOs and eliminate 190 IPOs that involve units. We also exclude 72 IPOs without necessary information, mostly issuers that undergo a change in legal form.¹⁰ Since our interest is analyst coverage and the price formation of bookbuilt IPOs, we omit 13 IPOs sold via auction (Degeorge, Derrien and Womack 2010). Lastly, we exclude 18 IPOs with an IPR mid-point of \$5 or less and 4 IPOs for which the period of time from the date of the prospectus disclosing the IPR to the date of the IPO exceeds one year (Edelen and Kadlec 2005). Our full sample consists of 1,554 IPOs.

3.2 Variables

Panel B of Table 1 presents the variables for the full sample (see Appendix A for variable definitions). Consistent with recent trends, less than 1% of our sample (12 of 1,554) do not have analyst coverage, per IBES, within the first year (not tabled).¹¹ The mean (median) number of analysts covering an issuer within 12 months post-IPO (*Analysts-Total*) is 7.30 (6.00). Most of this coverage is by affiliated analysts, which we define as those with an affiliation to either a lead- or co-manager, as mean (median) *Analysts-Affiliated* of 4.85 (4.00) is about double that of *Analysts-UnAffiliated* at 2.45 (2.00).

Our design adopts the view that underpricing is conditional the offer price revision. We operationalize this by splitting initial return into ‘expected’ and ‘unexpected’ components. For

¹⁰ Because of this, we are unable to reliably determine the issuer’s age. In addition, many of these issuers present financial statements that pertain to successor and predecessor entities and we cannot reliably compute certain ratios.

¹¹ 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.

former, we specify *PriceRevision* (the percentage change from the IPR mid-point to the IPO price); and for the latter, we specify *UE(InitialReturn)*, the residuals from regressing *InitialReturn* (the percentage change from the IPO price to the closing price on the first trading day) on *PriceRevision*.¹² This split is an attempt to isolate the sources of demand, with *PriceRevision* representing that of institutional investors with potential access to the shares at the IPO price and *UE(InitialReturn)* representing a blend of institutional and retail investors with potential access to the shares at first-day trading prices. Per panel B of Table 1, mean (median) *InitialReturn* is 18.73% (11.08%) and *PriceRevision* is -3.19% (0.00%). This average level of underpricing, while greater than Rajan and Servaes' (1997) 10.03% for IPOs from 1975 to mid-1987, is less than Aggarwal et al.'s (2002) 50.4% for IPOs from 1994 to 1999 or Cliff and Denis' (2004) 27.5% for IPOs from 1993 to 2000. Similarly, average *PriceRevision* for our sample is also lower than the 13.6% for Aggarwal et al. (2002) and the 3.1% for Cliff and Denis (2004).

In our multivariate analyses of analyst coverage, we specify covariates for underwriter, issuer and shares that the literature documents are important determinants (Rajan and Servaes 1997; Aggarwal et al. 2002; Bradley, Jordan and Ritter 2003; Cliff and Denis 2004; Das et al. 2006; Bradley et al. 2008; O'Brien and Tan 2015). For underwriter, we control for the number of lead- / co-managers (*Mgrs-Affiliated*) and lead manager(s) reputation (*UW*). For issuer, we control for venture backing (*VC*), age (*Age*), high-technology industry (*HighTech*) and pre-IPO valuation (*Valuation*).¹³ For the shares, we control for market returns (*CAR-3mo*), trading volume (*Volume-3mo*) and the number of institutional investors (*Inst#-3mo*); all of which we measure as of three months post-IPO.¹⁴ Lastly, we specify fixed effects for IPO year and Fama and French (1997) 49 industry groups (hereafter, FF49).

¹² For example, IPOs with a low *UE(InitialReturn)* include Lumber Liquidators, Inc. (*PriceRevision* of -15.38% and *InitialReturn* of -11.27%) and Facebook Inc. (*PriceRevision* of +20.63% and *InitialReturn* of +0.61%); and IPOs with a high *UE(InitialReturn)* include Kintera, Inc. (*PriceRevision* of -22.22% and *InitialReturn* of +47.14%) and Noodles & Co. (*PriceRevision* of +28.57% and *InitialReturn* of +104.17%).

¹³ For our primary analysis, we define the *HighTech* variable as per SDC. However, our results are essentially identical to those we table when we use Loughran and Ritter's (2004) high-technology industry definition.

¹⁴ In addition to the number of post-IPO institutional investors, some papers (e.g., O'Brien and Tan, 2015) also control for the percentage of post-IPO institutional ownership. For two reasons, we do not also specify a covariate

3.3 Correlations

Table 2 presents Pearson correlations. The correlation between *PriceRevision* and *LnInst#-3mo* is 0.40, which is supportive of price revision as a proxy for institutional investor demand.¹⁵ In addition, consistent with literature, the correlation between *PriceRevision* and *InitialReturn*, at 0.51, is quite high and, by construction, *PriceRevision* and *UE(InitialReturn)* are orthogonal. As for the analyst coverage variables, their correlations with *PriceRevision* are larger than with *InitialReturn* (e.g., 0.35 versus 0.20 with *Analysts-Total*, respectively). Moreover, given that unaffiliated analysts have little to gain from underpricing, it is interesting the 0.23 correlation between *InitialReturn* and *Analysts-UnAffiliated* is almost three times that between *InitialReturn* and *Analysts-Affiliated* of 0.08. Lastly, the correlation between *PriceRevision* and *Analysts-UnAffiliated* is higher than that between *PriceRevision* and *Analysts-Affiliated* (i.e., 0.34 versus 0.22, respectively).

4. EMPIRICAL ANALYSIS

4.1 IPO Price Formation and Analyst Coverage – Descriptive Analysis

We begin by presenting descriptive sorts of our sample that supplement the Table 2 correlations. In panel A of Table 3, we sort into three categories of *InitialReturn*. The first two are the 324 and 88 IPOs for which *InitialReturn* is negative and zero, respectively, and the third is the remaining 1,142 IPOs. Analyst coverage generally increases across these categories, as mean (median) *Analysts-Total* goes from 6.15 to 5.83 to 7.75 (from 5.00 to 5.00 to 7.00). However,

for the percentage of institutional ownership as of 3-months post-IPO: one, at 0.57, it has a very high Pearson correlation with *LnInst-3mo* (the natural logarithm of the number of institutional owners as per the issuer's first Form 13F), to the extent that specifying it engenders frequent sign flips to significant *negative* coefficients; and two, it has weaker Pearson correlations with our analyst coverage dependent variables (0.22, 0.34 and 0.05 with *Analysts-Total*, *Analysts-Affiliated* and *Analysts-UnAffiliated*, respectively; versus that of 0.42, 0.45 and 0.25 for *LnInst#-3mo*, respectively). In addition, in contrast to *LnInst#-3mo* which, per Table 2, has Pearson correlations of 0.26 with *InitialReturn* and 0.40 with *PriceRevision*, the percentage of institutional ownership as of 3-months post-IPO has Pearson correlations of 0.08 and 0.15 with *InitialReturn* and *PriceRevision*, respectively. As such, controlling for the number of institutional investors (instead of the percentage of institutional ownership) should impart a bias against results for *InitialReturn* and *PriceRevision* as determinants of post-IPO analyst coverage.

¹⁵ In addition, *PriceRevision* has a high correlation with *LnVolume-3mo* (0.45), which, in turn, has a high correlation with *Analysts-Affiliated* and *Analysts-UnAffiliated* (0.65 and 0.47, respectively). See Section 4.7, where we estimate a path analysis of the relation from *PriceRevision* to *Analysts-UnAffiliated* via *LnVolume-3mo*.

upon distinguishing analysts by whether they are affiliated with a lead- or co-manager (and consistent with the difference in correlations), this increasing pattern primarily stems from unaffiliated analysts.

In panel B of Table 3, using the IPR as a reference, we sort into five categories of *PriceRevision*. The middle category is the 220 IPOs with *PriceRevision* of zero; those beside these are the 197 and 242 IPOs with negative and positive revisions within the IPR, respectively; the left-most category is the 482 IPOs with offer prices below their IPR minimum; and the right-most category is the 413 IPOs with offer prices above their IPR maximum. Going from left to right, while neither *Analysts-Affiliated* nor *Analysts-UnAffiliated* manifest much of a trend for the first two categories, there is an increasing trend from the middle to the right-most category. As with panel A (and consistent with the difference in correlations), the increase in unaffiliated coverage is more evident. For example, upon comparing IPOs with a price revision of zero to those that price above their IPR maximum, whereas the mean value of *Analysts-Affiliated* increases by 1.30 (from 4.36 to 5.66), the increase in *Analysts-UnAffiliated* is 2.31 (1.82 to 4.13).

4.2 IPO Price Formation and Analyst Coverage – Regression Analysis

We first estimate a benchmark analyst coverage regression (equation (1a)), to assess the incremental effects of our price formation variables of interest.^{16,17} As we discuss in Section 3.2, we specify controls for underwriter, issuer and shares and fixed effects for IPO year and FF49 industry.¹⁸ Also, because analysts tend to specialize along industry lines, we cluster standard errors by FF49 industry (Boni and Womack, 2006; Kadan, Madureira, Wang and Zach, 2012).

$$\begin{aligned}
 \text{Analysts-Total} = & \beta_0 + \beta_1 \text{Mgrs-Affiliated} + \beta_2 \text{UW} + \beta_3 \text{VC} + \beta_4 \text{LnAge} + \beta_5 \text{HighTech} + \\
 & \beta_6 \text{LnValuation} + \beta_7 \text{CAR-3mo} + \beta_8 \text{LnVolume-3mo} + \beta_9 \text{LnInst\#-3mo} + \\
 & \sum \beta_t \text{Year} + \sum \beta_k \text{Industry} + \varepsilon
 \end{aligned} \tag{1a}$$

¹⁶ As we mention in Section 3.2, because less than 1% of our sample IPOs have no analyst coverage within one year post-IPO we do not estimate a first-stage regression to address instances of no coverage.

¹⁷ Because our analyst coverage variables are non-negative integers that exhibit considerable over-dispersion (e.g., *Analysts-Total* variance of 23.88 (un-tabled) exceeds its mean of 7.30), we use count data econometric techniques, specifically negative binomial regression, for estimation (Rock, Sedo and Willenborg, 2000; Bradley et al. 2008).

¹⁸ To facilitate convergence of our regressions, we do not specify a fixed effect for FF49 industries with three or fewer observations (i.e., for the full sample these FF49 industries are: 03, 04, 05, 16, 20, 24, 25, 39 and 40).

Column 1 of panel A of Table 4 presents the results of estimating equation (1a). Total analyst coverage is positively associated with the number of lead- / co-managers, lead manager reputation, venture banking, issuer valuation, post-IPO returns, trading volume and the number of institutional investors, and negatively associated with issuer age.

We next augment equation (1a) by specifying *InitialReturn* and *PriceRevision*, in equations (1b) and (1c) respectively; and then modify equation (1c) by replacing *InitialReturn* with *UE(InitialReturn)* in equation (1d).

$$\text{Analysts-Total} = \beta_0 + \beta_1 \text{InitialReturn} + \text{Controls from Eq. (1a)} + \varepsilon \quad (1b)$$

$$\text{Analysts-Total} = \beta_0 + \beta_1 \text{InitialReturn} + \beta_2 \text{PriceRevision} + \text{Controls from Eq. (1a)} + \varepsilon \quad (1c)$$

$$\text{Analysts-Total} = \beta_0 + \beta_1 \text{PriceRevision} + \beta_2 \text{UE(InitialReturn)} + \text{Controls from Eq. (1a)} + \varepsilon \quad (1d)$$

Column 2 of panel A of Table 4 presents the results of estimating equation (1b). The coefficient on *InitialReturn* is positive and significant (beyond 1%) and including this variable increases the pseudo R² above that of equation (1a).¹⁹ *InitialReturn*'s marginal effect is 0.015 (not tabled), which suggests a one-standard-deviation change in *InitialReturn* corresponds to a 0.5 change in the total number of analysts covering the issuer (30.00 * 0.015).

Column 3 of panel A of Table 4 presents the results of estimating equation (1c). Despite their 0.51 correlation, the coefficients on *PriceRevision* and *InitialReturn* are both positive and significant (beyond 1%) and including *PriceRevision* increases the pseudo R² above that of equation (1b). A test of the difference in coefficients between *PriceRevision* and *InitialReturn* yields a chi-square statistic of 4.39 (p-value 0.04). As for their marginal effects, a one-standard-deviation change in *PriceRevision* corresponds to a 0.5 change in the total number of analysts providing coverage (21.21 * 0.024) versus that of 0.3 for *InitialReturn* (30.00 * 0.009).

¹⁹ We report McFadden's (1974) pseudo-R², a goodness-of-fit measure commonly reported with count models. It is defined as 1 - (the loglikelihood of the full model ÷ the loglikelihood of the intercept-only model). McFadden (1978, p. 307) states that the values of Pseudo-R² "... tend to be considerably lower than those of the R² index and should not be judged by the standards for a 'good fit' in ordinary regression analysis. For example, values of .2 to .4 for [Pseudo-R²] represent an excellent fit." For an improvement in model fit, we use the Akaike Information Criterion (Akaike 1973; hereafter AIC). Given our sample size, a reduction in AIC of 2.5 or more is indicative of an improvement in fit (Hilbe 2011). We conclude equation (1b) has greater explanatory power than equation (1a).

Column 4 of panel A of Table 4 presents the results of estimating equation (1d) which, in place of *InitialReturn*, specifies *UE(InitialReturn)*. After considering underpricing as conditional on the price revision, the coefficient on *PriceRevision* increases to 0.0042 (from 0.0033 in the equation (1c) estimation) and a test of the difference in coefficients between *PriceRevision* and *UE(InitialReturn)* yields a chi-square statistic of 13.32 (p-value 0.00). *PriceRevision*'s marginal effect suggests a one-standard-deviation change corresponds to a 0.6 change in total analyst coverage ($21.21 * 0.030$); whereas a similar change for *UE(InitialReturn)* corresponds to a 0.2 change in total coverage ($25.81 * 0.009$).

We next estimate these regressions after considering whether an analyst is affiliated with a lead or co-manager. As such, the dependent variable is *Analysts-Affiliated* for equations (2a) – (2d) and *Analysts-UnAffiliated* for equations (3a) – (3d).

Columns 5 through 8 of panel A of Table 4 present the results of estimating equations (2a) – (2d). Per column 5, affiliated analyst coverage has very strong, positive associations with *Mgrs-Affiliated* and *UW*. *Mgrs-Affiliated*'s coefficient is consistent with Loughran and Ritter (2004, p. 9-10) that “[i]nvestment bankers note that co-managers are included in a syndicate almost exclusively to provide research coverage.” In contrast, for our variables of interest, the results in columns 6 through 8 provide no support of a relation between IPO pricing and affiliated coverage. To explore this, we split our sample by whether the IPO has a lead or co-manager that was subject to sanction by the Global Settlement. In contrast to the full sample correlation between *Analyst-Affiliated* and *InitialReturn* of 0.08 (p-value 0.00) per Table 2, this correlation is 0.04 (p-value 0.15) for IPOs with a Global Settlement lead or co-manager and 0.09 (p-value 0.07) for IPOs without a Global Settlement lead or co-manager.²⁰ This suggests that the change in the underpricing / affiliated analyst coverage relation that we document stems, at least in part, from effects associated with investigations of research analyst conflicts of interest.

²⁰ *InitialReturn*'s coefficient is also insignificant when we estimate equation (2b) with either of these sub-samples (i.e., for the 1,167 IPOs with a lead or co-manager sanctioned by the Global Settlement, *InitialReturn*'s coefficient is 0.0004 (z-statistic 0.94) and for the remaining 387 IPOs *InitialReturn*'s coefficient is -0.0008 (z-statistic -1.64)).

Columns 9 through 12 of panel A of Table 4 presents the results of estimating equations (3a) – (3d). While there are similarities (e.g., *LnValuation* and *CAR-3mo*), several determinants of unaffiliated coverage differ from those of affiliated coverage. Of note, the coefficients on *Mgrs-Affiliated* and *UW* are no longer significantly positive whereas those on *VC* and *LnVolume-3mo* are positive and *LnAge*'s coefficient is negative. This suggests that unaffiliated analysts are drawn to cover younger, venture-backed IPOs that generate trading volume. As for our variables of interest, consistent with Table 3, the results in columns 10 through 12 indicate that those in columns 2 through 4 pertain to unaffiliated analysts. Column 11 presents the results of estimating equation (3c), for which the coefficients on *InitialReturn* and *PriceRevision* are each positive and significant. A test of the difference between the coefficient of 0.0086 on *PriceRevision* versus that of 0.0034 on *InitialReturn* yields a chi-square-statistic of 7.5 (p-value of 0.01). Column 12 presents the results of estimating equation (3d). The coefficient on *PriceRevision* increases to 0.0110 and a test of the difference in coefficients between *PriceRevision* and *UE(InitialReturn)* yields a chi-square statistic of 27.0 (p-value 0.00). As for economic significance, it is similar to that for total analyst coverage. *PriceRevision*'s marginal effect suggests a one-standard-deviation change corresponds to a 0.6 change in unaffiliated analyst coverage ($21.21 * 0.027$); whereas that for *UE(InitialReturn)* suggests a comparable change corresponds to a 0.2 change in unaffiliated coverage ($25.81 * 0.008$).²¹

Given the IPR, we next estimate alternative specifications of these coverage regressions after parsing *PriceRevision* into a sequence of four indicator variables based on the categories in panel B of Table 3 (we omit the '*PriceRevision* = 0' category). Equation (1e) is an alternative specification to equation (1c) and equation (1f) is an alternative to equation (1d):

²¹ Consistent with most literature, we measure coverage as the number of analysts that issue a recommendation within 12 months of the IPO. This is arguably a long window if coverage arises from the price revision after the roadshow and / or the return on the first day of trading. That is, if, say, it takes 11 months for an unaffiliated analyst to initiate coverage, it seems reasonable to think something else (other than IPO pricing) is driving their decision. To examine this, we estimate equations (3a) – (3d) as of each post-IPO quarter (i.e., instead of 12 months post-IPO, we measure unaffiliated coverage as of the 3-, 6- and 9-month marks). The results (not tabled) are similar to those in columns 9–12 in panel A of Table 4 (e.g., when we estimate equation (3d) as of the 3-month mark, the coefficient on *PriceRevision* is 0.0088 (z-statistic 2.81) and the coefficient on *UE(InitialReturn)* is 0.0031 (z-statistic 2.05)).

$$\begin{aligned}
Analysts-Total = & \beta_0 + \beta_1 InitialReturn + \beta_2(1 \text{ if } PriceRevision < \text{IPR minimum, } 0 \text{ otherwise}) + \\
& \beta_3(1 \text{ if } \text{IPR minimum} \leq PriceRevision < 0, 0 \text{ otherwise}) + \beta_4(1 \text{ if } 0 < \\
& PriceRevision \leq \text{IPR maximum, } 0 \text{ otherwise}) + \beta_5(1 \text{ if } \text{IPR maximum} < \\
& PriceRevision, 0 \text{ otherwise}) + \text{Controls from Eq. (1a)} + \varepsilon
\end{aligned} \tag{1e}$$

$$\begin{aligned}
Analysts-Total = & \beta_0 + \beta_1(1 \text{ if } PriceRevision < \text{IPR minimum, } 0 \text{ otherwise}) + \beta_2(1 \text{ if } \text{IPR} \\
& \text{minimum} \leq PriceRevision < 0, 0 \text{ otherwise}) + \beta_3(1 \text{ if } 0 < PriceRevision \leq \\
& \text{IPR maximum, } 0 \text{ otherwise}) + \beta_4(1 \text{ if } \text{IPR maximum} < PriceRevision, 0 \\
& \text{otherwise}) + \beta_5 UE(InitialReturn) + \text{Controls from Eq. (1a)} + \varepsilon
\end{aligned} \tag{1f}$$

Panel B of Table 4 presents the results of estimating equations (1e) and (1f) for total coverage as well as the counterpart estimations of equations (2e) and (2f) for affiliated analysts and equations (3e) and (3f) for unaffiliated analysts. We suppress the control variable results, which are very similar to those in panel A of Table 4; and to aid comparison, repeat the results of estimating equations (1b), (2b) and (3b) from panel A. Per the far-right columns of panel B, the results show that the positive coefficient on *PriceRevision* primarily stems from IPOs that price above their IPR maximum, which go on to garner higher unaffiliated coverage; and, to a lesser extent, also from IPOs that price below their IPR minimum, which garner lower coverage.

The results in Table 4 show that both the price revision and initial return are positively associated with post-IPO coverage by unaffiliated analysts and that the relation between this coverage and the price revision is particularly strong. Our lack of findings regarding the initial return / affiliated analysts relation updates the extant literature, which mostly studies periods prior to the regulatory events of the early 2000s. Overall, our findings are consistent with the view that unaffiliated analysts consider institutional investor demand during book-building as an important input into their decision of whether to cover an IPO issuer.

4.3 IPO Price Formation and Analyst Recommendations

In this section, we examine stock recommendations over the course of the issuer's first, post-IPO year by our IPO pricing variables of interest and analyst type. We initially compare affiliated analysts with unaffiliated analysts and then compare lead-manager affiliated analysts with co-manager affiliated analysts. For each comparison, we require the issuer be covered by both types of analysts and test for differences in their respective mean recommendations as of each post-

IPO quarter. For each IPO as of each quarter, we compute mean IBES recommendation by analyst type where: 1 is ‘Strong Buy’, 2 is ‘Buy’, 3 is ‘Hold’, 4 is ‘Sell’ and 5 is ‘Strong Sell’.

Panel A of Table 5 compares the recommendations of affiliated and unaffiliated analysts by *InitialReturn* and *PriceRevision* by post-IPO quarter (panels A1 and A2, respectively). As of the 3-month mark, 461 (of 1,554) IPOs have coverage by both types of analysts, at which time the mean recommendation for affiliated analysts of 2.06 is more favorable than that of 2.24 for unaffiliated analysts. This difference then dissipates over the next nine months, as the number of IPOs with coverage by both types increases. Consistent with McNicols and O’Brien (1997), this difference wanes because the incremental unaffiliated analysts are increasingly more favorable.²² Of note, at the 3-month mark, affiliated analysts, most of whom commence coverage as soon as possible, provide more favorable recommendations regardless of pricing. For example, per panel A1, as with James and Karceski (2006), the recommendations of affiliated analysts are more favorable than those of unaffiliated analysts regardless of whether initial returns are negative, zero or positive; and particularly so if underpricing is not positive.²³ A similar pattern is evident across the categories of price revision in panel A2; as the difference in recommendation strength is greatest for IPOs whose price does not increase following book building.²⁴ This suggests the ‘booster shot’ phenomenon of more-favorable coverage by affiliated analysts that James and Karceski (2006) document for issuers with negative or zero initial returns is also evident for issuers that encounter weak, institutional demand during the road show.

James and Karceski (2006) also distinguish between types of affiliated analysts and find that lead analysts provide more favorable recommendations than co-manager analysts. To re-examine this, Panel B of Table 5 compares recommendations of lead versus co-manager analysts by *InitialReturn* and *PriceRevision* and post-IPO quarter (panels B1 and B2, respectively). At the

²² When we follow the 461 IPOs as of 3-months post-IPO through to 12-months post-IPO, the mean value of *Recommend-UnAffiliated* of 2.24 (per panel A of Table 5) decreases slightly from 2.24 to 2.21.

²³ A test of the difference in mean recommendations between the 93 IPOs with *InitialReturn* of zero or less versus the 368 with *InitialReturn* greater than zero is significant at the 1% level.

²⁴ For example, the difference in mean recommendations between the 118 IPOs with *PriceRevision* below the IPR minimum versus the 184 with *PriceRevision* above the IPR maximum is significant at the 1% level.

12-month mark, 1,258 (of 1,554) IPOs have coverage by both types of affiliated analysts. In contrast to James and Karceski (2006), we find that lead analyst recommendations are less favorable than those of co-managers (2.08 versus 1.88) and that this difference emerges as soon as 3-months post-IPO. Moreover, the relative favorableness of co-manager analysts is evident across all categories of our pricing variables of interest. These results indicate that co-manager analysts provide the most-favorable recommendations, largely irrespective of IPO pricing.

This change from the findings of James and Karceski (2006) is consistent with effects of the Global Settlement on the IPO market. Corwin, Larocque and Stegemoller (2017) document a decrease in optimistic bias for analysts affiliated with banks subject to sanction by the Global Settlement; but no evidence of a change in affiliated analyst bias at non-sanctioned banks. In our sample, a much higher percentage of lead underwriters were subject to sanction than were co-manager underwriters (56.0% and 8.5%, respectively). As a result, a much higher percentage of lead-analyst recommendations are from those at sanctioned banks, which issue less-favorable recommendations post-Global Settlement; while the recommendations of co-manager analysts are mostly from those at non-sanctioned banks, who continue to issue more-favorable recommendations post-Global Settlement.²⁵

4.4 IPO Price Formation and Analyst Coverage / Recommendations – The JOBS Act

We next consider effects associated with the JOBS Act, which relaxed certain restrictions on analysts affiliated with underwriters of IPOs by EGCs. To do this, we split our sample by pre- / post-JOBS. For pre-JOBS, we start with the 711 IPOs prior to April 18, 2012 (i.e., the day Splunk Inc. went public, the first IPO in our sample to claim EGC status in its final prospectus) and then exclude 66 issuers with pre-IPO annual revenues more than \$1 billion, for a pre-JOBS sample of 645 EGC IPOs. For post-JOBS, we start with the 843 IPOs on or after April 18, 2012

²⁵ Similar to the difference in recommendations between lead manager analysts with versus without affiliation to a Global Settlement sanctioned bank (e.g., at the 3-month, post-IPO mark, 2.21 versus 1.69, respectively), analysts with co-manager affiliation at sanctioned banks also provide less-favorable recommendations than analysts with co-manager affiliation at non-sanctioned banks (e.g., at the 3-month, post-IPO mark, 2.44 versus 1.75, respectively). It is simply that, in contrast to lead manager analysts, it is rare for a co-manager analyst to work at a sanctioned bank.

and then exclude 95 issuers that do not claim EGC status in their prospectus, for a post-JOBS sample of 749 EGC IPOs. For each of these EGC IPO samples, we reassess our findings with respect to analyst coverage and analyst recommendations.

With respect to analyst coverage, we re-estimate equations (2b), (2c) and (2d) (affiliated analysts) and equations (3b), (3c) and (3d) (unaffiliated analysts). Table 6 presents the results, which are quite similar to those we present in panel A of Table 4. We find no evidence of a relation between IPO pricing and affiliated coverage for either pre- or post-JOBS Act periods (columns 1–6). As for unaffiliated analyst coverage, the results (columns 7–12) are similar to those in panel A of Table 4; with the only noticeable difference being an increase, albeit an insignificant one, in $UE(InitialReturn)$'s coefficient from pre- to post-JOBS.²⁶

With respect to analyst recommendations, we repeat the analyses of the full sample in panel A of Table 5 for the pre- and post-JOBS samples of EGC IPOs. Table 7 presents the results, with panels A and B partitioning by *InitialReturn* and *PriceRevision*, respectively. For pre-JOBS EGC IPOs, there are few differences between the affiliated and unaffiliated recommendations. In contrast, for post-JOBS EGC IPOs as of the 3-month mark, 164 (of 749) EGC IPOs have coverage by both types of analysts and the mean recommendation for EGC affiliated analysts of 2.01 is more favorable than that of 2.27 for non-affiliated analysts. As with the full sample, this difference also dissipates over the subsequent nine months as the number of IPOs with coverage by both types increases. These findings indicate that those in panel A of Table 5 (i.e., the relative favorableness of recommendations by affiliated analysts) are primarily driven by post-JOBS IPOs.²⁷ This is consistent with Dambra et al. (2018), which shows that the

²⁶ A test of the change in $UE(InitialReturn)$'s coefficient in the equation (3d) estimations, from pre-JOBS of 0.0020 to post-JOBS of 0.0040, yields a chi-square of 1.09 (p-value 0.30).

²⁷ Similar to panel B of Table 5 for the overall sample, we also compare lead versus co-manager recommendations for pre- / post-JOBS EGC issuers. The (un-tabled) findings indicate that co-manager EGC affiliated analysts provide more-favorable recommendations than their lead-manager counterparts for both pre- and post-JOBS periods. In addition, while both types of analysts increase their favorableness post-JOBS, this increase is greater for co-manager analysts. As for unaffiliated analysts, we find they provide less favorable recommendations post-JOBS.

initial earnings forecasts of EGC affiliated analysts become relatively (versus non-affiliated analysts) more optimistic and less accurate after the JOBS Act.²⁸

Taken together, the findings that we discuss in Sections 4.3 and 4.4 are consistent with the view that, rather than issuers' underpricing to compensate their lead underwriter(s) for providing coverage, subsequent to the JOBS Act, lead underwriters bring on co-managers that seemingly pre-commit to provide (very) favorable recommendations regardless of IPO pricing.

4.5 IPO Price Formation and Unaffiliated Analyst Coverage – The ‘Off-Diagonals’

We interpret our finding that the price revision is positively associated with unaffiliated analyst coverage as consistent with the view that it proxies for the revelation of institutional investor demand during the road show. In establishing this finding, we control for the number of institutions holding shares as of the issuer's first Form 13F filing ($\text{LnInst}\#-3\text{mo}$). However, if one combines the viewpoint that analysts follow institutions along with the well-documented link between institutional interest and partial adjustment (and hence underpricing) then this finding may seem derivative. That is, given that Bhushan (1989) reports a positive relation between institutional ownership and analyst coverage, along with Benveniste and Spindt (1989) which models institutional investors (as road-show participants) as the reason for partial adjustment, this ‘takeaway’ may seem obvious. We address this concern in two ways. With respect to the former, we note that the literature on the institutional ownership / analyst coverage relation does not examine the IPO setting and that its findings in non-IPO settings are inconclusive. With respect to the latter, we address this in an empirical manner by focusing our analyses on subsamples wherein price revision and underpricing are not positively correlated.

With respect to the literature, whereas Bhushan (1989) does report a positive relation between the number of institutional investors and the number of analysts that follow a firm,

²⁸ Our 6-month post-IPO results are most comparable to Dambra et al. (2018), which focuses on earnings forecast initiations within 180 days of the IPO. Along these lines, we find that recommendations by affiliated analysts become more favorable after JOBS (i.e., a test of the decrease from mean *Recommend-Affiliated* at the 6-month post-IPO mark of 2.07 pre-JOBS to 1.98 post-JOBS is significant beyond 1%; whereas *Recommend-UnAffiliated* manifests an insignificant increase from 2.08 to 2.11).

subsequent papers that use non-OLS estimation techniques do not confirm this finding. O'Brien and Bhushan (1990) use a 2SLS simultaneous equations approach and, contrary to expectation, do not find a significant positive association between changes in the number of institutional investors and changes in analyst coverage. Rock et al. (2001) use a single-equation specification and regress the level of analyst coverage on Bhushan's (1989) covariates but, instead of OLS, use count-data estimations and report a negative association between the number of institutional investors and the number of analysts following a firm. Ackert and Athanassakos (2003) extend O'Brien and Bhushan (1990) with a 3SLS approach and, akin to Rock et al. (2001), find that an increase in the number of institutional investors is associated with lower analyst following.

With respect to empirics, we begin by sorting the full sample by the five categories of *PriceRevision* in panel B of Table 3 and then by the three categories of *InitialReturn* in panel A of Table 3. While most IPOs are on the 'main diagonal' (i.e., reflective of the 0.51 correlation between *PriceRevision* and *InitialReturn*), there are many that are 'off-diagonal'. There are 375 IPOs with negative *PriceRevision* but positive *InitialReturn*; issuers that, despite a downward price revision, still went public and left some money on the table in the form of underpricing. In addition, there are 41 IPOs with positive *PriceRevision* but an *InitialReturn* equal to or less than zero; shares that, despite an upward price revision, did not increase on the first day.

These 'off-diagonal IPOs' do not fit the Benveniste and Spindt (1989) story, as their price revision was arguably too extreme and the positive relation between it and underpricing is not evident. However, for us, the issue is whether the positive association between price revision and unaffiliated coverage remains evident. To examine this, we estimate equations (3b), (3c) and (3d) on the following three sub-samples: the 375 'Upper off-diagonal IPOs', for which the correlation between *PriceRevision* and *InitialReturn* is 0.02; the 41 'Lower off-diagonal IPOs', for which this correlation is -0.31; and the remaining 1,138 'Main-diagonal IPOs', for which this correlation is 0.62. Because of sample size concerns, and to ensure comparability across these estimations, we specify fixed effects for IPO year and FF12 (not FF49) industry.

Table 8 presents the results. Columns 1–3 pertain to the ‘Upper off-diagonal IPOs’, columns 4–6 to the ‘Lower off-diagonal IPOs’ and columns 7–9 to the remaining 1,138 ‘Main-diagonal IPOs’. The coefficient on *PriceRevision* is significantly positive for each of these estimations. We interpret these findings as consistent with the inference that the price revision proxies for the revelation of institutional investor demand during the roadshow and, as a consequence, is predictive of the extent of post-IPO unaffiliated analyst coverage.

4.6 IPO Price Formation and Unaffiliated Analyst Coverage – Endogenous Price Revision

A concern with the above inference is that it neglects the endogenous nature of the price revision, which literature documents varies with market returns and issuer / issue characteristics that plausibly connect to analyst incentives. For example, Loughran and Ritter (2002), Lowry and Schwert (2004) and Edelen and Kadlec (2005) report an asymmetric relation between book-building market returns and price revisions; in that prices revise fully downward when roadshow market returns are negative but the upward revision when returns are positive is negligible. Given this, it is possible that unaffiliated coverage is lower when an IPO prices below its IPR minimum because analysts are less likely to initiate coverage during market downturns. Other papers find that IPOs by issuers with more-favorable operating performance have positive price revisions (Willenborg et al. 2015; and Bochkay, Chychyla, Sankaraguruswamy and Willenborg 2018). Following this, another explanation for our results is that unaffiliated analysts cover IPOs with better historical performance because it portends better future performance (Das et al., 2006; Jung, Wong and Zhang, 2015); or, because initiating coverage is costly, analysts avoid covering firms more likely to experience problems with future viability (Lee and So, 2017). Lastly, Aggarwal et al. (2002) find that IPOs with higher levels of managerial ownership sustain higher underpricing and have higher levels of coverage by unaffiliated analysts. Following this, another explanation for our results is that unaffiliated coverage is higher because managers leave money on the table, especially when they are retaining substantial ownership for future sale.

To assess these explanations, we first estimate equation (3) from Bochkay et al. (2018) which regresses the IPO price revision on market returns and issue / issuer characteristics (see Appendix B for the results). We label the predicted values as $E(\text{PriceRevision})$ and the residuals as $UE(\text{PriceRevision})$; where the former is a measure of the ‘expected’ price revision and the latter of the ‘unexpected’ price revision. We then substitute these variables in place of PriceRevision in equations (3c) and (3d) and estimate equations (3c’) and (3d’):

$$\text{Analysts-UnAffiliated} = \beta_0 + \beta_1 \text{InitialReturn} + \beta_2 E(\text{PriceRevision}) + \beta_3 UE(\text{PriceRevision}) + \text{Controls from Eq. (1a)} + \varepsilon \quad (3c')$$

$$\text{Analysts-UnAffiliated} = \beta_0 + \beta_1 E(\text{PriceRevision}) + \beta_2 UE(\text{PriceRevision}) + \beta_3 UE(\text{InitialReturn}) + \text{Controls from Eq. (1a)} + \varepsilon \quad (3d')$$

Table 9 presents the results of estimating equations (3c’) and (3d’) in columns 3 and 5, respectively (and, for exposition, in columns 1, 2 and 4 repeats the results from columns 10-12 of Table 4 of estimating equations (3b), (3c) and (3d), respectively). For either specification, results show that the relation between price revision and unaffiliated analyst coverage primarily stems from $UE(\text{PriceRevision})$, the portion of price revision that is not explained by market returns or issuer / issue characteristics. We interpret this as further support that analysts cover companies for which they expect higher, post-IPO interest from institutional investors.²⁹

4.7 IPO Price Formation and Unaffiliated Analyst Coverage – Path Analysis

Our multivariate findings indicate positive associations between unaffiliated analyst coverage and both offer price revision and initial return; and that the importance of the former exceeds that of the latter. However, these results are from single-equation estimations for which we measure the independent variables at different points in time. That is, several control variables (*Mgrs-*

²⁹ Per Appendix B, the coefficient on *Retain* (the percentage of ownership that pre-IPO shareholders plan to retain) is positive and significant. Of the determinants of price revision, ownership retention may have the most connection to analyst coverage incentives; since, in the presence of information asymmetry, higher ownership retention can serve as a signal of firm value (Leland and Pyle, 1977). Given that analysts tend to follow such firms (McNichols and O’Brien, 1997), ownership retention may enhance the positive influence of offer price revision on analyst coverage. To study this, we examine the interaction between *Retain* and *PriceRevision*. In un-tabled analyses, we find that while unaffiliated analyst coverage is increasing with ownership retention descriptively, this relation is not robust when we specify the control variables and fixed effects in equation (1a).

Affiliated, *UW*, *VC*, *LnAge*, *HighTech*, *LnValuation*) precede *PriceRevision*, *PriceRevision* precedes *InitialReturn* and other controls are post-IPO (*CAR-3mo*, *LnVolume-3mo*, and *LnInst#-3mo*). As such, for example, it is possible that the price revision indirectly affects coverage via the initial return. To assess this, as well as other potential mechanisms, we conduct a path analysis of the price revision / unaffiliated analyst relation, with *InitialReturn*, *CAR-3mo*, *LnVolume-3mo* and *LnInst#-3mo* as mediating variables and *PriceRevision*, $E(\text{PriceRevision})$ and $UE(\text{PriceRevision})$ as the exogenous variables.³⁰ Given the findings in Section 4.6, we focus our discussion on the results pertaining to $UE(\text{PriceRevision})$.

The results in the far-right columns of Table 10 (see also Figure 1) indicate a positive direct effect of $UE(\text{PriceRevision})$ on unaffiliated coverage (coefficient 0.144, z-statistic 5.97) and also a positive indirect effect of $UE(\text{PriceRevision})$ on unaffiliated coverage (coefficient 0.055, z-statistic 3.89); primarily via the mediating effects of *InitialReturn* and *LnVolume-3mo*.³¹ That is, in addition to a direct effect, these results also show that the offer price revision affects coverage, primarily via the first-day return and post-IPO trading volume. Moreover, a test of the difference in the total effect of *PriceRevision* on unaffiliated coverage (coefficient 0.199, z-statistic 6.50) versus that of *InitialReturn* (coefficient 0.125, z-statistic 3.90) yields a chi-square of 7.07 (p-value 0.01). These results continue to indicate that the relation between price revision and unaffiliated analyst coverage exceeds that between initial return and unaffiliated coverage.

5. CONCLUSION

The information environment of newly public firms is an important topic. In this paper, drawing motivation from changes in both IPO market conditions and regulation, we re-examine the relation between IPO pricing and the coverage and recommendation decisions of sell-side

³⁰ Because we use OLS for the path analysis, we specify $\text{Ln}(1 + \text{Analysts-UnAffiliated})$ as the outcome variable.

³¹ $UE(\text{PriceRevision})$'s indirect effect of 0.055 is the sum of the products of multiplying each mediating path coefficient times its respective mediating variable direct effect coefficient $((0.364 * 0.109) + (0.364 * 0.034 * 0.079) + (0.364 * 0.102 * 0.156) + (0.364 * 0.071 * -0.024) + (-0.080 * 0.079) + (0.130 * 0.156) + (0.190 * -0.024)) = 0.0397 + 0.0010 + 0.0058 - 0.0006 - 0.0063 + 0.0203 - 0.0046 = 0.0553$.

analysts. In doing so, we introduce consideration of the offer price revision as a proxy for the revelation of institutional investor demand during the issuer's road show.

Our findings provide several insights on IPO analyst coverage / recommendations. Consistent with the imposition of regulatory restrictions intended to sever the ties between research and underwriter activities, we find no evidence to suggest that the coverage decisions of affiliated analysts vary with IPO pricing; in terms of either the first trading-day return or the offer price revision. As for unaffiliated analysts, our results show that their coverage decisions are driven more so by the offer price revision following book building than by the return on the first trading day; consistent with the effects that the interest of institutional investors has on analyst incentives. In essence, to the extent that IPO pricing influences analyst coverage, our findings indicate that it is with respect to those analysts that are not affiliated with the managers (either lead or co-) underwriting the transaction.

We find that affiliated analysts issue more favorable recommendations than unaffiliated analysts as of 3-months post-IPO, but that this difference is no longer evident at 12-months post IPO. With respect to our focus on the price revision, we also find that this initial difference is evident whether the offer price moves down or up after the road show; though, consistent with a pre-IPO 'booster shot', that is strongest for issues that do not experience a positive price revision. In addition, this we find that this initial difference stems, in large part, from the recommendations of co-manager analysts versus those of their lead-manager counterparts; and primarily emerges after the JOBS Act of 2012, which relaxed certain restrictions on analyst participation in IPOs. Collectively, these findings suggest that, for IPOs after the JOBS Act of 2012, lead underwriters bring on co-managers, that seemingly pre-commit to provide very favorable recommendations; especially for IPOs that do not experience an increase in their offer price after the road show or an increase in their share price on the first trading day.

Jia, Ritter, Xie and Zhang (2019) examine IPOs in China and find that pre-IPO analyst coverage, which is the "norm", is positively associated with offer price revisions and first-day returns. This raises the question of whether the positive relation between the price revision and

post-IPO unaffiliated coverage that we document is due to the former determining the latter. In our U.S. context, institutional details are such that the positive relation between price revision (as a proxy for higher investor demand) and post-IPO coverage is ‘Granger Causal’ in nature; in the sense that the former precedes, and helps to predict, the latter. In contrast, given the details of the Chinese context, the relation is the reverse of that in the U.S.; as it manifests as a positive relation from pre-IPO coverage (as a proxy for higher investor demand) to price revision. In either case, we see price revision and analyst coverage as both driven by investor demand.

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APPENDIX A Variable Definitions

Variables for analyst analyses (source):

<i>Analysts-Total</i>	=	Total number of analysts that issue a recommendation for the issuer within 12 months post IPO (IBES)
<i>Analysts-Affiliated</i>	=	Number of analysts with an affiliation to either a lead manager or co-manager that issue a recommendation for the issuer within 12 months post IPO (IBES)
<i>Analysts-UnAffiliated</i>	=	Number of analysts without an affiliation to either a lead manager or co-manager that issue a recommendation for the issuer within 12 months post IPO (IBES)
<i>InitialReturn</i>	=	(Closing price on the first trading day – IPO price) ÷ IPO price, in percentage (CRSP and final prospectus)
<i>PriceRevision</i>	=	(IPO price – Mid-point of the initial price range) ÷ Mid-point of initial price range, in percentage (Final prospectus and prospectus disclosing the initial price range)
<i>UE(InitialReturn)</i>	=	Residuals from regressing <i>InitialReturn</i> on <i>PriceRevision</i>
<i>Mgrs-Affiliated</i>	=	Number of lead managers and co-managers (SDC)
<i>UW</i>	=	Average rank of lead managers per Loughran and Ritter’s (2004) update of Carter et al.’s (1998) rankings (SDC)
<i>VC</i>	=	1 if issuer has venture capital backing, 0 otherwise (SDC)
<i>Age</i>	=	Number of years from founding or incorporation to IPO year (Prospectus disclosing initial price range)
<i>HighTech</i>	=	1 if issuer is a high technology company, 0 otherwise (SDC)
<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 (using 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 (Issuer’s first Form 13F, Thompson Reuters)
<i>Recommend-Affiliated</i>	=	Average of mean affiliated analyst (i.e., those with an affiliation to either a lead manager or co-manager) recommendations for IPOs with coverage by both affiliated and unaffiliated analysts as of a given post-IPO quarter where: 1 is ‘Strong Buy’, 2 is ‘Buy’, 3 is ‘Hold’, 4 is ‘Sell’ and 5 is ‘Strong Sell’ (IBES)
<i>Recommend-LeadMgr</i>	=	Average of mean lead-manager analyst recommendations for IPOs with coverage by both lead manager and co-manager analysts as of a given post-IPO quarter where: 1 is ‘Strong Buy’, 2 is ‘Buy’, 3 is ‘Hold’, 4 is ‘Sell’ and 5 is ‘Strong Sell’ (IBES)
<i>Recommend-CoMgr</i>	=	Average of mean co-manager analyst recommendations for IPOs with coverage by both lead manager and co-manager analysts as of a given post-IPO quarter where: 1 is ‘Strong Buy’, 2 is ‘Buy’, 3 is ‘Hold’, 4 is ‘Sell’ and 5 is ‘Strong Sell’ (IBES)
<i>Recommend-UnAffiliated</i>	=	Average of mean unaffiliated analyst (i.e., those without an affiliation to either a lead manager or co-manager) recommendations for IPOs with coverage by both affiliated and unaffiliated analysts as of a given post-IPO quarter where: 1 is ‘Strong Buy’, 2 is ‘Buy’, 3 is ‘Hold’, 4 is ‘Sell’ and 5 is ‘Strong Sell’ (IBES)

APPENDIX A (continued) Variable Definitions

Additional variables for IPO offer price revision regression in Appendix B (source):

<i>GCOpinion</i>	=	1 if the auditor's opinion expresses substantial doubt regarding registrant's current ability to continue as a going concern, 0 otherwise (Prospectus disclosing the initial price range)
<i>GCDisclosure</i>	=	1 if <i>GCOpinion</i> is zero but the prospectus contains the term "going concern" regarding the registrant's current ability to continue as a going concern, 0 otherwise (Prospectus disclosing the initial price range)
<i>PC1-LM</i>	=	1 st principal component from a factor analysis using Loughran and McDonald's (2011; 2013) uncertain, weak modal and negative words (Prospectus disclosing the price initial range)
<i>PC2-LM</i>	=	2 nd principal component from a factor analysis using Loughran and McDonald's (2011; 2013) uncertain, weak modal and negative words (Prospectus disclosing the price initial range)
<i>RiskFactors</i>	=	(# words in the Risk Factors section – average # words in the Risk Factors section for the issuer's Fama-French 12 industry) ÷ standard deviation # words in the Risk Factors section for the issuer's Fama-French 12 industry (Prospectus disclosing the initial price range)
<i>Distress</i>	=	Probability of bankruptcy per Shumway's (2001) update of Zmijewski (1984) (variables per Final prospectus)
<i>StartUp</i>	=	1 if issuer's annualized pre-IPO revenues are less than \$1 million, 0 otherwise (Final prospectus)
<i>OCF/Assets</i>	=	Pre-IPO annualized operating cash flow per the most recent Statement of Cash Flows ÷ average assets, winsorized at the top and bottom 1%, in percentage (Final prospectus)
<i>IndustryReturn</i>	=	Average return on all companies in CRSP in the issuer's Fama-French 12 industry for the period from the date of the prospectus disclosing the initial price range to the IPO date, in percentage
<i>IndustryReturn⁺</i>	=	<i>IndustryReturn</i> when positive and zero otherwise
<i>IPOReturn</i>	=	Average initial return on IPOs between first prospectus date and IPO date, in percentage
<i>Retain</i>	=	1 – (number of shares to be sold in the IPO ÷ number of post-IPO shares outstanding), in percentage (Prospectus disclosing the initial price range)
<i>SellShr</i>	=	Number of shares to be sold by selling shareholders ÷ number of shares to be sold in the IPO, in percentage (Prospectus disclosing the initial price range)
<i>BigN</i>	=	1 if issuer has a Big 5 or 4 audit firm, 0 otherwise (Prospectus disclosing the initial price range)
<i>LnProceeds</i>	=	Natural logarithm of proceeds, excluding overallotment, in millions of dollars (Prospectus disclosing the initial price range)
<i>NYSE/AMEX</i>	=	1 if IPO lists on NYSE or AMEX, 0 otherwise (Prospectus disclosing the initial price range)
<i>Carve</i>	=	1 if a carve-out IPO, 0 otherwise (SDC)
<i>LnAssets</i>	=	Natural logarithm of issuer's pre-IPO total assets, in millions of dollars (Prospectus disclosing the initial price range)

APPENDIX B
Determinants of IPO Offer Price Revision

Constant	-31.40 (-2.85)b
<i>GCOpinion</i>	-4.82 (-5.18)a
<i>GCDisclosure</i>	-4.51 (-3.31)a
<i>PC1-LM</i>	1.79 (1.61)
<i>PC2-LM</i>	-6.07 (-3.92)a
<i>RiskFactors</i>	-0.88 (-0.74)
<i>Distress</i>	-4.38 (-2.20)c
<i>StartUp</i>	-2.38 (-1.64)
<i>OCF/Assets</i>	0.02 (0.92)
<i>IndustryReturn</i>	1.04 (5.48)a
<i>IndustryReturn</i> ⁺	-1.28 (-4.71)a
<i>IPOReturn</i>	0.08 (2.78)b
<i>Retain</i>	0.32 (4.16)a
<i>SellShr</i>	0.01 (0.25)
<i>UW</i>	1.16 (1.99)c
<i>BigN</i>	-0.24 (-0.11)
<i>VC</i>	0.68 (0.30)
<i>LnProceeds</i>	2.10 (1.48)
<i>NYSE/AMEX</i>	1.65 (0.95)
<i>Carve</i>	-3.12 (-1.59)
<i>HighTech</i>	5.39 (3.98)a
<i>LnAge</i>	-1.32 (-2.88)b
<i>LnAssets</i>	-1.07 (-0.84)
Observations	1,554
Adjusted R ²	24.50%

Observations are the 1,554 IPOs per Panel A of Table 1. The dependent variable is *PriceRevision*. Specification includes covariates and fixed effects for IPO year and FF 12 industry per equation (3) in Bochkay et al. (2018). See Table 1 for sample details and Appendix A for variable definitions. Estimation is OLS with t-statistics using standard errors clustered on FF12 industry in parentheses a,b,c Significant at or beyond the 1%, 5% and 10% levels, respectively (two-sided tests).

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, 2020 (SDC)	1,851
Less: Unit IPOs	190
Necessary financial statement and other information not available	72
Issued via auction mechanism	13
Initial price range mid-point \leq \$5.00	18
Days from initial range date to IPO date exceed 365	4
Full Sample	1,554

Panel B: Descriptive statistics (n 1,554)

Variable	Mean	Median	Standard deviation
<i>Analysts-Total</i>	7.30	6.00	4.89
<i>Analysts-Affiliated</i>	4.85	4.00	2.72
<i>Analysts-UnAffiliated</i>	2.45	2.00	3.24
<i>InitialReturn</i>	18.73	11.08	30.00
<i>PriceRevision</i>	-3.19	0.00	21.21
<i>UE(InitialReturn)</i>	0.00	-4.45	25.81
<i>Mgrs-Affiliated</i>	5.74	4.50	3.73
<i>UW</i>	7.80	8.33	1.52
<i>VC</i>	0.57	1.00	0.49
<i>Age</i>	17.76	10.00	23.20
<i>HighTech</i>	0.29	0.00	0.46
<i>Valuation</i>	1,099.39	423.13	3,293.67
<i>CAR-3mo</i>	2.34	0.09	20.99
<i>Volume-3mo</i>	460.95	170.66	1,594.68
<i>Inst#-3mo</i>	46.20	42.00	35.21

See Appendix A for variable definitions.

TABLE 2
Pearson Correlations

	<i>Analysts- Total</i>	<i>Analysts- Affiliated</i>	<i>Analysts- UnAffiliated</i>	<i>Initial Return</i>	<i>Price Revision</i>	<i>UE (Initial Return)</i>	<i>Mgrs- Affiliated</i>	<i>UW</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>Analysts-Affiliated</i>	0.78 (<0.00)													
<i>Analysts-UnAffiliated</i>	0.85 (<0.00)	0.34 (<0.00)												
<i>InitialReturn</i>	0.20 (<0.00)	0.08 (0.00)	0.23 (<0.00)											
<i>PriceRevision</i>	0.35 (<0.00)	0.22 (<0.00)	0.34 (<0.00)	0.51 (<0.00)										
<i>UE(InitialReturn)</i>	0.02 (0.33)	-0.03 (0.18)	0.07 (0.01)	0.86 (<0.00)	0.00 (1.00)									
<i>Mgrs-Affiliated</i>	0.71 (<0.00)	0.88 (<0.00)	0.33 (<0.00)	0.03 (0.19)	0.16 (0.00)	-0.06 (0.03)								
<i>UW</i>	0.37 (<0.00)	0.41 (<0.00)	0.21 (<0.00)	0.09 (<0.00)	0.19 (<0.00)	-0.01 (0.60)	0.31 (<0.00)							
<i>VC</i>	-0.10 (<0.00)	-0.25 (<0.00)	0.06 (0.03)	0.16 (<0.00)	0.03 (0.32)	0.17 (<0.00)	-0.31 (<0.00)	0.08 (0.00)						
<i>LnAge</i>	0.09 (<0.00)	0.24 (<0.00)	-0.06 (0.02)	-0.07 (0.01)	-0.02 (0.54)	-0.07 (0.01)	0.28 (<0.00)	0.13 (<0.00)	-0.44 (<0.00)					
<i>HighTech</i>	0.22 (<0.00)	0.13 (<0.00)	0.22 (<0.00)	0.20 (<0.00)	0.27 (<0.00)	0.08 (0.00)	0.06 (0.02)	0.10 (<0.00)	0.18 (<0.00)	-0.13 (<0.00)				
<i>LnValuation</i>	0.70 (<0.00)	0.76 (<0.00)	0.43 (<0.00)	0.15 (<0.00)	0.29 (<0.00)	0.00 (1.00)	0.78 (<0.00)	0.51 (<0.00)	-0.21 (<0.00)	0.21 (<0.00)	0.13 (<0.00)			
<i>CAR-3mo</i>	0.06 (0.02)	0.03 (0.17)	0.06 (0.01)	0.01 (0.80)	-0.06 (0.02)	0.04 (0.10)	-0.02 (0.48)	0.06 (0.02)	-0.01 (0.77)	-0.01 (0.75)	0.02 (0.44)	-0.01 (0.61)		
<i>LnVolume-3mo</i>	0.67 (<0.00)	0.65 (<0.00)	0.47 (<0.00)	0.29 (<0.00)	0.45 (<0.00)	0.07 (0.00)	0.65 (<0.00)	0.38 (<0.00)	-0.17 (<0.00)	0.20 (<0.00)	0.21 (<0.00)	0.79 (<0.00)	0.04 (0.13)	
<i>LnInst#-3mo</i>	0.42 (<0.00)	0.45 (<0.00)	0.25 (<0.00)	0.26 (<0.00)	0.40 (<0.00)	0.06 (0.02)	0.42 (<0.00)	0.39 (<0.00)	-0.09 (<0.00)	0.14 (<0.00)	0.11 (0.00)	0.55 (<0.00)	0.02 (0.53)	0.56 (<0.00)

Observations are the 1,554 IPOs per Panel A of Table 1. See Appendix A for variable definitions. To accord with the regression specifications, we present correlations for the natural logarithm of *Age* (plus one), *Valuation*, *Volume-3mo*, and *Inst#-3mo*.

TABLE 3
IPO Price Formation and Analyst Coverage – Descriptive Sorts

Panel A: Analyst coverage by *InitialReturn*

		<i>InitialReturn</i> < 0	<i>InitialReturn</i> = 0	0 < <i>InitialReturn</i>	Full Sample
	n	324	88	1,142	1,554
<i>InitialReturn</i>	mean	-7.95	0.00	27.74	18.73
	median	-5.89	0.00	18.78	11.08
<i>Analysts-Total</i>	mean	6.15	5.83	7.75	7.30
	median	5.00	5.00	7.00	6.00
<i>Analysts-Affiliated</i>	mean	4.44	4.26	5.01	4.85
	median	4.00	4.00	4.00	4.00
<i>Analysts-UnAffiliated</i>	mean	1.71	1.57	2.73	2.45
	median	1.00	1.00	2.00	2.00

Panel B: Analyst coverage by *PriceRevision*

		<i>PriceRevision</i> < IPR minimum	IPR minimum ≤ <i>PriceRevision</i> < 0	<i>PriceRevision</i> = 0	0 < <i>PriceRevision</i> ≤ IPR maximum	IPR maximum < <i>PriceRevision</i>	Full Sample
	n	482	197	220	242	413	1,554
<i>PriceRevision</i>	mean	-28.11	-7.29	0.00	6.33	20.58	-3.19
	median	-25.00	-6.67	0.00	6.67	17.65	0.00
<i>Analysts-Total</i>	mean	6.09	5.63	6.18	7.86	9.79	7.30
	median	5.00	5.00	5.00	7.00	8.00	6.00
<i>Analysts-Affiliated</i>	mean	4.52	3.99	4.36	5.25	5.66	4.85
	median	4.00	4.00	4.00	4.50	5.00	4.00
<i>Analysts-UnAffiliated</i>	mean	1.57	1.64	1.82	2.61	4.13	2.45
	median	1.00	1.00	1.00	2.00	3.00	2.00

Observations are the 1,554 IPOs per Panel A of Table 1. See Appendix A for variable definitions. IPR refers to the Initial Price Range.

TABLE 4
IPO Price Formation and Analyst Coverage

Panel A: PriceRevision as a continuous variable

	<i>Analysts-Total</i>				<i>Analysts-Affiliated</i>				<i>Analysts-UnAffiliated</i>			
	Eq (1a)	Eq (1b)	Eq (1c)	Eq (1d)	Eq (2a)	Eq (2b)	Eq (2c)	Eq (2d)	Eq (3a)	Eq (3b)	Eq (3c)	Eq (3d)
Constant	-1.240 (-4.93)a	-1.011 (-5.72)a	-0.781 (-4.35)a	-0.755 (-4.34)a	-0.696 (-5.98)a	-0.676 (-6.03)a	-0.641 (-5.43)a	-0.640 (-5.30)a	-4.474 (-5.91)a	-3.855 (-5.44)a	-3.219 (-4.53)a	-3.148 (-4.42)a
<i>InitialReturn</i>		0.0021 (3.82)a	0.0013 (2.50)a			0.0002 (0.40)	0.0001 (0.13)			0.0055 (5.02)a	0.0034 (3.40)a	
<i>PriceRevision</i>			0.0033 (4.22)a	0.0042 (5.06)a			0.0005 (0.69)	0.0005 (0.66)			0.0086 (6.27)a	0.0110 (8.13)a
<i>UE(InitialReturn)</i>				0.0013 (2.50)a				0.0001 (0.13)				0.0034 (3.40)a
<i>Mgrs-Affiliated</i>	0.029 (4.81)a	0.032 (7.11)a	0.033 (7.39)a	0.033 (7.39)a	0.050 (13.87)a	0.051 (15.12)a	0.051 (15.97)a	0.051 (15.97)a	-0.008 (-0.70)	-0.001 (-0.15)	0.003 (0.35)	0.003 (0.35)
<i>UW</i>	0.070 (7.36)a	0.066 (8.35)a	0.062 (7.86)a	0.062 (7.86)a	0.119 (10.06)a	0.118 (10.45)a	0.118 (11.06)a	0.118 (11.06)a	-0.020 (-0.99)	-0.026 (-1.41)	-0.035 (-1.74)c	-0.035 (-1.74)c
<i>VC</i>	0.057 (3.23)a	0.043 (2.32)b	0.045 (2.38)b	0.045 (2.38)b	-0.060 (-1.95)c	-0.061 (-1.86)c	-0.061 (-1.87)c	-0.061 (-1.87)c	0.233 (3.47)a	0.195 (3.07)a	0.198 (3.27)a	0.198 (3.27)a
<i>LnAge</i>	-0.075 (-5.01)a	-0.070 (-4.63)a	-0.063 (-4.50)a	-0.063 (-4.50)a	-0.003 (-0.18)	-0.002 (-0.15)	-0.001 (-0.09)	-0.001 (-0.09)	-0.241 (-7.03)a	-0.227 (-6.12)a	-0.211 (-6.10)a	-0.211 (-6.10)a
<i>HighTech</i>	-0.004 (-0.14)	-0.008 (-0.31)	-0.023 (-0.94)	-0.023 (-0.94)	0.007 (0.24)	0.006 (0.21)	0.004 (0.12)	0.004 (0.12)	-0.063 (-0.72)	-0.060 (-0.71)	-0.094 (-1.15)	-0.094 (-1.15)
<i>LnValuation</i>	0.152 (6.77)a	0.166 (6.57)a	0.172 (6.68)a	0.172 (6.68)a	0.070 (4.69)a	0.071 (4.69)a	0.072 (4.57)a	0.072 (4.57)a	0.301 (7.02)a	0.333 (7.04)a	0.352 (7.58)a	0.352 (7.58)a
<i>CAR-3mo</i>	0.002 (3.57)a	0.002 (3.71)a	0.003 (4.15)a	0.003 (4.15)a	0.001 (6.59)a	0.001 (6.50)a	0.001 (6.43)a	0.001 (6.43)a	0.004 (2.36)b	0.004 (2.42)b	0.005 (3.16)a	0.005 (3.16)a
<i>LnVolume-3mo</i>	0.103 (5.78)a	0.081 (5.22)a	0.066 (4.40)a	0.066 (4.40)a	0.019 (2.02)b	0.017 (1.49)	0.015 (1.11)	0.015 (1.11)	0.244 (5.40)a	0.185 (4.06)a	0.136 (3.14)a	0.136 (3.14)a
<i>LnInst#-3mo</i>	0.028 (1.75)c	0.016 (0.90)	0.002 (0.12)	0.002 (0.12)	0.020 (2.22)b	0.019 (1.90)c	0.017 (1.37)	0.017 (1.37)	0.038 (0.85)	0.008 (0.21)	-0.029 (-0.78)	-0.029 (-0.78)
Pseudo R ²	20.06%	20.48%	20.80%	20.80%	20.79%	20.79%	20.80%	20.80%	11.79%	12.42%	12.97%	12.97%
AIC	7023.9	6975.0	6945.7	6945.7	5758.7	5760.5	5762.1	5762.1	5769.1	5732.1	5697.1	5695.1

TABLE 4
IPO Price Formation and Analyst Coverage

Panel B: *PriceRevision* as indicator variables by IPR category

	<i>Analysts-Total</i>			<i>Analysts-Affiliated</i>			<i>Analysts-UnAffiliated</i>		
	Eq (1b)	Eq (1e)	Eq (1f)	Eq (2b)	Eq (2e)	Eq (2f)	Eq (3b)	Eq (3e)	Eq (3f)
Constant	-1.011 (-5.72)a	-0.875 (-4.71)a	-0.898 (-4.53)a	-0.676 (-6.03)a	-0.639 (-5.53)a	-0.642 (-5.57)a	-3.855 (-5.44)a	-3.418 (-4.65)a	-3.484 (-4.64)a
<i>InitialReturn</i>	0.0021 (3.82)a	0.0014 (2.44)b		0.0002 (0.40)	-0.000 (-0.05)		0.0055 (5.02)a	0.0037 (3.23)a	
<i>PriceRevision</i> < IPR minimum		-0.0432 (-1.62)	-0.0605 (-2.22)b		-0.0096 (-0.37)	-0.0082 (-0.28)		-0.1547 (-1.71)c	-0.2036 (-2.05)b
IPR minimum ≤ <i>PriceRevision</i> < 0		-0.0183 (-0.48)	-0.0229 (-0.59)		-0.0246 (-0.54)	-0.0244 (-0.52)		-0.0313 (-0.36)	-0.0422 (-0.48)
0 < <i>PriceRevision</i> ≤ IPR maximum		0.0136 (0.57)	0.0205 (0.85)		-0.0138 (-0.50)	-0.0135 (-0.48)		0.1261 (1.24)	0.1456 (1.43)
IPR maximum < <i>PriceRevision</i>		0.0898 (3.66)a	0.1175 (4.54)a		0.0187 (0.53)	0.0197 (0.55)		0.2351 (3.53)a	0.3059 (4.77)a
<i>UE(InitialReturn)</i>			0.0009 (1.59)			-0.0001 (-0.20)			0.0026 (2.03)b
Control variables included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R ²	20.48%	20.68%	20.60%	20.79%	20.81%	20.81%	12.42%	12.82%	12.71%
AIC	6975.0	6958.0	6966.8	5760.5	5765.4	5763.4	5732.1	5706.5	5715.8

The dependent variable is *Analysts-Total* for Eq (1a) – (1f), *Analysts-Affiliated* for Eq (2a) – (2f) and *Analysts-UnAffiliated* for Eq (3a) – (3f). Observations are the 1,554 IPOs per Panel A of Table 1. See Appendix A for variable definitions. Specifications include fixed effects for IPO year and FF49 industry (for industries with four or more observations). Estimation is negative binomial with z-statistics using standard errors clustered on FF49 industry in parentheses. AIC is the Akaike Information Criterion; for which, given our sample size, a reduction of 2.5 (or more) indicates an improvement in model fit. For Panel A, tests of the difference in coefficients between: *PriceRevision* and *InitialReturn* for Eq (1c) yields a chi-square of 4.39 (p-value 0.04); *PriceRevision* and *UE(InitialReturn)* for Eq (1d) yields a chi-square of 13.32 (p-value 0.00); *PriceRevision* and *InitialReturn* for Eq (3c) yields a chi-square of 7.50 (p-value 0.01); *PriceRevision* and *UE(InitialReturn)* for Eq (3d) yields a chi-square of 27.00 (p-value 0.00). For Panel B, IPR refers to the Initial Price Range and we specify all control variables from Eq (1a) for all estimations (though do not report the results, which are very similar to those we report in Panel A).

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

TABLE 5
IPO Price Formation and Analyst Recommendations

Panel A: Mean recommendations – IPOs with coverage by both affiliated and unaffiliated analysts

Panel A1: By *InitialReturn* by post-IPO quarter

	<u>3-months post-IPO</u>			<u>6-months post-IPO</u>			<u>9-months post-IPO</u>			<u>12-months post-IPO</u>		
	n	Recommend-		n	Recommend-		n	Recommend-		n	Recommend-	
		<i>Affiliated</i>	<i>UnAffiliated</i>		<i>Affiliated</i>	<i>UnAffiliated</i>		<i>Affiliated</i>	<i>UnAffiliated</i>		<i>Affiliated</i>	<i>UnAffiliated</i>
<i>InitialReturn</i> < 0	69	1.95	2.24 a	118	1.93	2.10 b	156	1.94	2.07 b	208	1.98	2.02
<i>InitialReturn</i> = 0	24	1.85	2.15 a	40	1.86	2.07	55	1.88	1.94	60	1.93	2.00
<i>InitialReturn</i> > 0	368	2.10	2.25 a	592	2.08	2.13 c	788	2.04	2.06	898	2.05	2.03
Full Sample	461	2.06	2.24 a	750	2.05	2.12 a	999	2.02	2.05 c	1166	2.03	2.03

Panel A2: By *PriceRevision* by post-IPO quarter

	<u>3-months post-IPO</u>			<u>6-months post-IPO</u>			<u>9-months post-IPO</u>			<u>12-months post-IPO</u>		
	n	Recommend-		n	Recommend-		n	Recommend-		n	Recommend-	
		<i>Affiliated</i>	<i>UnAffiliated</i>		<i>Affiliated</i>	<i>UnAffiliated</i>		<i>Affiliated</i>	<i>UnAffiliated</i>		<i>Affiliated</i>	<i>UnAffiliated</i>
<i>PriceRevision</i> < IPR minimum	118	1.86	2.06 b	185	1.93	2.00	251	1.92	1.92	319	1.95	1.94
IPR minimum ≤ <i>PriceRevision</i> < 0	38	1.88	2.22 b	67	1.90	1.97	104	1.92	1.94	124	1.96	1.92
<i>PriceRevision</i> = 0	44	2.04	2.40 a	83	1.95	2.16 a	127	1.89	2.09 a	157	1.93	1.97
0 < <i>PriceRevision</i> ≤ IPR maximum	77	2.04	2.20	140	2.04	2.12	174	2.04	2.12	199	2.04	2.08
IPR maximum < <i>PriceRevision</i>	184	2.24	2.34 c	275	2.19	2.24	343	2.15	2.13	367	2.15	2.14
Full Sample	461	2.06	2.24 a	750	2.05	2.12 a	999	2.02	2.05 c	1166	2.03	2.03

Observations are those IPOs (of the full sample of 1,554 IPOs per Panel A of Table 1) with coverage by both an affiliated analyst and an unaffiliated analyst as of each post-IPO quarter for the first year. See Appendix A for variable definitions. IPR refers to the Initial Price Range.

TABLE 5
IPO Price Formation and Analyst Recommendations

Panel B: Mean recommendations – IPOs with coverage by both a lead-manager and a co-manager affiliated analyst

Panel B1: By *InitialReturn* by post-IPO quarter

	<u>3-months post-IPO</u>			<u>6-months post-IPO</u>			<u>9-months post-IPO</u>			<u>12-months post-IPO</u>		
	n	<i>LeadMgr</i>	<i>CoMgr</i>	n	<i>LeadMgr</i>	<i>CoMgr</i>	n	<i>LeadMgr</i>	<i>CoMgr</i>	n	<i>LeadMgr</i>	<i>CoMgr</i>
<i>InitialReturn</i> < 0	241	1.85	1.72 a	248	1.91	1.76 a	249	1.95	1.79 a	250	1.98	1.83 a
<i>InitialReturn</i> = 0	69	1.88	1.59 a	71	1.91	1.65 a	71	1.95	1.70 a	71	1.98	1.74 a
<i>InitialReturn</i> > 0	905	2.08	1.83 a	928	2.09	1.86 a	936	2.10	1.87 a	937	2.12	1.91 a
Full Sample	1,215	2.03	1.79 a	1,247	2.05	1.83 a	1,256	2.06	1.85 a	1,258	2.08	1.88 a

Panel B2: By *PriceRevision* by post-IPO quarter

	<u>3-months post-IPO</u>			<u>6-months post-IPO</u>			<u>9-months post-IPO</u>			<u>12-months post-IPO</u>		
	n	<i>LeadMgr</i>	<i>CoMgr</i>	n	<i>LeadMgr</i>	<i>CoMgr</i>	n	<i>LeadMgr</i>	<i>CoMgr</i>	n	<i>LeadMgr</i>	<i>CoMgr</i>
<i>PriceRevision</i> < IPR minimum	379	1.84	1.70 a	396	1.88	1.76 a	400	1.91	1.79 a	401	1.95	1.84 a
IPR minimum \leq <i>PriceRevision</i> < 0	134	1.96	1.70 a	138	1.98	1.73 a	140	1.99	1.76 a	141	2.02	1.82 a
<i>PriceRevision</i> = 0	164	1.90	1.67 a	167	1.93	1.72 a	169	1.97	1.74 a	169	2.00	1.78 a
0 < <i>PriceRevision</i> \leq IPR maximum	191	2.03	1.88 a	197	2.06	1.91 a	197	2.07	1.91 a	197	2.08	1.92 a
IPR maximum < <i>PriceRevision</i>	347	2.32	1.94 a	349	2.31	1.95 a	350	2.29	1.96 a	350	2.31	1.98 a
Full Sample	1,215	2.03	1.79 a	1,247	2.05	1.83 a	1,256	2.06	1.85 a	1,258	2.08	1.88 a

Observations are those IPOs (of the full sample of 1,554 IPOs per Panel A of Table 1) with coverage by both a lead-manager affiliated analyst and a co-manager affiliated analyst as of each post-IPO quarter for the first year. See Appendix A for variable definitions. IPR refers to the Initial Price Range.

TABLE 6
IPO Price Formation and Analyst Coverage – Pre-/ Post-JOBS Act EGC Issuers

	<i>Analysts-Affiliated</i>						<i>Analysts-UnAffiliated</i>					
	Pre-JOBS			Post-JOBS			Pre-JOBS			Post-JOBS		
	Eq (2b)	Eq (2c)	Eq (2d)	Eq (2b)	Eq (2c)	Eq (2d)	Eq (3b)	Eq (3c)	Eq (3d)	Eq (3b)	Eq (3c)	Eq (3d)
Constant	-0.614 (-2.71)a	-0.632 (-2.59)a	-0.631 (-2.64)a	-0.409 (-2.55)b	-0.346 (-2.13)b	-0.351 (-2.12)b	-4.035 (-4.28)a	-2.884 (-2.97)a	-2.851 (-2.92)a	-2.729 (-4.61)a	-2.409 (-4.06)a	-2.306 (-3.97)a
<i>InitialReturn</i>	0.0000 (0.02)	0.0001 (0.12)		0.0001 (0.22)	-0.0002 (-0.59)		0.0059 (2.68)a	0.0020 (1.06)		0.0054 (4.33)a	0.0040 (4.09)a	
<i>PriceRevision</i>		-0.0002 (-0.21)	-0.0001 (-0.21)		0.0012 (1.32)	0.0010 (1.00)		0.0104 (3.85)a	0.0114 (4.48)a		0.0067 (5.52)a	0.0104 (5.55)a
<i>UE(InitialReturn)</i>			0.0001 (0.12)		-0.0002 (-0.59)			0.0020 (1.06)				0.0040 (4.09)a
<i>Mgrs-Affiliated</i>	0.095 (10.52)a	0.095 (10.59)a	0.095 (10.59)a	0.065 (7.39)a	0.065 (7.78)a	0.065 (7.78)a	-0.019 (-1.01)	-0.014 (-0.78)	-0.014 (-0.78)	-0.020 (-2.45)b	-0.016 (-1.92)c	-0.016 (-1.92)c
<i>UW</i>	0.099 (7.59)a	0.099 (7.61)a	0.099 (7.61)a	0.120 (6.05)a	0.120 (6.08)a	0.120 (6.08)a	0.058 (2.19)b	0.049 (1.94)c	0.049 (1.94)c	-0.087 (-3.18)a	-0.088 (-2.99)a	-0.088 (-2.99)a
<i>VC</i>	-0.017 (-0.85)	-0.016 (-0.85)	-0.016 (-0.85)	-0.027 (-0.58)	-0.025 (-0.57)	-0.025 (-0.57)	0.213 (2.71)a	0.196 (2.92)a	0.196 (2.92)a	0.099 (1.02)	0.111 (1.13)	0.111 (1.13)
<i>LnAge</i>	0.009 (0.59)	0.009 (0.60)	0.009 (0.60)	0.033 (1.23)	0.036 (1.38)	0.036 (1.38)	-0.243 (-3.63)a	-0.240 (-3.89)a	-0.240 (-3.89)a	-0.210 (-3.51)a	-0.199 (-3.53)a	-0.199 (-3.53)a
<i>HighTech</i>	0.034 (1.10)	0.035 (1.14)	0.035 (1.14)	-0.015 (-0.22)	-0.018 (-0.28)	-0.018 (-0.28)	0.076 (0.65)	0.032 (0.29)	0.032 (0.29)	-0.234 (-1.68)c	-0.262 (-1.84)c	-0.262 (-1.84)c
<i>LnValuation</i>	0.061 (2.38)b	0.060 (2.26)b	0.060 (2.26)b	0.023 (1.03)	0.020 (0.93)	0.020 (0.93)	0.223 (3.12)a	0.285 (3.96)a	0.285 (3.96)a	0.514 (9.98)a	0.492 (9.51)a	0.492 (9.51)a
<i>CAR-3mo</i>	0.001 (3.21)a	0.001 (3.36)a	0.001 (3.36)a	0.001 (2.44)b	0.002 (2.43)b	0.002 (2.43)b	0.003 (2.09)b	0.004 (2.90)a	0.004 (2.90)a	0.004 (1.31)	0.006 (1.80)c	0.006 (1.80)c
<i>LnVolume-3mo</i>	0.003 (0.13)	0.004 (0.19)	0.004 (0.19)	0.031 (2.01)b	0.030 (1.86)c	0.030 (1.86)c	0.259 (3.20)a	0.155 (2.04)b	0.155 (2.04)b	0.131 (3.45)a	0.123 (3.23)a	0.123 (3.23)a
<i>LnInst#-3mo</i>	0.047 (3.05)a	0.047 (2.82)a	0.047 (2.82)a	0.029 (1.50)	0.024 (1.09)	0.024 (1.09)	-0.004 (-0.06)	-0.040 (-0.70)	-0.040 (-0.70)	-0.027 (-0.54)	-0.058 (-1.19)	-0.058 (-1.19)
Pseudo R ²	13.90%	13.90%	13.90%	21.46%	21.49%	21.49%	12.90%	13.82%	13.82%	13.67%	13.96%	13.96%
AIC	2303.6	2303.5	2303.5	2754.3	2759.3	2759.3	2479.8	2454.2	2454.2	2589.4	2586.9	2586.9

The dependent variable is *Analysts-Affiliated* for Equations (2b) – (2d) and *Analysts-UnAffiliated* for Equations (3b) – (3d). Pre-JOBS observations are 645 IPOs prior to April 18, 2012 with pre-IPO annual revenues below \$1 billion; and Post-JOBS observations are 749 IPOs that claim Emerging Growth Company (EGC) status on or after April 18, 2012 (the day of Splunk Inc.’s IPO, the first in our sample to claim EGC status in its final prospectus). See Appendix A for variable definitions. Specifications include fixed effects for IPO year and FF49 industry (for industries with four or more observations). Estimation is negative binomial with z-statistics using standard errors clustered on FF49 industry in parentheses. AIC is the Akaike Information Criterion; for which, given our sample size, a reduction of 2.5 (or more) indicates an improvement in model fit (Hilbe, 2011). Tests of the differences in *PriceRevision*’s and *UE(InitialReturn)*’s coefficient between the Eq (3d) Post-JOBS and Eq (3d) Pre-JOBS estimations yields chi-squares of 0.09 (p-value 0.76) and 1.09 (p-value 0.30), respectively.

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

TABLE 7
IPO Price Formation and Analyst Recommendations – Pre-/ Post-JOBS Act

Panel A: Mean recommendations by *InitialReturn*– EGC IPOs with coverage by both affiliated and unaffiliated analysts

Panel A1: Pre-JOBS EGC IPOs by post-IPO quarter

	<u>3-months post-IPO</u>			<u>6-months post-IPO</u>			<u>9-months post-IPO</u>			<u>12-months post-IPO</u>		
	n	<i>Recommend-</i>		n	<i>Recommend-</i>		n	<i>Recommend-</i>		n	<i>Recommend-</i>	
		<i>Affiliated</i>	<i>UnAffiliated</i>		<i>Affiliated</i>	<i>UnAffiliated</i>		<i>Affiliated</i>	<i>UnAffiliated</i>		<i>Affiliated</i>	<i>UnAffiliated</i>
<i>InitialReturn</i> < 0	35	2.06	2.19	51	2.03	2.06	68	2.06	2.07	85	2.13	2.06
<i>InitialReturn</i> = 0	11	1.81	1.83	23	1.80	1.92	30	1.91	1.79	33	2.00	1.88
<i>InitialReturn</i> > 0	174	2.09	2.18	287	2.10	2.10	358	2.09	2.07	398	2.10	2.05
Full Sample	220	2.07	2.16	361	2.07	2.08	456	2.07	2.05	516	2.09	2.04 c

Panel A2: Post-JOBS EGC IPOs by post-IPO quarter

	<u>3-months post-IPO</u>			<u>6-months post-IPO</u>			<u>9-months post-IPO</u>			<u>12-months post-IPO</u>		
	n	<i>Recommend-</i>		n	<i>Recommend-</i>		n	<i>Recommend-</i>		n	<i>Recommend-</i>	
		<i>Affiliated</i>	<i>UnAffiliated</i>		<i>Affiliated</i>	<i>UnAffiliated</i>		<i>Affiliated</i>	<i>UnAffiliated</i>		<i>Affiliated</i>	<i>UnAffiliated</i>
<i>InitialReturn</i> < 0	22	1.80	2.27 a	48	1.78	2.10 a	68	1.78	2.02 a	97	1.85	1.93
<i>InitialReturn</i> = 0	10	1.83	2.23	14	1.91	2.19	21	1.81	2.16	23	1.83	2.16 c
<i>InitialReturn</i> > 0	132	2.06	2.28 a	231	2.02	2.11 c	343	1.96	1.98	406	1.97	1.95
Full Sample	164	2.01	2.27 a	293	1.98	2.11 a	432	1.92	1.99 b	526	1.94	1.96

TABLE 7
IPO Price Formation and Analyst Recommendations – Pre-/ Post-JOBS Act

Panel B: Mean recommendations by *PriceRevision*– EGC IPOs with coverage by both affiliated and unaffiliated analysts

Panel B1: Pre-JOBS EGC IPOs by post-IPO quarter

	<u>3-months post-IPO</u>			<u>6-months post-IPO</u>			<u>9-months post-IPO</u>			<u>12-months post-IPO</u>		
	n	<i>Affiliated</i>	<i>UnAffiliated</i>	n	<i>Affiliated</i>	<i>UnAffiliated</i>	n	<i>Affiliated</i>	<i>UnAffiliated</i>	n	<i>Affiliated</i>	<i>UnAffiliated</i>
<i>PriceRevision</i> < PR minimum	65	1.84	1.76	106	1.92	1.81	132	1.95	1.83 b	167	1.99	1.87 b
IPR minimum \leq <i>PriceRevision</i> < 0	16	1.81	2.33 b	29	1.87	1.99	49	1.92	1.87	56	1.99	1.89
<i>PriceRevision</i> = 0	19	2.09	2.64 b	36	1.98	2.27 b	50	1.97	2.13	56	2.03	2.04
0 < <i>PriceRevision</i> \leq IPR maximum	32	2.05	2.15	59	2.11	2.13	70	2.14	2.15	79	2.16	2.15
IPR maximum < <i>PriceRevision</i>	88	2.29	2.34	131	2.24	2.24	155	2.23	2.22	158	2.24	2.23
Full Sample	220	2.07	2.16	361	2.07	2.08	456	2.07	2.05	516	2.09	2.04 c

Panel B2: Post-JOBS EGC IPOs by post-IPO quarter

	<u>3-months post-IPO</u>			<u>6-months post-IPO</u>			<u>9-months post-IPO</u>			<u>12-months post-IPO</u>		
	n	<i>Affiliated</i>	<i>UnAffiliated</i>	n	<i>Affiliated</i>	<i>UnAffiliated</i>	n	<i>Affiliated</i>	<i>UnAffiliated</i>	n	<i>Affiliated</i>	<i>UnAffiliated</i>
<i>PriceRevision</i> < PR minimum	28	1.83	2.49 a	48	1.88	2.22 a	84	1.83	1.94	110	1.86	1.93
IPR minimum \leq <i>PriceRevision</i> < 0	14	1.91	1.89	27	1.88	1.93	41	1.87	1.93	52	1.92	1.85
<i>PriceRevision</i> = 0	17	1.88	2.22 a	37	1.83	2.02 c	66	1.77	2.02 a	88	1.82	1.89
0 < <i>PriceRevision</i> \leq IPR maximum	24	1.88	2.19	53	1.88	1.97	74	1.89	1.96	90	1.90	1.90
IPR maximum < <i>PriceRevision</i>	81	2.16	2.30	128	2.12	2.20	167	2.06	2.04	186	2.07	2.07
Full Sample	164	2.01	2.27 a	293	1.98	2.11 a	432	1.92	1.99 b	526	1.94	1.96

Pre-JOBS IPOs are those (of the 645 IPOs prior to April 18, 2012) with pre-IPO annual revenues below \$1 billion and coverage by both affiliated and unaffiliated analysts as of each post-IPO quarter for the first year. Post-JOBS IPOs are those (of the 749 IPOs that claim Emerging Growth Company (EGC) status on or after April 18, 2012 (the day of Splunk Inc.'s IPO, the first in our sample to claim EGC status in its final prospectus) and coverage by both affiliated and unaffiliated analysts as of each post-IPO quarter for the first year. See Appendix A for variable definitions. IPR refers to the Initial Price Range.

TABLE 8
IPO Price Formation and Unaffiliated Analyst Coverage –by direction of *PriceRevision* / *InitialReturn*

	Upper off-diagonal IPOs			Lower off-diagonal IPOs			Main-diagonal IPOs		
	Eq (3b)	Eq (3c)	Eq (3d)	Eq (3b)	Eq (3c)	Eq (3d)	Eq (3b)	Eq (3c)	Eq (3d)
Constant	-2.393 (-2.97)a	-1.980 (-2.09)b	-1.891 (-2.02)b	-4.093 (-1.11)	-4.287 (-1.22)	-4.428 (-1.25)	-3.215 (-9.15)a	-2.639 (-9.55)a	-2.593 (-9.12)a
<i>InitialReturn</i>	0.0066 (1.68)c	0.0068 (1.76)c		0.0244 (1.52)	0.0357 (1.82)c		0.0049 (8.46)a	0.0024 (4.18)a	
<i>PriceRevision</i>		0.0113 (5.43)a	0.0114 (5.64)a		0.0323 (1.94)c	0.0216 (1.76)c		0.0090 (7.84)a	0.0115 (12.29)a
<i>UE(InitialReturn)</i>			0.0068 (1.76)c			0.0357 (1.82)c			0.0024 (4.18)a
<i>Mgrs-Affiliated</i>	-0.003 (-0.09)	0.005 (0.15)	0.005 (0.15)	0.033 (1.48)	0.060 (2.30)b	0.060 (2.30)b	-0.001 (-0.10)	0.002 (0.19)	0.002 (0.19)
<i>UW</i>	-0.036 (-0.81)	-0.028 (-0.62)	-0.028 (-0.62)	-0.001 (-0.01)	0.013 (0.08)	0.013 (0.08)	-0.014 (-0.61)	-0.023 (-1.09)	-0.023 (-1.09)
<i>VC</i>	0.229 (1.25)	0.277 (1.64)	0.277 (1.64)	-1.054 (-3.19)a	-0.989 (-2.82)a	-0.989 (-2.82)a	0.206 (1.75)c	0.207 (1.97)b	0.207 (1.97)b
<i>LnAge</i>	-0.194 (-1.74)c	-0.216 (-1.93)c	-0.216 (-1.93)c	-0.169 (-0.57)	-0.115 (-0.38)	-0.115 (-0.38)	-0.255 (-7.00)a	-0.238 (-6.71)a	-0.238 (-6.71)a
<i>HighTech</i>	0.315 (3.74)a	0.298 (3.89)a	0.298 (3.89)a	-0.335 (-1.41)	-0.485 (-1.90)c	-0.485 (-1.90)c	0.237 (3.87)a	0.207 (3.52)a	0.207 (3.52)a
<i>LnValuation</i>	0.440 (3.70)a	0.416 (3.45)a	0.416 (3.45)a	-0.003 (-0.01)	0.035 (0.11)	0.035 (0.11)	0.285 (4.86)a	0.300 (5.15)a	0.300 (5.15)a
<i>CAR-3mo</i>	0.006 (3.24)a	0.007 (3.75)a	0.007 (3.75)a	0.002 (0.18)	0.003 (0.23)	0.003 (0.23)	0.004 (2.45)b	0.005 (2.66)a	0.005 (2.66)a
<i>LnVolume-3mo</i>	0.045 (0.58)	0.040 (0.47)	0.040 (0.47)	0.569 (1.54)	0.528 (1.50)	0.528 (1.50)	0.234 (4.40)a	0.194 (4.24)a	0.194 (4.24)a
<i>LnInst#-3mo</i>	-0.058 (-0.58)	-0.079 (-0.76)	-0.079 (-0.76)	-0.409 (-2.53)b	-0.477 (-3.78)a	-0.477 (-3.78)a	0.035 (0.95)	0.004 (0.12)	0.004 (0.12)
Pseudo R ²	8.49%	8.99%	8.99%	18.54%	19.09%	19.09%	12.71%	13.16%	13.16%
AIC	1237.4	1230.7	1230.7	168.4	167.4	167.4	4303.7	4281.6	4281.6

The dependent variable is *Analysts-UnAffiliated*. ‘Upper off-diagonal IPOs’ are the 375 IPOs with *PriceRevision* < 0 and *InitialReturn* > 0 (correlation 0.02). ‘Lower off-diagonal IPOs’ are the 41 IPOs with *PriceRevision* > 0 and *InitialReturn* ≤ 0 (correlation -0.31). ‘Main-diagonal IPOs’ are the remaining 1,138 (correlation 0.62). See Panel A of Table 1 for sample details and Appendix A for variable definitions. Specifications include fixed effects for IPO year and, due to concerns regarding sample size and comparability, FF12 industry (for years / industries with four or more observations). Estimation is negative binomial with z-statistics using standard errors clustered on FF12 industry in parentheses. AIC is the Akaike Information Criterion for which, given our sample size, a reduction in AIC of 2.5 (or more) indicates an improvement in model fit (Hilbe, 2011).

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

TABLE 9
IPO Price Formation and Unaffiliated Analyst Coverage – Endogenous *PriceRevision*

	Eq (3b)	Eq (3c)	Eq (3c')	Eq (3d)	Eq (3d')
Constant	-3.855 (-5.44)a	-3.219 (-4.53)a	-3.373 (-4.67)a	-3.148 (-4.42)a	-3.300 (-4.56)a
<i>InitialReturn</i>	0.0055 (5.02)a	0.0034 (3.40)a	0.0035 (3.61)a		
<i>PriceRevision</i>		0.0086 (6.27)a		0.0110 (8.13)a	
<i>E(PriceRevision)</i>			0.0032 (1.02)		0.0058 (1.76)c
<i>UE(PriceRevision)</i>			0.0090 (6.42)a		0.0116 (8.35)a
<i>UE(InitialReturn)</i>				0.0034 (3.40)a	0.0035 (3.61)a
<i>Mgrs-Affiliated</i>	-0.001 (-0.15)	0.003 (0.35)	0.002 (0.21)	0.003 (0.35)	0.002 (0.21)
<i>UW</i>	-0.026 (-1.41)	-0.035 (-1.74)c	-0.026 (-1.31)	-0.035 (-1.74)c	-0.026 (-1.31)
<i>VC</i>	0.195 (3.07)a	0.198 (3.27)a	0.209 (3.56)a	0.198 (3.27)a	0.209 (3.56)a
<i>LnAge</i>	-0.227 (-6.12)a	-0.211 (-6.10)a	-0.221 (-6.20)a	-0.211 (-6.10)a	-0.221 (-6.20)a
<i>HighTech</i>	-0.060 (-0.71)	-0.094 (-1.15)	-0.058 (-0.68)	-0.094 (-1.15)	-0.058 (-0.68)
<i>LnValuation</i>	0.333 (7.04)a	0.352 (7.58)a	0.372 (8.79)a	0.352 (7.58)a	0.372 (8.79)a
<i>CAR-3mo</i>	0.004 (2.42)b	0.005 (3.16)a	0.005 (3.17)a	0.005 (3.16)a	0.005 (3.17)a
<i>LnVolume-3mo</i>	0.185 (4.06)a	0.136 (3.14)a	0.133 (3.10)a	0.136 (3.14)a	0.133 (3.10)a
<i>LnInst#-3mo</i>	0.008 (0.21)	-0.029 (-0.78)	-0.030 (-0.83)	-0.029 (-0.78)	-0.030 (-0.83)
Pseudo R ²	12.42%	12.97%	12.99%	12.97%	12.99%
AIC	5732.1	5697.1	5695.5	5695.1	5695.5

The dependent variable is *Analysts-UnAffiliated*. *E(PriceRevision)* and *UE(PriceRevision)* are the predicted values and residuals, respectively, from regressing *PriceRevision* on the determinants in equation (3) from Table 4 of Bochkay et al. (2018) (See Appendix B for the results). Observations are the 1,554 IPOs per Panel A of Table 1. See Appendix A for variable definitions. Specifications include fixed effects for IPO year and FF49 industry (for industries with four or more observations). Estimation is negative binomial with z-statistics using standard errors clustered on FF49 industry in parentheses. AIC is the Akaike Information Criterion for which, given our sample size, a reduction in AIC of 2.5 (or more) indicates an improvement in model fit (Hilbe, 2011). Tests of the difference in coefficients between: *E(PriceRevision)* and *InitialReturn* in Eq (3c') yields a chi-square statistic of 0.01 (p-value of 0.93); *UE(PriceRevision)* and *InitialReturn* in Eq (3c') yields a chi-square statistic of 8.31 (p-value of 0.00); *E(PriceRevision)* and *UE(InitialReturn)* in Eq (3d') yields a chi-square statistic of 0.51 (p-value of 0.48); and *UE(PriceRevision)* and *UE(InitialReturn)* in Eq (3d') yields a chi-square statistic of 28.65 (p-value of 0.00).

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

TABLE 10
IPO Price Formation and Unaffiliated Analyst Coverage – Path Analysis

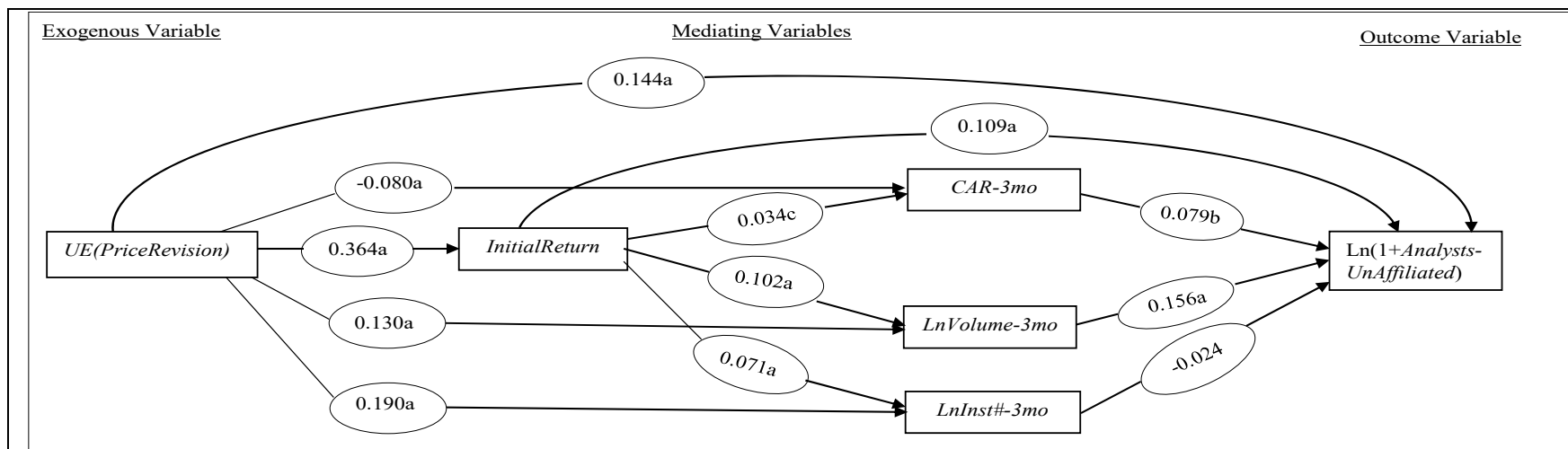
Outcome Variable: Ln(1 + <i>Analysts-UnAffiliated</i>)	Standardized Coefficient	z- statistic	Standardized Coefficient	z- statistic	Standardized Coefficient	z- statistic
<u>Direct Effects (Exogenous Variables):</u>						
<i>PriceRevision</i>	0.164	5.67a				
<i>E(PriceRevision)</i>			-0.001	-0.03		
<i>UE(PriceRevision)</i>					0.144	5.97a
<u>Direct Effects (Mediating Variables):</u>						
<i>InitialReturn</i>	0.101	3.48a	0.158	4.31a	0.109	3.64a
<i>CAR-3mo</i>	0.079	2.35b	0.065	1.96b	0.079	2.32b
<i>LnVolume-3mo</i>	0.154	3.04a	0.202	3.98a	0.156	3.14a
<i>LnInst#-3mo</i>	-0.022	-0.84	0.010	0.35	-0.024	-0.89
<u>Mediating Paths:</u>						
<i>PriceRevision, InitialReturn</i>	0.457	11.48a				
<i>E(PriceRevision), InitialReturn</i>			0.356	9.41a		
<i>UE(PriceRevision), InitialReturn</i>					0.364	9.90a
<i>PriceRevision, CAR-3mo</i>	-0.099	-4.08a				
<i>E(PriceRevision), CAR-3mo</i>			-0.042	-0.66		
<i>UE(PriceRevision), CAR-3mo</i>					-0.080	-3.21a
<i>PriceRevision, LnVolume-3mo</i>	0.154	5.80a				
<i>E(PriceRevision), LnVolume-3mo</i>			0.028	0.89		
<i>UE(PriceRevision), LnVolume-3mo</i>					0.130	5.67a
<i>PriceRevision, LnInst#-3mo</i>	0.214	7.17a				
<i>E(PriceRevision), LnInst#-3mo</i>			-0.019	-0.57		
<i>UE(PriceRevision), LnInst#-3mo</i>					0.190	7.21a
<i>InitialReturn, CAR-3mo</i>	0.042	2.32b	0.004	0.35	0.034	1.75c
<i>InitialReturn, LnVolume-3mo</i>	0.093	3.85a	0.155	7.49a	0.102	4.54a
<i>InitialReturn, LnInst#-3mo</i>	0.063	3.63a	0.154	6.05a	0.071	4.22a
<u>Indirect Effects:</u>						
<i>PriceRevision</i>	0.065	3.89a				
<i>E(PriceRevision)</i>			0.071	3.15a		
<i>UE(PriceRevision)</i>					0.055	3.89a
<i>InitialReturn</i>	0.016	2.32b	0.033	3.64a	0.017	2.41b
<u>Total Effects:</u>						
<i>PriceRevision</i>	0.229	6.37a				
<i>E(PriceRevision)</i>			0.070	1.70c		
<i>UE(PriceRevision)</i>					0.199	6.50a
<i>InitialReturn</i>	0.117	3.69a	0.191	4.85a	0.125	3.90a
<i>CAR-3mo</i>	0.079	2.35b	0.065	1.96b	0.079	2.32b
<i>LnVolume-3mo</i>	0.154	3.04a	0.202	3.98a	0.156	3.14a
<i>LnInst#-3mo</i>	-0.022	-0.84	0.010	0.35	-0.024	-0.89

<u>Effect Mediated:</u>			
<i>PriceRevision</i>	28.31%		
<i>E(PriceRevision)</i>		101.21%	
<i>UE(PriceRevision)</i>			27.70%
Control Variables	Included	Included	Included
Adjusted R ²	88.92%	85.08%	88.43%

This table presents the results of estimating a structural equation model to determine the direct and indirect effects of IPO price revision on unaffiliated analyst coverage. The path analysis provides estimates of the relations among an exogenous variable (*PriceRevision*, *E(PriceRevision)* or *UE(PriceRevision)*), four mediating variables (*InitialReturn*, *CAR-3mo*, *LnVolume-3mo* and *LnInst#-3mo*) and the unaffiliated analyst coverage outcome variable (*Ln(1+Analysts-UnAffiliated)*). *E(PriceRevision)* and *UE(PriceRevision)* are the predicted values and residuals, respectively, from regressing *PriceRevision* on the determinants in equation (3) in Table 4 of Bochkay et al. (2018) (see Appendix B). Observations are the 1,554 IPOs per Panel A of Table 1. See Appendix A for variable definitions. Specifications include all control variables from Eq (1a) and fixed effects for IPO year and FF49 industry (for industries with four or more observations). Estimation is OLS with z-statistics using standard errors clustered on FF49 industry. We present standardized path coefficients and use the Sobel (1982) test to assess the significance of the indirect effects. A test of the difference in the total effect of *PriceRevision* on *Analyst-UnAffiliated* (standardized coefficient 0.229, z-statistic 6.37) versus the total effect of *InitialReturn* (standardized coefficient 0.117, z-statistic 3.69) yields a chi-square of 12.10 (p-value < 0.00). A test of the difference in the total effect of *UE(PriceRevision)* (standardized coefficient 0.199, z-statistic 6.50) on *Analyst-UnAffiliated* versus the total effect of *InitialReturn* (standardized coefficient 0.125, z-statistic 3.90) yields a chi-square of 7.07 (p-value 0.01) (note: for the test, we first separately estimate the total effects of standardized *PriceRevision* (i.e., $PriceRevision \div$ its standard deviation) and standardized *InitialReturn* on standardized *Ln(1+Analysts-UnAffiliated)*, and then use seemingly unrelated estimation to test the difference between the corresponding coefficients).

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

Figure 1
IPO Price Formation and Unaffiliated Analyst Coverage – Path Analysis



This figure shows the standardized coefficients of the direct and indirect paths between an exogenous variable ($UE(PriceRevision)$), four mediating variables ($InitialReturn$, $CAR-3mo$, $LnVolume-3mo$, $LnInst\#-3mo$) and the outcome variable ($Ln(1+Analysts-UnAffiliated)$). We estimate the following structural equation model via OLS with fixed effects for IPO year and FF49 industry (for industries with four or more observations) and standard errors clustered on FF49 industry.

$$Ln(1+Analysts-UnAffiliated) = \beta_0 + \beta_1 UE(PriceRevision) + \beta_2 InitialReturn + \beta_3 Mgrs-Affiliated + \beta_4 UW + \beta_5 VC + \beta_6 LnAge + \beta_7 HighTech + \beta_8 LnValuation + \beta_9 CAR-3mo + \beta_{10} LnVolume-3mo + \beta_{11} LnInst\#-3mo + \sum \beta_t Year + \sum \beta_k Industry + \varepsilon$$

$$InitialReturn = \beta_0 + \beta_1 UE(PriceRevision) + \beta_2 Mgrs-Affiliated + \beta_3 UW + \beta_4 VC + \beta_5 LnAge + \beta_6 HighTech + \beta_7 LnValuation + \sum \beta_t Year + \sum \beta_k Industry + \varepsilon$$

$$CAR-3mo = \beta_0 + \beta_1 UE(PriceRevision) + \beta_2 InitialReturn + \beta_3 Mgrs-Affiliated + \beta_4 UW + \beta_5 VC + \beta_6 LnAge + \beta_7 HighTech + \beta_8 LnValuation + \sum \beta_t Year + \sum \beta_k Industry + \varepsilon$$

$$LnVolume-3mo = \beta_0 + \beta_1 UE(PriceRevision) + \beta_2 InitialReturn + \beta_3 Mgrs-Affiliated + \beta_4 UW + \beta_5 VC + \beta_6 LnAge + \beta_7 HighTech + \beta_8 LnValuation + \sum \beta_t Year + \sum \beta_k Industry + \varepsilon$$

$$LnInst\#-3mo = \beta_0 + \beta_1 UE(PriceRevision) + \beta_2 InitialReturn + \beta_3 Mgrs-Affiliated + \beta_4 UW + \beta_5 VC + \beta_6 LnAge + \beta_7 HighTech + \beta_8 LnValuation + \sum \beta_t Year + \sum \beta_k Industry + \varepsilon$$

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