CHICAGO BOOTH

Perceptions and Price: Evidence from CEO Presentations at IPO Roadshows

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ABSTRACT

This paper examines the relation between cognitive perceptions of management and firm valuation. We develop a composite measure of investor perception using 30-second content-filtered video clips of initial public offering (IPO) roadshow presentations. We show that this measure, designed to capture viewers' overall perceptions of a CEO, is positively associated with pricing

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at all stages of the IPO (proposed price, offer price, and end of first day of trading). The result is robust to controls for traditional determinants of firm value. We also show that firms with highly perceived management are more likely to be matched to high-quality underwriters. In further exploratory analyses, we find the impact is greater for firms with more uncertain language in their written S-1. Taken together, our results provide evidence that investors' instinctive perceptions of management are incorporated into their assessments of firm value.

1. Introduction

In this study, we examine the relation between investors' perceptions of management and firm valuation. A large body of literature argues that as humans interact, they form social perceptions of others (Adams et al. [2011]). These perceptions provide information that people use when attempting to attain their goals (McArthur and Baron [1983]). The perceptions are formed rapidly and unconsciously, and they are based on a wealth of nonverbal information, including gestures, body movement, dynamic facial expressions, and eye gaze (Rosenthal et al. [1979], Ambady, Bernieri, and Richeson [2000]). We predict that perceptions created from observations of management affect investors' assessment of firm value.

We create a measure of perception using a "thin-slice" approach common in social vision research. Specifically, we ask viewers to provide their perceptions of CEOs after watching 30-second video clips of a CEO's initial public offering (IPO) roadshow presentation with verbal content filtered out. This filtering isolates the nonverbal visual and auditory signals that determine rapidly formed perceptions. Consistent with our prediction, we find a positive association between cognitive perceptions of management and measures of firm value throughout the IPO process.

Our work builds on a body of research that shows investors find value in meeting with management. Surveys of investor relations firms and of analysts show direct interactions with management are highly sought after (Bushee and Miller [2012], Brown et al. [2015]). Empirical studies confirm the value of such meetings for analysts and investors (Green et al. [2014], Soltes [2014], Bushee, Jung, and Miller [2016]). There is also evidence of a capital market response to managers' affect as revealed by vocal cues during conference calls (Mayew and Venkatachalam [2012]). Specific to our setting, Ann Sherman testified to the U.S. Senate in 2012 that investors primarily attend IPO roadshows "to get a feel for [management], because [investors] are not just investing in the idea or the product; [investors] are investing or betting on the management team" (Sherman [2012]). We combine this evidence with the psychology literature's documentation of individuals forming intuitive perceptions to argue that investors form

perceptions and incorporate them into firm value. That is, firms with more highly perceived managers receive higher valuations.[1]

While we argue that perceptions of management are priced, we know that investors have a large amount of verifiable, objective information about the firm. Firm financial reports provide historical performance of the firm and detailed biographies that discuss the managers' experience, education, and general background. This information-rich environment is different from that in many psychology studies and may reduce the role of basic cognitive assessments. Investors are still likely to form cognitive perceptions of managers through interactions, but the investors might focus solely on the "hard" information provided in regulatory filings and other disclosures to form expectations of future cash flows. This tension suggests the impact of basic perceptions on firm valuation is an empirical question.

Valuation implications are our primary focus, but it is also interesting to consider whether any valuation response from investors is rational. If perceptions are an accurate measure of manager quality, they should be priced (Drucker [1954]). Prior research has shown such perceptions have accurately predicted educational, sales, and medical evaluation outcomes, especially when based on dynamic behavior rather than static photos (Ambady, Connor, and Hallahan [1999], Ambady, Bernieri, and Richeson [2000]). It is possible that they are predictive in a corporate setting as well. Observing a CEO's dynamic behavior may provide information about his leadership skills and ability to interact with stakeholders, which are important components of the CEO's task. Alternatively, the perceptions may not capture information about skills that result in longer-term value creation. We make no prediction, but investigate future returns to assess the rationality of the valuation decisions.

Our empirical analysis begins by examining the association between basic perceptions of management and firm valuation for a sample of 224 U.S. IPOs filed from 2011 through 2013. We estimate investors' perception of management using naïve participants who view 30-second content-filtered slices of CEOs' roadshow presentations. To develop a rich, robust measure of perception, we ask participants to assess each CEO's competence, trustworthiness, and attractiveness on a seven-point Likert scale. These are classic traits examined in the psychology and economics literature. We select these traits because they are characteristics investors are likely to naturally incorporate when perceiving management. Our goal is to prompt raters to consider perception from various angles to make sure that idiosyncratic interpretations of a single characteristic or its description do not skew our results. We focus our analysis on overall perception, which is created by

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[1] Investors could also be hoping that managers will provide additional "hard" information beyond that in the registration statement, either intentionally or unintentionally. In fact, it is likely that investors hope to get both as these are not mutually exclusive. As discussed later, we have designed our perceptions construct to remove potential "hard" information.

combining these three attributes to provide a composite measure of perception. Each video clip is rated by at least 40 participants. We calculate mean ratings of CEO-specific perceptions of competence, trustworthiness, and attractiveness, and then average the characteristics for our summary CEO-specific measure of perception. This measure is designed to capture investors' overall instinctive perception of the CEO at the time of the firm's IPO.[2]

We gain several advantages by using information-rich expressive behavior from CEO IPO roadshow presentations. First, the IPO roadshow is the initial major exposure of management to IPO investors prior to the market's initial valuation of the firm, providing a clear link between investor perceptions in that period and valuation (Ernst & Young [2008]).[3] Second, the use of content-filtered video clips allows us to base perceptions on rich, dynamic information about CEOs while controlling for the content of what is being said. Third, the IPO setting allows us to focus on younger firms where financial performance is less informative and assessment of management is considered more important, increasing the power of our tests of the impact of perceptions of management (Kim and Ritter [1999], Chemmanur, Simonyan, and Tehranian [2013]).[4]

We examine the valuation of perception throughout the IPO period. The valuation process begins with underwriters providing an initial proposed IPO price before the roadshow presentation. This price is modified based on investor feedback via limit orders after the roadshow presentation to create the final offer price. Finally, the firm begins public trading, creating a final market value at the end of the first day of trading. We find a positive relation between perceptions of management and the IPO firm's valuation at all three of these valuation points. The relation is robust to the inclusion of important determinants of price (i.e., firm, offer, and CEO characteristics such as executive age, gender, and facial width-to-height ratio). Including perception increases the explanatory power of the final market valuation model by 2.3 percentage points.

In addition to valuation, the matching of firms and underwriters is an important part of the IPO process. The literature examining this matching

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[2] Our measure relies on two assumptions supported by prior literature: (1) perceptions based on thin slices of behavior are reasonable proxies for judgments based on longer interactions (Ambady and Rosenthal [1992]). (2) Third party ratings are reasonable proxies for investors, given that perceptions are not affected by intelligence or effort (Ambady, Bernieri, and Richeson [2000]).

[3] This survey of institutional investors reports that more than 88% of institutional investors cite the quality of the roadshow as a key nonfinancial measure in their buying decisions and that the roadshow is generally "the only time a company's senior management meets the investor."

[4] In support of this, Kaplan and Stromberg [2004] examine venture capital firms' reasons for investing in a given firm and find that 60% cite managerial quality, while only 27% cite performance to date. While the IPO setting increases the power of the tests, the findings are less generalizable to other settings.

indicates that higher quality firms are matched to higher quality underwriters. Accordingly, we predict that higher quality underwriters will prefer firms with higher perceived managers. Our results support this prediction.

We next perform several exploratory tests to better understand how perception is incorporated during the IPO valuation process, as well as to assess the sufficiency of alternative proxies of perception. We first examine the relation between perceptions and price revision. If the underwriters fully incorporate their perceptions into the proposed price, there would be no relation between perceptions and price revision after the initial proposed price.[5] However, reputational concerns may constrain underwriters to focus on more objective, verifiable information when valuing issuers, thus underweighting the perceptions. Accordingly, underwriters' perceptions of management would have a smaller impact on the initial proposed price, and perception would impact price revision as underwriters receive information from investors during the book-building process (Benveniste and Spindt [1989]). We find that perception is associated with the price revision from the proposed price to the closing price on the firm's first day of secondary market trading.[6]

In our second set of exploratory tests, we examine the role that uncertainty might play in the impact of perceptions. We find that the relation between perception and valuation is more positive when there is more uncertain language in the firm's final prospectus, consistent with perception of management being more informative when there is more uncertainty in disclosure. This is consistent with work by Milovac and Sanchez-Burks [2014] that shows investors are more likely to place value on items such as managerial emotion when information is less certain.

While our preceding tests are attempts to more fully understand the economic phenomenon of perception in the market, we also provide some additional analyses on the efficacy of an alternative proxy for perception. Specifically, in our third set of tests, we examine whether a measure of perception based on static photos would be sufficient to capture investors' perception of management based on interactions. We find that the video-based perception measure dominates the photo-based proxy when they are included in the same regression. The dynamic measure remains positive and significant at the 5% level or better in our main analyses, while the static measure is significantly positive in only one of the four models at the 10% level. When we examine the static perception measure on its own, we find that it is positively associated with firm valuation at a 5% level but does not reproduce the significant relation in the underwriter

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[5] Note that this is true whether the underwriters' assessment of management exactly matches the market or it varies from the market, but in a random way (i.e., noisy, but unbiased assessments).

[6] However, the results should be viewed with a strong caveat. We cannot observe underwriters' perceptions of management, thus while our dependent variable is the *change* in valuation, our independent variable continues to be the *level* of perception.

matching analysis. Overall, a video-based proxy appears to more completely capture investors' perception of management interactions. However, if a video-based proxy is not available, a photo-based measure does serve as a noisier proxy of investors' perception that may find similar results in tests with strong, clean research designs.

We next turn to investigating whether the pricing of perception is rational by examining the association between perception and firms' subsequent stock returns. If perceptions of CEOs capture an aspect of manager quality, perceptions should not be correlated with future returns. However, if perceptions are not actually informative in the CEO context and investors inappropriately respond to perceptions in the moment rather than focusing on more objective information included in the IPO filings, any short-term correlation between perceptions and firm value would reverse in future stock returns.

Using several time periods, we fail to find a robust statistically significant relationship between perception and firms' post-IPO buy-and-hold abnormal returns, suggesting that investors rationally incorporated perceptions of management. We then examine the relation between perception and two outcomes—future CEO turnover and future return on assets (ROA)—as potential reasons for rational incorporation of perceptions into firm value. We find evidence of a negative relation with CEO turnover, but no relation with future accounting performance. While the CEO turnover relation suggests perceptions may accurately reflect a weaker manager (or at least a bad fit with the current firm), the expected shortcomings of a weaker manager are not captured by the accounting performance during this period. Given the lack of consistent findings, we advise caution in drawing a definitive conclusion.

We perform extensive robustness tests to confirm that results are not driven by CEO gender, rater quality, or rater characteristics, and we find that our results are robust in all cases. Overall, the evidence suggests that managers' expressive behavior evokes instinctive perceptions from investors, and that these perceptions influence investors' assessment of firm value.

Our study contributes to several research streams. First, our study contributes to the literature examining the impact of perceptions of individuals on economic outcomes. Prior and concurrent work estimates perceptions of facial features based on still photos and examines their relation to political outcomes, personal loan funding, market reactions to job and merger announcements, and CEO compensation (e.g., Todorov et al. [2005], Duarte, Siegel, and Young [2012], Halford and Hsu [2014], Graham, Harvey, and Puri [2016]). We add to the literature by examining market pricing implications of perception, using "thin slices" of video. These perceptions are based on information-rich excerpts of CEOs' dynamic, physical behavior that incorporate their mannerisms, movements, and vocal quality in addition to facial features, allowing us to capture investors' complex yet instinctive overall assessments of management.

Second, we bring additional evidence to the more general literature on whether and how management impacts firm market value. A number of studies work to disentangle management from the firm by testing for changes in investor behavior around a change in management (e.g., Johnson et al. [1985], Bennedsen, Perez-Gonzalez, and Wolfenzon [2012]), or modeling management characteristics such as education, gender, or founder-status (e.g., Cohen and Dean [2005], Hendricks and Miller [2014]). Our setting and evidence provide an alternative and distinct set of findings that imply firm management impacts firm value.

Third, we contribute to the disclosure literature by examining a disclosure channel that includes a variety of nonverbal components. Several studies find evidence of an impact of investors' and analysts' one-on-one meetings with management, implying that information may be conveyed through multiple channels (Green et al. [2014], Solomon and Soltes [2015], Bushee, Jung, and Miller [2016]). Consistent with the potential importance of nonverbal behavior, managerial affect conveyed through vocal cues in conference calls contains information about financial misreporting and future performance (Hobson, Mayew, and Venkatachalam [2012], Mayew and Venkatachalam [2012]). Our study turns to the sensory-rich channel of roadshow video presentations and finds evidence that valuable information about management is conveyed through their nonverbal behavior.

Fourth, our study contributes to the IPO literature by being the first to examine how information learned during the IPO roadshow influences IPO pricing. While practitioners have suggested that investors learn valuable, nontangible information from attending an IPO firm's roadshow (NYSE/NASD [2003], Sherman [2012]), our study is the first to provide empirical evidence of the value of roadshow information, focusing on qualitative information.

2. Setting, Motivation, and Predictions

2.1 PERCEPTION

A large body of literature argues that through interaction humans form social perceptions of others (Adams et al. [2011]). The ability to form such perceptions appears to be adaptive and used as information to guide biological and social function behaviors (McArthur and Baron [1983]). Research has found that people draw on a wide range of nonverbal information in forming these perceptions, including gestures, general body movement, eye gaze, gait, posture, facial expression, and changes in tone of speech (Rosenthal et al. [1979], Adams et al. [2011]). Although some of these items may be broken into individual inputs, it appears that the richest sensory information comes from dynamic, fluid behavior where there is multimodal input—particularly visual stimuli (McArthur and Baron [1983], Ambady, Connor, and Hallahan [1999], Grahe and Bernieri [1999],

Ambadar, Schooler, and Cohn [2005]). As a package, these nonverbal actions are often termed to be "expressive behavior" (Ambady and Rosenthal [1992]). The value of these dynamic situations is not just in providing more pieces of information than a static picture, but also in dynamic unfolding of the emotional display (Ambadar, Schooler, and Cohn [2005]).

The assessment of expressive behavior appears to be unconscious to the person making the evaluation.[7] There is no evidence of rater fatigue over time or due to increased cognitive load, and requiring explicit justification for perceptions can often reduce their accuracy (Ambady, Bernieri, and Richeson [2000]). These basic perceptions are akin to System 1 thinking processes (Kahneman and Frederick [2002], Evans [2008]), which are described as more rapid, intuitive, and universal, relative to System 2 thinking processes that are slower, controlled, and logical. System 1 processes are the primary response in a given situation, which is consistent with the automatic, unconscious nature of perceptions.

The expressive behavior is potentially an informative, unmanipulated signal about the individual's true disposition because the behavior is unconscious, difficult for individuals to control or suppress, yet easily observed (DePaulo [1992]). Consistent with the potentially informative nature of this signal, a large body of research shows that "naïve viewers"[8] can accurately assess emotional states and long-term personality traits, as well as more objective traits such as intelligence (Borkenau and Liebler [1992], Gangestad et al. [1992], Murphy, Hall, and Colvin [2003], Harrigan, Wilson, and Rosenthal [2004]).[9] In addition, these social perceptions can be predictive of longer-term evaluations and performance outcomes, such as teacher ratings (Ambady and Rosenthal [1993]), sales evaluations (Ambady, Krabbenhoft, and Hogan [2006]), political elections (Todorov et al. [2005]), criminal activities (Troscianko et al. [2004]), trial outcomes (Blanck, Rosenthal, and Cordell [1985]), medical student performance (Rosenblum et al. [1994], Tickle-Degnen [1998]), and malpractice outcomes (Ambady et al. [2002]).

In sum, the literature shows that humans gather a wide range of information about other humans, much of it unconsciously. This information is richest in a dynamic setting that allows viewers to see body language, facial

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[7] The cognitive schema involved in these decisions remain unclear. While some studies try to isolate individual stimuli in an attempt to identify the schema, others argue it is more useful to focus on the predictive power of the process as a whole (Adams et al. [2011]). For example, early work on brain imaging appeared to identify parts of the brain that respond to facial stimuli. However, later work found that the same areas also respond to body movement. Follow-up work showed that body language and facial signals are combined to reach an overall conclusion (see De Gelder and Tamietto [2011] for a discussion of this literature).

[8] A "naïve viewer" is an external judge who has never met or interacted with the subject and who often does not even know the situation in which the subject is pictured/filmed.

[9] Obviously, these studies required measures of the characteristics being judged. Personality characteristics and internal states were identified via asking the subjects and/or close acquaintances of the subjects. Intelligence was measured using a short test.

expression, and other characteristics, as well as the emotional progression of the subject. The perceptions formed during such encounters are often accurate, but have the potential to be biased. For firm valuation, the perception literature implies that investors are likely to form perceptions of management based on dynamic behavior in settings such as a roadshow presentation, and to incorporate these perceptions into their firm valuations. Accordingly, we predict that firms with more highly perceived managers receive higher valuations throughout the IPO process.

In order for us to test the impact in financial markets using the IPO setting, we need to develop a measure for perceptions of management. An ideal measure would use dynamic media to capture management in a setting that is consistent with those seen by investors, so as to most closely replicate the nonverbal cues present during capital market interactions (Borkenau et al. [2004], Yeagley, Morling and Nelson [2007]). To create such a measure, researchers frequently use a "thin slices" approach. This involves taking several short "slices" of a dynamic media and providing these to a naïve judge for rating across several characteristics. These thin slices are an effective way of capturing individuals' dynamic expressive behavior that is the basis for perceptions (Ambady and Rosenthal [1992]). In fact, such thin slices are equally effective in comparison to much longer video, even when viewed by trained raters (Murphy [2005]).

The primary goal of our study is to examine whether instinctive perceptions influence pricing in the IPO process; it is not necessary for the thin slice perceptions to be long-term predictive. However, a natural question is whether such pricing of perceptions is rational. Consistent with the broader perception literature, perceptions based on thin slices of expressive behavior often predict future outcomes. Using segments of behavior ranging from as little as 10 to 60 seconds, studies find evidence that judgments of thin slices of behavior are associated with longer-term evaluations and final outcomes in a broad range of fields, from teaching to sales and even medical practice (e.g., Ambady and Rosenthal [1993], Rosenblum et al. [1994], Tickle-Degnen [1998], Tickle-Degnen and Puccinelli [1999], Ambady et al. [2002], Ambady, Krabbenhoft, and Hogan [2006]).[10]

Within the setting of CEOs and firm value, it is not clear whether perceptions will predict future outcomes. On one hand, the connection between CEOs' expressive behavior and firm outcomes may not be as direct as for teaching and sales, where the core job requirement is direct communication of information to students or potential customers using expressive behavior. In contrast, the position of CEO requires assessing investment opportunities and making sound operational decisions. Thus, intuitive perceptions may not be relevant for firm value, with any short-term correlation

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[10] This implies that the initial perception remains influential even when information from subsequent interactions is incorporated (e.g., Lord, Ross, and Lepper [1979], Rabin and Schrag [1999]). However, our study does not attempt to answer whether or to what extent initial perceptions impact later perceptions.

Firm files registration statement with SEC	Initial pricing range is announced	The final offer price is announced	Price observed on secondary market

IPO Roadshow

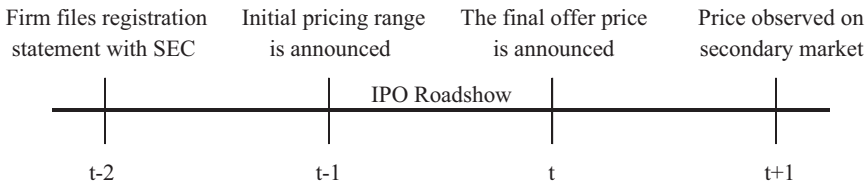t-2   t-1   t   t+1

FIG. 1.—IPO timeline.

reversing in future stock returns. On the other hand, the core component of the CEO's task is to lead the company and convey its vision to stakeholders such as employees, customers, suppliers, or investors. In this role, the perception of the CEO's leadership abilities is important to persuade others of its vision and motivate necessary actions. This suggests that perceptions of a CEO could predict the abilities of the CEO in a variety of firm activities and thus be relevant for firm value.

2.2 THE ROLE OF ROADSHOWS IN THE IPO PROCESS

Uncertainty is pervasive throughout the IPO process. Potential investors usually know little about the issuer, and the issuer knows neither the interested investors nor their level of interest. To reduce this bilateral information asymmetry, an issuer is required to file an SEC registration statement that provides extensive information about the firm (Leone, Rock, and Willenborg [2007], Loughran and McDonald [2013]). After filing, issuers enter into a designated quiet period that extends through the completion of the offering. If an issuer learns new information during the quiet period, the issuer has a responsibility under the Securities Act of 1933 to amend its filing to communicate this information to investors. The registration process is designed to provide investors with all the information they need to make an informed investment decision in a single document.

After filing the S-1, the issuing firm's management team promotes the offering via a series of roadshows at financial centers (see figure 1).[11] Typically, the firm's management gives multiple presentations a day to institutional investors over the final two to three weeks of the registration period. Management is counseled to only make factually accurate statements that coincide with the registration statements (Arcella [2011]). Despite the information being repetitive, Ann Sherman testified to the U.S. Senate in 2012 that investors primarily attend roadshows to observe the managers and "find value in watching them on their feet" (Sherman [2012]). The NYSE/NASD advisory committee formed in 2003 to examine the fairness of the IPO process expressed a similar view. In considering institutional investors' selective access to roadshows, the committee concluded:

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[11] A roadshow is defined under Rule 433 of the Securities Act of 1933 as an offer (other than a statutory prospectus or a portion of one filed as part of a registration statement) that contains a presentation made by one or more members of the issuer's management:

> [E]ven the opportunity to see and hear senior management may provide significant information for an investment decision. Many potential investors, both in the IPO and in the aftermarket, having been excluded from the roadshow, are not privy to this information. To dispel the perception of unfairness, this must change. (NYSE/NASD [2003])

Following the committee's recommendation, the 2005 Securities Offering Reform stated that issuers that conduct roadshows in conjunction with an equity offering are required to file an electronic copy of one of their roadshows with the SEC or make a "bona fide" electronic roadshow available to unrestricted audiences *during* the registration period.[12]

In addition to providing information to investors, the roadshow also provides the underwriter an opportunity to gauge the amount of investor demand that exists for the offering (Rock [1986], Benveniste and Spindt [1989]). In fact, the majority of final offerings price outside of the initially proposed range, suggesting that investors' indications of interest are often significantly different from underwriters' expectations (Cornelli and Goldreich [2001, 2003], Lowry and Schwert [2004]).

2.3 RELATED LITERATURE

Many studies find evidence of managers affecting firm performance and valuation. Bertrand and Schoar [2003] find that manager fixed effects are related to firm practices and performance, and Bennedsen, Perez-Gonzalez, and Wolfenzon [2010] show that CEO deaths are correlated with changes in firm profitability, investment, and growth. Johnson et al. [1985] find a relation between executive characteristics and market reaction to their unexpected deaths, and Hayes and Schaefer [1999] show that market reaction to managers' job movements is associated with manager characteristics. Similarly, Adams, Almeida, and Ferreira [2005] find that returns are more variable for powerful CEOs, supporting the theory that CEO characteristics can influence performance and firm valuation.

The impact of management on valuation may be greater for young firms, such as IPO and pre-IPO firms (e.g., Kaplan and Stromberg [2004]). Management characteristics like education and experience (e.g., Cohen and Dean [2005], Higgins and Gulati [2006]), gender (Bigelow et al. [2014]), and founder-status (Hendricks and Miller [2014]) impact IPO investor interest and valuation. Bernstein, Korteweg, and Laws [2016] provide further evidence that investors place significant value on information about management of young firms by using a randomized field experiment to show

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[12] A bona fide electronic roadshow is defined in the final regulation as "a roadshow that is a written communication transmitted by graphic means that contains a presentation by one or more officers of an issuer … [that] includes discussion of the same general areas of information … that are written communications. To be bona fide, the version need not address all of the same subjects or provide the same information as the other versions of an electronic roadshow. It also need not provide an opportunity for questions and answers or other interaction." Refer to Rule 433, "Conditions to permissible post-filing free writing prospectuses," for additional details.

that investors respond more to information about the founding team than to firm traction or lead investors.

This literature assumes that investors somehow observe and incorporate manager ability into firm valuation, but it is difficult to directly identify investors' assessments and match them with the relevant firm valuation because investor perception of management is typically not observable. A stream of literature has begun trying to estimate perceptions of facial features based on still photos. In the political sphere, Todorov et al. [2005] find a relation between perceptions of political candidates' competence and outcomes of political races. Duarte, Siegel, and Young [2012] show that perceptions of individuals' trustworthiness are positively associated with personal loan funding and outcomes. Turning to perceptions of management, Rule and Ambady [2008] capture perceptions of power based on still photos of 46 CEOs, and they find a relation between power and average gross revenue but not CEO compensation, controlling for age, affect, and attractiveness. Graham, Harvey, and Puri [2016] examine perceived competence and attractiveness of 134 CEOs based on still photos, and they find a positive relation between perceptions and the level of compensation, controlling for sales and industry fixed effects. They also examine firm performance, but find no relation. Finally, a concurrent working paper (Halford and Hsu [2014]) measures CEO attractiveness using an algorithmic analysis of facial structure and symmetry based on static photos. They find a positive relation between facial symmetry and the market response to job and merger announcements.

We add to this literature in several ways. First, we investigate market pricing of the perception of CEOs, which is a different economic question from all except the working paper by Halford and Hsu [2014]. Second, we focus on a fundamentally different construct by turning to CEOs' expressive, dynamic behavior and capturing inherent perceptions of managerial traits using video clips. Incorporating CEOs' mannerisms, movements, and vocal quality as well as facial features results in a rich source of information on which to base judgments of management. Third, while many of these prior papers suggest interesting relations, they do so with relatively small samples and use research designs with limited controls and robustness tests. Our larger sample in a setting where we control for a number of items such as firm performance, managerial background, and certainty of other information allows us the ability to develop a cleaner research design.

3. Data

3.1 IPO ROADSHOWS

We use video capture software to obtain IPO roadshows from RetailRoadshow.com, a Web site that posts roadshow presentation videos for public offerings. To comply with the 2005 Securities Offering Reform, firms provide RetailRoadshow with a "bona fide" version of their roadshow. During the

TABLE 1
Final Sample

Panel A: Sample selection

Details	Observations
U.S. firms that completed an original initial public offering between March 24, 2011 and December 31, 2013	549
Less: Financial registrants (SIC 6xxx)	(181)
Less: Minor offerings (OTC listings or filings less than $10 million)	(68)
Less: Limited Partnerships or Unit offerings	(37)
Less: IPOs with insufficient historical financial information	(11)
Less: Audio-only roadshows, roadshows without manager presentations, or roadshows that were not captured from RetailRoadshow	(28)
Final Sample	**224**

Panel B: Sample distribution

Industry	2011	2012	2013	Total
Consumer Nondurables	1	3	2	6
Consumer Durables	0	1	2	3
Manufacturing	2	5	3	10
Oil & Gas	4	5	4	13
Chemicals	1	0	3	4
Business Equipment	19	28	23	70
Telecommunications	1	1	2	4
Wholesale	7	10	11	28
Healthcare	5	11	36	52
Other	5	8	21	34
Total	**45**	**72**	**107**	**224**

Panel A details our sample selection process and reports the final number of firms included in our empirical analyses. Section 3.2 provides additional information about our sample selection process. Panel B details the distribution of our final sample reporting both the issuing year and Fama–French 12-industry classification.

final weeks of the registration period, individuals may view the roadshow as often as they like. However, once the offering is priced, the roadshow presentation is no longer available.

3.2 SAMPLE SELECTION

We obtain a listing of all U.S. firms that completed an original IPO on NASDAQ or NYSE in the United States from March 24, 2011 (the first day we began capturing videos) to December 31, 2013. Consistent with prior research on IPO firms, we exclude: financial firms, minor offerings (OTC listings and filings less than $10 million), limited partnerships, and unit offerings. In addition, we remove firms whose financial information was either incomplete or missing. Finally, we exclude firms whose roadshows did not include video, did not feature presentations from their management team, or were not captured from RetailRoadshow.com. As detailed in table 1, 224 IPO filings remain in our study after applying these criteria.

3.3 PERCEPTIONS OF MANAGEMENT

To measure perceptions of management, we follow the thin slice literature and extract a brief portion of each roadshow video to examine. The goal is for each thin slice to represent the entire behavioral sequence from which it is extracted. To this end, prior research has generally extracted three samples from a behavioral sequence rather than use a single excerpt (Ambady, Bernieri, and Richeson [2000]). We follow this approach and construct a 30-second thin slice using three 10-second excerpts from the first five minutes of each CEO's roadshow presentation. We take the first excerpt from the beginning and combine it with two 10-second excerpts taken two and four minutes after the initial 10-second excerpt has ended.[13]

Although we only use 30 seconds from each video, there is still the concern that viewers' perceptions may be influenced by factual information about the firm conveyed during these excerpts. To capture investor perception of management independent of firm characteristics, we follow Ambady, Krabbenhoft, and Hogan [2006] and content-filter the video. Specifically, we use both a lowpass and highpass filter to remove frequencies that aid in word recognition. This process makes the CEO's words indiscernible, but preserves the sequence and rhythm of their speech.

Our goal is to capture the overall perception of the manager. To encourage raters to consider the broad construct of overall perception from various angles, we ask for ratings of three characteristics that investors are likely to use to assess manager quality: competence, trustworthiness, and attractiveness. These are classic constructs in the psychology and economics literature, and these attributes provide concrete manifestations of perception for raters to consider. Competence, or the ability to do something successfully or efficiently, is closely related to the construct of CEO quality. Trustworthiness, or the ability to be relied on to do what is needed or right, is another potential component of perception of management. A number of studies find a relation between perceived competence and/or trustworthiness and economic outcomes, such as political elections, teaching evaluations, compensation, and personal loan funding (Ambady and Rosenthal [1993], Todorov et al. [2005], Duarte, Siegel, and Young [2012], Graham, Harvey, and Puri [2016]). Finally, a manager's general attractiveness could impact assessment of the manager's value to the firm, given the evidence of a relation between attractiveness and compensation, confidence, perceived ability, and market reaction to firm events (Hamermesh and Biddle [1994], Mobius and Rosenblat [2006], Halford and Hsu [2014], Graham, Harvey, and Puri [2016]). We focus on the combination of these attributes as the

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[13] An alternative is to take samples from the entire presentation, rather than just the first five minutes. However, a linear trend such as fatigue would have a more significant impact on those clips taken from the middle and end portions of longer presentations. Our approach removes these concerns while still capturing some of the linear trends that might appear in the manager presentations.

overall intuitive perception of a CEO at the time of a firm's IPO based on our belief that investors' perceptions are formed by information encompassed in multiple traits. In addition, while individual raters may have idiosyncratic differences in their view of individual traits, the composite measure should help overcome any noise this introduces.

We use Amazon's Mechanical Turk (MTurk) service to analyze each of the 224 thin slices created from the roadshow presentations.[14] This online labor market allows requesters to post jobs for an on-demand workforce. Numerous studies provide evidence that MTurk is a viable alternative to the traditional lab setting for behavioral research in a variety of fields (e.g., Paolacci, Chandler, and Ipeirotis [2010], Buhrmester, Kwang, and Gosling [2011], Mason and Suri [2012], Crump, McDonnell, and Gureckis [2013]). In finance and accounting research, MTurk is being used as an alternative to traditional lab experiments (e.g., Rennekamp [2012], Asay and Hales [2015], Koonce, Miller, and Winchel [2015]), and there is also potential for its use to generate a construct not available via archival sources (e.g., Duarte, Siegel, and Young [2012]). For our setting, psychology research indicates that intuitive perceptions are not influenced by intelligence or effort, suggesting that perceptions from a general sample of raters is a good proxy for investors' perceptions.[15]

Table 2, panel A, provides demographic information about the MTurk workers in our sample. Of the respondents, 87% are between 18 and 50 years old, and slightly over half (53%) are male; 74% identify themselves as Caucasian, and 81% have at least some college education (with 51% having college or graduate degrees). As shown in figure 2, we ask the MTurk workers to use a seven-point Likert scale to provide their perceptions about a CEO's competence, trustworthiness, and attractiveness after watching each CEO's roadshow presentation, with each CEO being rated by at least 40 MTurk workers. As table 2, panel B, describes, the full rating scale is utilized by respondents, with 64% of ratings falling in the range of 3 to 5, 17.5% below 3, and 18.5% above 5. We take the average MTurk worker rating for each of the CEO's characteristics to create the following three

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[14] See appendix A for survey design and implementation details, and section 5 for robustness tests related to rating quality.

[15] Prior to our MTurk data collection, we gave a pilot survey to 100 students in the Stanford GSB Behavioral Lab to pretest our approach. This allowed us to observe raters, ask follow-up questions, and adjust our process to reduce misunderstandings and enhance the data validity for the later MTurk data collection. The pretest was not designed to generate usable observations, and we did not use the data in this paper. However, when we compare our later MTurk ratings to the in-lab ratings for the overlapping sample of 26 CEOs, we find that the CEO-component level ratings have a Pearson correlation of 0.91. In addition, in early stages we piloted with an in-class survey of MBAs at the University of Michigan. Despite obtaining ratings for only four CEOs and excluding the audio to control for content (students observed a silent video rather than a content-filtered video), we continued to find a high correlation (0.84) between the two sets of ratings. Both comparisons confirm the validity of MTurk ratings.

TABLE 2
Mechanical Turk Workers

Panel A: Characteristics of Mechanical Turk workers

	Frequency	Percent
Gender		
Male	473	52.6%
Female	427	47.4%
Total	**900**	**100%**
Age		
18–29	406	45.1%
30–49	378	42.0%
50+	116	12.9%
Total	**900**	**100%**
Education		
Some high school or less	9	1.0%
High school graduate or equivalent	112	12.4%
Trade, technical, or vocational training	49	5.4%
Some college credit, no degree	274	30.5%
College graduate	350	38.9%
Some postgraduate work	25	2.8%
Postgraduate degree	81	9.0%
Total	**900**	**100%**
Ethnicity		
Caucasian	662	73.6%
African American	76	8.4%
Asian	66	7.3%
Hispanic	60	6.7%
Other	36	4.0%
Total	**900**	**100%**

Panel B: Distribution of ratings provided by Mechanical Turk workers

Rating	*Competent*	*Trust*	*Attractive*	Combined
1	209	468	1,555	2,232
2	438	914	1,699	3,051
3	1,073	1,656	2,146	4,875
4	2,396	2,769	2,573	7,738
5	2,947	2,421	1,366	6,734
6	2,191	1,440	590	4,221
7	822	408	147	1,377
Total	10,076	10,076	10,076	30,228

Panel C: Distribution of rating averages by CEO

Value	*Perception*	*Competent*	*Trustworthy*	*Attractive*
Less than 2.25	0	0	0	6
2.25–2.50	0	0	0	24
2.75–2.50	0	0	0	20
2.75–3.00	0	0	0	34
3.00–3.25	5	0	0	37
3.25–3.50	12	0	11	24
3.50–3.75	39	0	24	28
3.75–4.00	41	5	50	17

(*Continued*)

TABLE 2—*Continued*

Panel C: Distribution of rating averages by CEO

Value	Perception	Competent	Trustworthy	Attractive
4.00–4.25	57	20	50	13
4.25–4.50	41	39	43	8
4.50–4.75	21	55	27	8
4.75–5.00	8	53	13	5
5.00–5.25	0	44	6	0
Greater than 5.25	0	8	0	0
Total	224	224	224	224

Panel A provides the demographic and background characteristics of the MTurk workers that analyzed the CEO presentations in our study. Appendix A provides additional information about our use of Amazon's Mechanical Turk system. Panel B provides the distribution of ratings provided by Mechanical Turk workers. Appendix A provides additional information about the survey techniques used in obtaining these responses. Panel C provides the distribution of rating averages of the 224 CEO presentations included in our sample. Each CEO is rated by at least 40 MTurk workers, and we take the average MTurk rating for each of the CEO's characteristics to create *Competent*, *Trustworthy*, and *Attractive*. *Perception* is the average of *Competent*, *Trustworthy*, and *Attractive*.

On a scale of 1 (Not at all) to 7 (Very), is this individual:

	1 (Not at all)	2	3	4	5	6	7 (Very)
Trustworthy	◎	◎	◎	◎	◎	◎	◎
Competent	◎	◎	◎	◎	◎	◎	◎
Attractive	◎	◎	◎	◎	◎	◎	◎
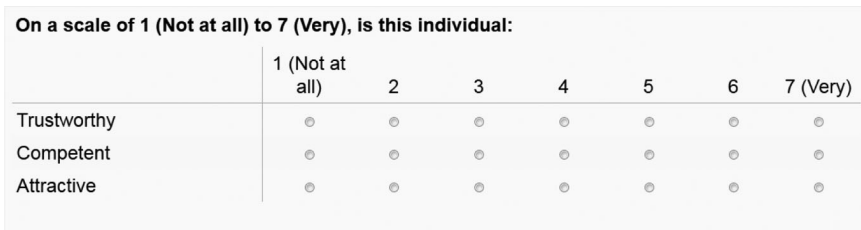
FIG. 2.—Survey question.

CEO-specific variables: *Competent*, *Trustworthy*, and *Attractive*. We then calculate the average of these three variables to create a summary CEO-specific variable, *Perception*.[16]

Table 2, panel C, provides the distribution of average CEO ratings. *Perception* ranges from 3.00 to 5.00, with 79% of the observations between 3.50 and 4.50. For the individual characteristics, *Competent (Attractive)* has a higher (lower) mean, and *Attractive* has a larger standard deviation, ranging from below 2.25 through 5.00. Table 3 confirms these statistics, showing a mean *Perception* of 4.05, mean *Competent* of 4.72, and mean *Attractive* of 3.28. Turning to personal characteristics of the CEOs in our sample, we find that the average CEO is 51 years old, 4% are female, 14% earned a degree outside the United States, 59% earned a postgraduate degree, and 36% are founder-CEOs. For roadshow characteristics, 65% of the roadshows are captured from live presentations to investors, and 8% of CEOs are seated during their presentations.

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[16] Results are robust to using the quartile or quintile rank of *Perception* rather than the continuous measure.

TABLE 3
Descriptive Statistics

Variable	Obs	Mean	Std. Dev	Q1	Median	Q3
Perception	224	4.05	0.39	3.76	4.09	4.32
Competent	224	4.72	0.36	4.47	4.73	4.98
Trustworthy	224	4.16	0.42	3.86	4.13	4.47
Attractive	224	3.28	0.66	2.80	3.18	3.73
L(MVE_Proposed)	224	6.54	0.98	5.81	6.31	7.15
L(MVE_Offer)	224	6.51	1.07	5.82	6.34	7.16
L(MVE_Final)	224	6.68	1.12	5.94	6.58	7.34
Underwriter	224	8.25	0.86	8.00	8.50	8.75
Revision	224	0.24	0.54	−0.16	0.12	0.51
Price_Update	224	−0.01	0.23	−0.17	0.00	0.13
Initial_Returns	224	0.21	0.29	0.01	0.14	0.32
L(Book_Value)	224	4.61	2.48	4.33	4.87	5.71
L(Revenues)	224	4.83	2.17	3.99	4.94	6.09
L(Net_Income)	224	−0.38	3.33	−3.24	−1.54	2.89
L(R&D_Intensity)	224	2.00	1.60	0.00	2.46	3.16
L(Sales_Growth)	224	1.50	3.23	0.00	2.21	3.81
Assets	224	5.26	1.71	4.03	4.90	6.40
Firm_Age	224	2.62	0.89	2.08	2.48	3.16
Uncertainty	224	3.77	0.41	3.50	3.74	4.06
Tone_Roadshow	224	1.33	0.82	0.76	1.33	1.86
VC	224	0.48	0.50	0.00	0.00	1.00
Filing_Size	224	5.02	0.81	4.40	4.78	5.42
Big4	224	0.88	0.32	1.00	1.00	1.00
Secondary_Shares	224	0.15	0.26	0.00	0.00	0.20
Insider_Retention	224	0.41	0.25	0.17	0.45	0.59
Mkt_Cond_Level	224	3.12	0.42	2.75	3.00	3.48
Mkt_Cond_Change	224	0.08	0.09	0.04	0.08	0.14
Female	224	0.04	0.19	0.00	0.00	0.00
Foreign	224	0.14	0.35	0.00	0.00	0.00
CEO_Age	224	3.93	0.15	3.84	3.95	4.04
Grad_School	224	0.59	0.49	0.00	1.00	1.00
Experience	224	0.48	0.50	0.00	0.00	1.00
Founder	224	0.36	0.48	0.00	0.00	1.00
WHR	224	2.08	0.16	1.95	2.06	2.18
Live	224	0.65	0.48	0.00	1.00	1.00
Sitting	224	0.08	0.27	0.00	0.00	0.00
Background	224	0.15	0.36	0.00	0.00	0.00

Table 3 provides descriptive statistics for our sample of firms. The data used in this study are collected from a variety of sources including Compustat, CRSP, SDC Platinum, the SEC EDGAR database, and Jay Ritter's IPO database. The motivations and descriptions for all variables appear in both section 4 and appendix B of this paper.

4. Empirical Results

4.1 PERCEPTION AND FIRM VALUE

Our main prediction is that perception of a firm's CEO is positively associated with firm value. To measure firm value, we use the log transformation of the firm's market value of equity at each of the three major pricing points during the IPO process: the proposed offer price, the final offer price, and

the close of the first day of trading on a public exchange.[17] We then estimate the following pooled OLS regression and double-cluster standard errors by industry and week:

$$
\begin{aligned}
L(MVE\_X)_i = {} & \beta_0 + \beta_1 Perception_i + \beta_2 L(Book\_Value)_i + \beta_3 L(Revenues)_i \\
& + \beta_4 L(Net\_Income)_i + \beta_5 L(R\&D\_Expense)_i \\
& + \beta_6 L(Sales\_Growth)_i + \beta_7 Firm\_Age_i \\
& + \beta_8 Uncertainty_i + \beta_9 Tone\_Roadshow_i \\
& + \beta_{10} Underwriter_i + \beta_{11} VC_i \\
& + \beta_{12} Big4_i + \beta_{13} Secondary\_Shares_i \\
& + \beta_{14} Insider\_Retention_i + \beta_{15} Mkt\_Cond\_Level_i \\
& + \beta_{16-22} CEO\_Characteristics + FixedEffects + \varepsilon_i,
\end{aligned} \tag{1}
$$

where *L(MVE_X)* is the natural log of a firm's market value of equity calculated at (1) the proposed offer price for *L(MVE_Proposed)*, (2) the final offer price for *L(MVE_Offer)*, or (3) the close of its first trading day for *L(MVE_Final)*. *Perception* is our primary variable of interest and is the average of *Competent, Trustworthy*, and *Attractive*, as defined in section 3.3 and appendix B.

We include several control variables in our model that have been shown to be important indicators of IPO firm value. Following Xiao and Yung [2015], we include the log transformations of each firm's book value of equity, revenues, net income, R&D expense, and sales growth.[18] We also include other nonfinancial measures of firm quality as suggested by prior research and appropriate for our setting. Specifically, we include *Firm_Age*, calculated as the natural log of 1 plus the firm's age at IPO (Fernando, Gatchev, and Spindt [2005]); *Uncertainty* as the percent of words in the firm's final registration statement that are in the uncertain, negative, or weak modal word lists (Loughran and McDonald [2013]); *Tone_Roadshow*

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[17] Prior literature finds that using the log transformation of the market value of equity as the dependent variable is preferable both to (1) unlogged market value of equity because of model fit and distributional properties (Beatty, Riffe, and Thompson [2000], Hand [2003]) and (2) price per share because the clustering of issuances around a single price (typically $15, per Fernando, Krishnamurthy, and Spindt [2004]) results in highly unstable results and little explanatory power in a price per share specification. Thus, we follow prior literature and use the log of market value as our primary measure. However, if we repeat our main results using price per share (and similarly adjusted independent variables) or book-to-market value, we continue to find a positive significant relation between *Perception* and IPO valuation.

[18] Consistent with prior studies, we log transform these variables by taking the natural log (1+value) when the original value is positive and −log (1-value) when the value is negative, which retains the negative values as well as the monotonic relation of the original values. In addition, to be consistent with the dependent variable capturing post-IPO firm value, we adjust the book value of equity to include the value of shares issued during the IPO.

as the difference between the number of positive words and the number of negative words in the CEO's roadshow presentation divided by the total number of words in the CEO's presentation (Loughran and McDonald [2013]);[19] *Underwriter* as the average Carter-Manaster ranking of the firm's lead underwriters (Leland and Pyle [1977], Carter and Manaster [1990]);[20] *VC* as an indicator variable that takes the value of one if the firm has venture capital backing (Barry et al. [1990], Megginson and Weiss [1991]); *Big4* as an indicator variable for whether the firm has a Big4 auditor at the time of IPO (Titman and Trueman [1986]); *Secondary_Shares* as the percentage of a firm's shares being offered that are owned by existing shareholders (Brau, Li, and Shi [2007]); *Insider_Retention* as the percentage of a firm's total shares that are retained by executives and directors after the offering (Jain and Kini [1994]); and *Mkt_Cond_Level* as the NASDAQ level at the time of a firm's IPO (Ritter [1984], Ljungvist and Wilhelm [2003]).

Finally, we include several CEO characteristics to confirm that *Perception* does not simply capture an observable CEO characteristic previously studied.[21] Specifically, *Female* is an indicator variable that takes the value of one if the CEO is female. *Foreign* is an indicator variable for whether the CEO completed a degree from a non-U.S. university. *CEO_Age* is the natural log of the CEO's age. *Grad_School* is an indicator variable for whether the CEO earned a postgraduate degree. *Experience* is an indicator variable that takes the value of one if the CEO's prior employer was a publicly traded firm. *Founder* is an indicator variable for whether the CEO is also the founder of the IPO firm. *WHR* is the facial width-to-height ratio of the CEO, following Jia, van Lent, and Zeng [2014].[22] This measure is typically interpreted as masculinity, aggression, and/or risk-taking. We winsorize continuous variables at 1% and 99%, and we include both calendar-year and industry fixed

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[19] Results are robust (i.e., coefficients of interest in the main regressions remain significant at the 1% level or better) to alternative tone measures: tone of the entire roadshow rather than just the CEO portion, net tone excluding negated positive or negated negative words, and net tone scaled by total words rather than just words in Loughran and McDonald's dictionary. In addition, results are robust to including the intensity of roadshow language (strong modal in Loughran and McDonald's dictionary) and the extent of forward-looking language using several variants of the word list from Li [2010].

[20] Results are robust (i.e., coefficients of interest in the main regressions remain significant at the 1% level or better) to removing the continuous measure of underwriter quality and instead including (1) indicator variables based on discrete categories of the average underwriter quality for each firm, or (2) indicator variables for each individual underwriter quality level (1 through 9), where a firm with multiple underwriters of different quality has multiple indicators set to one.

[21] Results are robust to excluding CEO characteristics.

[22] Using the best resolution picture on Google Images of the CEO's face facing forward with a neutral expression, two research assistants measure the width and height of the face using ImageJ software. We use the average of the RAs' measures as *WHR* if the difference between the two is less than 5%; otherwise, a third rater's measures are averaged with the closer of the original two measures.

effects (based on the Fama–French 12-industry classifications) in several of the specifications, as noted in the tables.

Table 4, panel A, presents the results from estimating equation (1) for each of *L(MVE_Proposed), L(MVE_Offer),* and *L(MVE_Final).* Consistent with our main prediction, columns 1, 2, and 3 show positive coefficients for *Perception*: 0.2793 (*t*-stat 2.99) for the proposed market value, 0.3244 (*t*-stat 3.00) for the final offer market value, and 0.4050 (*t*-stat 3.54) for the final trading market value. The model includes seven CEO-specific characteristics, showing that our finding is not driven by these other CEO-specific qualities. Rather, this finding is consistent with the NYSE/NASD [2003] IPO Advisory Committee's statement that "even the opportunity to see and hear senior management may provide significant information for an investment decision." In terms of economic magnitude, these results suggest that a one standard deviation improvement in the perception of the CEO is associated with a final valuation between 7.2% and 27.9% higher, taking into account a 95% confidence interval.

Panel B of table 4 provides the results of regressing the three market values on the components of *Perception*. As shown, the coefficients for *Competent, Trustworthy,* and *Attractive* are all positive, with seven of nine coefficients significantly different from zero at the 10% level or better, again providing evidence of a positive relation between perceptions of management and firm valuation.[23] However, our survey measure was designed to capture overall perception rather than specific characteristics, so results based on individual attributes should be interpreted with caution.

4.2 PERCEPTION AND UNDERWRITER MATCHING

In the first major step of the IPO process, firms and underwriters associate by mutual choice, with prior research providing evidence that the quality of issuing firms is positively associated with underwriter quality (Chemmanur and Fulghieri [1994], Fernando, Gatchev, and Spindt [2005]). If underwriters rely on their perceptions of a firm's manager as valuable information about firm quality or as expectations of the market's likely assessment of the firm, then these perceptions should help explain the underwriter matching that occurs between firms and underwriters.[24] Accordingly, we examine this relation by estimating the following pooled OLS regression and double-cluster standard errors by industry and week:

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[23] While all three attributes have a positive relation with firm value, the results for *Trustworthy* here and in future tests are the weakest. One possible explanation is that investors might rely on monitoring mechanisms, such as regulators and auditors, to ensure that management is not undertaking inappropriate or fraudulent activities.

[24] Underwriter assessment of quality and prediction of market assessments are related concepts. In the former, the underwriter provides an honest personal assessment of firm quality. In the latter, the underwriter assesses whether the market will be interested in the firm at a higher price. Both assessments should help an underwriter predict eventual price and the value of being involved in the IPO.

$$Underwriter_i = \beta_0 + \beta_1 Perception_i + \beta_2 Assets_i + \beta_3 Revenues_i$$
$$+ \beta_4 Profitability_i + \beta_5 R\&D\_Intensity_i$$
$$+ \beta_6 R\&D\_Intensity_i + \beta_7 Sales\_Growth_i + \beta_8 Firm\_Age_i$$
$$+ \beta_9 VC_i + \beta_{10} Filing\_Size_i + \beta_{11} Big4_i$$
$$+ \beta_{12} Secondary\_Shares_i + \beta_{13-19} CEO\_Characteristics$$
$$+ FixedEffects + \varepsilon_i, \tag{2}$$

where *Underwriter* is the average Carter-Manaster ranking of the firm's lead underwriters, *Filing_Size* is the natural log of the size of the offering, and the remaining variables are as previously defined.[25]

Table 5 provides the results from estimating equation (2). Consistent with perceptions of a firm's manager being used by underwriters as an indicator of firm quality, column 1 reports that the coefficient for *Perception* is 0.3066 (*t*-stat 2.32). This benefit is important, given the evidence of prestigious underwriters providing all-star analyst coverage, more reputable syndicates, and higher valuations (Fernando et al. [2012]). Columns 2 through 4 report positive coefficients for *Competent, Trustworthy,* and *Attractive,* with the first two significantly different from zero (*t*-stats 3.39, 2.08, and 1.25, respectively). While prior research has primarily focused on how a firm's financial information influences underwriter matching (Fernando, Gatchev, and Spindt [2005]), our result suggests that an IPO firm's management team also plays an important role in attracting prestigious underwriters.[26]

5. Further Exploratory Analyses

In the following sections, we perform several additional descriptive analyses to explore the documented relation between perception and valuation and improve our understanding of it.

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[25] We model equation (2) following Fernando, Gatchev, and Spindt [2005], with several adjustments. We exclude the market value of equity, five-year survival indicator, secondary equity offering indicator, and number of analysts because they are not known at the time of matching. We then supplement the model with additional variables known at the time of IPO and believed to be important indicators of firm quality: *Assets, Revenues, R&D Intensity, Sales Growth, Big4,* and *Insider_Retention.*

[26] We assume that the perception of management captured during the roadshow is correlated with the perception that occurs during underwriter matching. However, underwriter training of management during the IPO process could improve the perception of management. If high-quality underwriters provide better communication training for management than low-quality underwriters, the positive relation between the perception of CEOs and underwriter quality could be partly due to underwriter training rather than underwriter matching. We control for pre-IPO training possibilities, such as interaction with venture capital firms and the prior public firm experience of the CEO, and we repeat valuation tests using alternative underwriter controls, as noted earlier. In addition, given the inherent, subconscious nature of the expressive behavior being assessed, it is unlikely that individuals could learn to completely control or influence their behavior in the few months of underwriter interactions before an IPO (Ambady, Bernieri, and Richeson [2000]).

TABLE 4
Perception and Firm Value

Panel A: Aggregate perception and firm value

Variables	Prediction	(1) L(MVE_Proposed)	(2) L(MVE_Offer)	(3) L(MVE_Final)
Perception	+	0.2793***	0.3244***	0.4050***
		(2.99)	(3.00)	(3.54)
L(Book_Value)		0.0328***	0.0533***	0.0609***
		(2.81)	(4.06)	(3.56)
L(Revenues)		0.3063***	0.3122***	0.3018***
		(3.12)	(3.42)	(3.96)
L(Net_Income)		−0.0140	−0.0205	−0.0160
		(−0.73)	(−0.99)	(−0.70)
L(R&D_Expense)		0.1348***	0.1269***	0.1435***
		(4.73)	(5.43)	(6.37)
L(Sales_Growth)		0.0294**	0.0321**	0.0362**
		(2.34)	(2.22)	(2.23)
Firm_Age		−0.0285	−0.0478	−0.0686
		(−0.27)	(−0.46)	(−0.65)
Uncertainty		−0.2819**	−0.2573*	−0.2696
		(−2.38)	(−1.76)	(−1.63)
Tone_Roadshow		0.0477	0.0925**	0.1121*
		(1.14)	(1.99)	(1.83)
Underwriter		0.0881***	0.1180***	0.1137***
		(3.20)	(4.82)	(3.28)
VC		0.0691	0.0582	0.0615
		(0.60)	(0.50)	(0.52)
Big4		0.2003***	0.2897***	0.3465***
		(2.62)	(3.75)	(4.58)

(Continued)

TABLE 4—Continued

Panel A: Aggregate perception and firm value

Variables	Prediction	(1) $L(MVE\_Proposed)$	(2) $L(MVE\_Offer)$	(3) $L(MVE\_Final)$
Secondary_Shares		0.4286**	0.4430**	0.4892**
		(2.56)	(2.18)	(2.59)
Insider_Retention		−0.4243*	−0.3200	−0.1487
		(−1.85)	(−1.32)	(−0.51)
Mkt_Cond_Level		0.6093***	0.5788***	0.6166***
		(4.11)	(3.96)	(4.14)
Female		−0.2327	−0.3496	−0.4503*
		(−1.00)	(−1.42)	(−1.88)
Foreign		0.0608	−0.0103	−0.0098
		(0.75)	(−0.08)	(−0.06)
CEO_Age		0.3120	0.4443**	0.4272
		(1.35)	(2.25)	(1.45)
Grad_School		−0.0820	−0.1158	−0.1323
		(−1.17)	(−1.32)	(−1.21)
Experience		0.1699**	0.1755**	0.1930**
		(2.14)	(1.98)	(1.97)
Founder		0.1422	0.1569	0.1883*
		(1.46)	(1.55)	(1.72)
WHR		−0.4042**	−0.5706**	−0.5761**
		(−2.18)	(−2.18)	(−2.18)
Industry Fixed Effects		Included	Included	Included
Time Fixed Effects		Included	Included	Included
Observations		224	224	224
Adjusted R-Squared		0.626	0.621	0.581

(*Continued*)

PERCEPTIONS AND PRICE   299

TABLE 4—*Continued*

Panel B: Perception components and firm value

Variables	Prediction	L(MVE_Proposed)			L(MVE_Offer)			L(MVE_Final)		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Competent	+	0.2457**			0.2461**			0.3174**		
		(2.37)			(2.21)			(2.42)		
Trustworthy	+		0.1305*			0.1252			0.1706	
			(1.84)			(1.44)			(1.45)	
Attractive	+			0.1657***			0.2257***			0.2764***
				(3.22)			(3.65)			(4.51)
Remaining Controls		Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry Fixed Effects		Included	Included	Included	Included	Included	Included	Included	Included	Included
Time Fixed Effects		Included	Included	Included	Included	Included	Included	Included	Included	Included
Observations		224	224	224	224	224	224	224	224	224
Adjusted *R*-squared		0.624	0.619	0.625	0.617	0.613	0.624	0.575	0.569	0.583

Panels A and B present the results from an OLS regression of firm value at three points in the IPO process on various CEO, firm, and offering characteristics. *Perception*, defined as the average of *Competent*, *Trustworthy*, and *Attractive*, is the primary variable of interest for panel A. The individual components of *Perception*, (*Competent*, *Trustworthy*, and *Attractive*) are the primary variables of interest for panel B. *L(MVE_Proposed)* is the natural log of the firm's market value of common equity calculated using the proposed offer price. *L(MVE_Offer)* is the natural log of the firm's market value of common equity calculated using the final offer price. *L(MVE_Final)* is the natural log of the firm's market value of common equity calculated at the end of its first day trading on the secondary market. See appendix B for all other variable definitions. Standard errors are double-clustered by Fama-French 48 industry and year-week. *T*-statistics are provided in parentheses below coefficients. *** designates two-tailed statistical significance at 1%, ** at 5%, and * at 10%.

TABLE 5
Perception and Underwriter Matching

Variables	Prediction	Underwriter			
		(1)	(2)	(3)	(4)
Perception	+	0.3066**			
		(2.32)			
Competent	+		0.3868***		
			(3.39)		
Trustworthy	+			0.2299**	
				(2.08)	
Attractive	+				0.1090
					(1.25)
Assets		0.1206	0.1212	0.1116	0.1235
		(1.17)	(1.14)	(1.10)	(1.24)
Revenues		−0.0006	0.0005	−0.0050	0.0104
		(−0.01)	(0.01)	(−0.06)	(0.13)
Profitability		0.3906**	0.3911**	0.3815**	0.3851**
		(2.44)	(2.40)	(2.35)	(2.41)
R&D_Intensity		0.2000	0.2027	0.1908	0.2089
		(0.91)	(0.94)	(0.84)	(0.95)
Sales_Growth		0.1225	0.1266	0.1413	0.1319
		(0.82)	(0.85)	(0.90)	(0.90)
Firm_Age		0.0423	0.0300	0.0403	0.0521
		(0.97)	(0.69)	(0.88)	(1.15)
VC		0.3635***	0.3658***	0.3536***	0.3740***
		(3.30)	(3.46)	(3.23)	(3.37)
Filing_Size		0.1596	0.1506	0.1746	0.1717
		(1.13)	(1.10)	(1.26)	(1.24)
Big4		0.6399*	0.6651**	0.6435**	0.6178*
		(1.97)	(2.12)	(1.99)	(1.86)
Secondary_Shares		0.1569	0.1851	0.1801	0.0999
		(1.04)	(1.28)	(1.25)	(0.62)
Insider_Retention		0.4971**	0.4891**	0.4819**	0.4955**
		(2.46)	(2.51)	(2.23)	(2.51)
Female		−0.0129	0.0414	0.0068	0.0701
		(−0.12)	(0.48)	(0.06)	(0.78)
Foreign		−0.1513	−0.1481	−0.1570	−0.1796
		(−0.88)	(−0.92)	(−0.91)	(−1.07)
CEO_Age		0.1226	−0.0172	−0.0899	0.0255
		(0.34)	(−0.06)	(−0.29)	(0.06)
Grad_School		0.0951	0.0896	0.1050	0.1115
		(1.18)	(1.16)	(1.34)	(1.35)
Experience		0.1299*	0.1321*	0.1451*	0.1143*
		(1.85)	(1.92)	(1.96)	(1.70)
Founder		−0.0775	−0.0828	−0.0892	−0.0945
		(−1.09)	(−1.26)	(−1.24)	(−1.25)
WHR		−0.6347	−0.6343	−0.7034	−0.6560
		(−1.04)	(−1.04)	(−1.17)	(−1.05)
Industry Fixed Effects		Included	Included	Included	Included
Time Fixed Effects		Included	Included	Included	Included
Observations		224	224	224	224
Adjusted *R*-squared		0.343	0.352	0.339	0.333

This table presents the results from an OLS regression of *Underwriter* on various CEO, firm, and offering characteristics. *Underwriter* is the average Carter-Manaster IPO ranking for the firm's lead underwriters. *Perception* is the average of *Competent*, *Trustworthy*, and *Attractive*. See appendix B for all other variable definitions. Standard errors are double-clustered by Fama–French 48 industry and year-week. *T*-statistics are provided in parentheses below the coefficients. *** designates two-tailed statistical significance at 1%, ** at 5%, and * at 10%.

5.1 PERCEPTION AND PRICE REVISION

Perception and the proposed IPO price are positively related, suggesting that underwriters at least partially incorporate their perceptions of CEOs in the valuations they propose. However, it is not clear if the perceptions are fully incorporated into the proposed IPO price, or if the perceptions are initially underweighted and incorporated more fully in subsequent pricing stages. Several studies provide reasons why the incorporation might increase at each stage. Hong and Page [2004] show that a diverse group of problem solvers arrives at a different, better solution than a group with greater ability but less diversity, and Eisenkraft [2013] finds that a group of raters' aggregated intuitive assessment of a thin slice of expressive behavior is more predictive than individual raters' assessment of an interview. Thus, the greater number and diversity of investors versus underwriters could result in meaningful differences in perceptions of management. Given the inherent noise in underwriters' proxy for market perceptions, these perceptions may be purposely underweighted in the proposed price. Consistent with the idea of purposeful underweighting, Roosenboom [2007] shows that underwriters often discount softer or less certain information due to reputational concerns. Thus, underwriters and investors could impound this soft information into price adjustments during the book-building process.

We examine the price revision that occurs from the proposed price to the closing market price on firms' first day of trading. We caution, though, that this test regresses a *change* in price (*Revision)* on a *level* (*Perception*). Ideally, we would incorporate the underwriter's perception, as well as any difference between underwriter and market perceptions, to examine whether and how perception and changes in perception influence the price revision during the roadshow. Because this information is not available, we use *Perception* as the proxy, but we recognize that it reduces the strength of the test and recommend caution in interpreting the results. We estimate the following pooled OLS regression, double-clustering standard errors by industry and week:

$$
\begin{aligned}
Revision_i = {} & \beta_0 + \beta_1 Perception_i + \beta_2 Assets + \beta_3 Revenues_i \\
& + \beta_4 Profitability_i + \beta_5 R\&D\_Intensity_i + \beta_6\ Sales\_Growth_i \\
& + \beta_7 Firm\_Age_i + \beta_8 Uncertainty_i + \beta_9 Tone\_Roadshow_i \\
& + \beta_{10} Underwriter_i + \beta_{11} VC_i + \beta_{12} Filing\_Size_i \\
& + \beta_{13} Big4 + \beta_{14} Secondary\_Shares + \beta_{15} Insider\_Retention_i \\
& + \beta_{16} Mkt\_Cond\_Change_i + \beta_{17_{23}} CEO\_Characteristics \\
& + FixedEffects + \varepsilon_i, \quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad (3)
\end{aligned}
$$

where *Revision* is defined as the percentage change between an issuing firm's closing price per share on its first day of trading on the secondary

market and the price per share initially proposed. *Mkt_Cond_Change* is the average daily change on NASDAQ between the date when the firm filed its initial registration statement and the offer date. This variable captures new information about the macroeconomic conditions that arise during this period and has been shown to be a powerful determinant of the price revision (Lowry and Schwert [2004]). All other variables are as previously defined.

Table 6 provides the results from estimating equation (3). Consistent with investors providing additional information about perceptions of management during the book-building process, the coefficient for *Perception* in column 1 is 0.2205 (*t*-stat 2.70). To gain further insight into this result, we decompose *Revision* into two components: the change from the proposed to the final offer price (*Price_Update*) and the change from the final offer price to the closing price on the first trading day (*Initial_Returns*).[27] As shown in columns 2 and 3, the coefficients between *Perception* and each of these two subcomponents (*Price_Update* and *Initial_Returns*) are positive, with *Initial_Returns* significantly different from zero (*t*-stats 1.34 and 1.84, respectively). Overall, this evidence suggests that perception continues to be incorporated into firm value estimates throughout the book-building process.[28]

5.2 PERCEPTION AND UNCERTAINTY

We next examine a setting where we expect perception to be more important for firm value. Firm communication during the IPO process begins with the S-1, and this written disclosure is followed by the oral roadshow presentations. Prior research has shown that variation in the level of uncertainty in this document impacts the valuation process (Loughran and McDonald [2013]). We argue that when there is greater uncertainty in the written disclosure, the subsequent communication of the roadshow and the perception of management is likely to be more important for assessing firm value.

To test this, we re-estimate equations (1) and (2), substituting an indicator for filings with highly (top quintile) uncertain language in the

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[27] Although we tabulate results for each partition of *Revision,* we caution against making conclusions about which investors are incorporating the perceptions. Prior literature finds that information revealed during book building is not fully impounded into the offer price (Benveniste and Spindt [1989], Hanley [1993], Lowry and Schwert [2004]). This suggests that, even if institutional investors incorporate perception fully into their limit orders, underwriters may choose not to fully impound this information into the final offer price. In that case, institutional investors' perceptions would "spill over" into the revision during the first day of trading.

[28] A positive *Perception* coefficient in *Initial_Returns* could suggest welfare implications for the firm as well, that is, firms with more highly perceived CEOs may not be able to capture as high a proportion of the benefit these CEOs bring during the IPO process. However, the allocation of funds between the firm and initial investors is complicated due to incentives of firms and/or underwriters to intentionally underprice firms. Disentangling welfare implications of the CEO perception is beyond the scope of our analyses.

TABLE 6
Perception and IPO Price Revision

Variables	Revision (1)	Price_Update (2)	Initial_Returns (3)
Perception	0.2205***	0.0578	0.1107*
	(2.70)	(1.34)	(1.84)
Assets	−0.1900**	−0.0724**	−0.0820*
	(−2.01)	(−2.35)	(−1.66)
Revenues	−0.0598	−0.0203	−0.0262
	(−1.06)	(−1.08)	(−0.76)
Profitability	0.1534***	0.0332*	0.0799*
	(2.69)	(1.68)	(1.94)
R&D_Intensity	−0.3180**	−0.2065***	−0.1006
	(−2.46)	(−4.89)	(−1.42)
Sales_Growth	0.0329	0.0335	−0.0106
	(0.18)	(0.63)	(−0.11)
Firm_Age	−0.0340	0.0029	−0.0263
	(−0.81)	(0.23)	(−1.00)
Uncertainty	0.0064	0.0129	−0.0042
	(0.06)	(0.22)	(−0.08)
Tone_Roadshow	0.0727	0.0296	0.0325
	(1.54)	(1.60)	(1.18)
Underwriter	0.0273	0.0179	0.0067
	(0.83)	(1.58)	(0.35)
VC	0.0596	0.0293	0.0313
	(0.83)	(0.98)	(0.74)
Filing_Size	0.1812	0.0827	0.0626
	(1.24)	(1.52)	(0.94)
Big4	0.2822***	0.1166***	0.1154**
	(4.90)	(4.40)	(2.30)
Secondary_Shares	0.0390	−0.0023	0.0476
	(0.59)	(−0.05)	(1.03)
Insider_Retention	0.2413*	0.0810	0.1573*
	(1.73)	(1.42)	(1.83)
Mkt_Cond_Change	1.1544**	0.3258	0.6551***
	(2.17)	(1.12)	(3.92)
Female	−0.3147***	-0.1174	−0.1291***
	(−3.26)	(−1.57)	(−3.39)
Foreign	−0.0442	−0.0506	0.0045
	(−0.50)	(−0.89)	(0.10)
CEO_Age	0.1931	0.1102	0.0284
	(0.95)	(1.19)	(0.17)
Grad_School	−0.0994	−0.0363*	−0.0295
	(−1.21)	(−1.77)	(−0.60)
Experience	0.1132	0.0340	0.0561
	(1.31)	(1.09)	(1.21)
Founder	0.0114	0.0123	0.0158
	(0.14)	(0.23)	(0.48)
WHR	−0.4802***	−0.2990***	−0.1255
	(−2.73)	(−3.42)	(−1.22)

(*Continued*)

T A B L E   6—*Continued*

Variables	Revision (1)	Price_Update (2)	Initial_Returns (3)
Industry Fixed Effects	Included	Included	Included
Time Fixed Effects	Included	Included	Included
Observations	224	224	224
Adjusted *R*-squared	0.248	0.272	0.159

This table presents the results from an OLS regression of price changes associated with the IPO process on various CEO, firm, and offering characteristics. *Revision* is the percentage change between the price per share initially proposed for the offering and the closing price per share after its first day of trading on the secondary market. *Price_Update* is the percentage change between the price per share initially proposed for the offering and the final offer price. *Underpricing* is the percentage change between the final offer price and the IPO firm's closing price per share after its first day of trading on the secondary market. *Perception* is the average of *Competent*, *Trustworthy*, and *Attractive*. See appendix B for all other variable definitions. Standard errors are double-clustered by Fama–French 48 industry and year-week. *T*-statistics are provided in parentheses below the coefficients. *** designates two-tailed statistical significance at 1%, ** at 5%, and * at 10%.

T A B L E   7
Perception and Uncertainty

Variables	L(MVE_Proposed) (1)	L(MVE_Offer) (2)	L(MVE_Final) (3)	Underwriter (4)
*Perception * High_Uncertain*	0.3510	0.5164**	0.5417**	0.5283*
	(1.64)	(2.38)	(2.40)	(1.86)
Perception	0.1663*	0.1774	0.2538*	0.1924
	(1.83)	(1.53)	(1.71)	(1.23)
High_Uncertain	−1.3149	−1.9433**	−2.0715**	−2.0307*
	(−1.47)	(−2.20)	(−2.25)	(−1.79)
Remaining Controls	Included	Included	Included	Included
Industry Fixed Effects	Included	Included	Included	Included
Time Fixed Effects	Included	Included	Included	Included
Observations	224	224	224	224
Adjusted *R*-squared	0.621	0.621	0.580	0.345

This table presents the results from an OLS regression of firms' IPO outcomes on various CEO, firm, and offering characteristics. *Perception* is defined as the average of *Competent*, *Trustworthy*, and *Attractive*. *High_Uncertain* is an indicator variable equal to one for firms in the top quintile of uncertain language in the S-1. The interaction of these two variables, *Perception * High_Uncertain*, is the primary variable of interest. *L(MVE_Proposed)* is the natural log of the firm's market value of common equity calculated using the proposed offer price. *L(MVE_Offer)* is the natural log of the firm's market value of common equity calculated using the final offer price. *L(MVE_Final)* is the natural log of the firm's market value of common equity calculated at the end of its first day trading on the secondary market. *Underwriter* is the average Carter–Manaster IPO ranking for the firm's lead underwriters. See appendix B for all other variable definitions. Standard errors are double-clustered by Fama–French 48 industry and year-week. *T*-statistics are provided in parentheses below the coefficients. *** designates two-tailed statistical significance at 1%, ** at 5%, and * at 10%.

registration statement (*High_Uncertain)* in place of the continuous *Uncertainty*, and including the interaction *Perception * High_Uncertain*. As shown in table 7, panel A, the interaction of *Perception* and *High_Uncertain* is positive for all models and significantly different from zero at the 10% level or better for three of the four models. The *Perception * High_Uncertain* coefficient ranges from 0.3510 (*t*-stat 1.64) to 0.5417 (*t*-stat 2.40), while the coefficient on *Perception* for firms without high uncertainty is smaller at 0.1663 (*t*-stat 1.83) to 0.2538 (*t*-stat 1.71). These findings suggest that investors value

the perception of management approximately twice as much when there is high uncertainty surrounding a firm's written disclosures. However, we caution against drawing strong conclusions given the difficulty in measuring investors' ex ante uncertainty.

As an additional test exploring perception and uncertainty, we examine the relation between perception and post-IPO return volatility. Loughran and McDonald [2013] find that uncertain language in the S-1 is positively associated with return volatility in the 60-day period just after the IPO. Because perception is more relevant for valuation when the firm's written disclosure is more uncertain, another potential outcome of high perceptions is the reduction of capital market uncertainty in the period just following the IPO. Using a model of post-IPO uncertainty similar to Loughran and McDonald [2013], we find (untabulated) that *Perception* is negatively correlated with post-IPO stock volatility, with a coefficient of –0.4216 and *t*-statistic of 2.49.[29] Overall, these findings suggest that perception of management might be another way in which investors resolve uncertainty.

5.3 MEASUREMENT OF PERCEPTION: VIDEOS AND PICTURES

Our primary measure of perception is based on ratings of thin slices of dynamic, information-rich video of management. We choose this approach due to prior literature's findings of the wealth of information in expressive, dynamic behavior. This information enables the creation of a rich, ecologically valid proxy for the interaction that actually occurred. However, an alternative basis for the measurement of perception is a static picture. A number of papers in finance and economics use static pictures to capture perceptions of individuals in other settings (e.g., Todorov et al. [2005], Duarte, Siegel, and Young [2012], Graham, Harvey, and Puri [2016]), and static pictures are more broadly available and lower in cost to use. Thus, two questions exist. First, do perceptions formed by viewing dynamic behavior provide additional insight over perceptions based on static pictures? Second, would perceptions based on static pictures be sufficient to capture the underlying construct of investor interaction with management?

To test these questions, we obtain pictures of all 224 CEOs and repeat the same MTurk surveys of perception of the three attributes, using pictures rather than video clips. The survey instrument and procedures are identical to those used for the main perception of video clips, except for wording changes in the survey to replace video (and related terms) with picture (and related terms). Thus, each picture was rated on the same three

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[29] Specifically, we regress the standard deviation of the firm's stock returns in the 60-day post-IPO period (+5, +64) on the firm's perception, price update, VC indicator, underwriter quality, revenues, sales growth, profitability, roadshow presentation tone, market condition change, firm linguistic uncertainty, share overhang, and market volatility, as well as year and industry fixed effects and standard errors double-clustered by industry and week. Consistent with Loughran and McDonald [2013], we also find that *Uncertainty* is positively associated with post-IPO return volatility (coefficient 0.5094, *t*-stat 1.80).

TABLE 8
Perception: Measurement Using Videos or Pictures

Panel A: Multiple measures of aggregate perception and IPO outcomes

Variables	L(MVE_Proposed) (1)	L(MVE_Offer) (2)	L(MVE_Final) (3)	Underwriter (4)
Perception	0.1843*	0.2477**	0.3046**	0.3046**
	(1.77)	(2.11)	(2.37)	(2.37)
Perception_Pic	0.2166*	0.1749	0.2291	0.2291
	(1.79)	(1.34)	(1.53)	(1.53)
Remaining Controls	Included	Included	Included	Included
Industry Fixed Effects	Included	Included	Included	Included
Time Fixed Effects	Included	Included	Included	Included
Observations	224	224	224	224
Adjusted *R*-squared	0.630	0.623	0.584	0.340

Panel B: Aggregate perception formed from a CEO's picture and IPO outcomes

Variables	L(MVE_Proposed) (1)	L(MVE_Offer) (2)	L(MVE_Final) (3)	Underwriter (4)
Perception_Pic	0.2865**	0.2689**	0.3446**	0.1284
	(2.49)	(2.13)	(2.49)	(0.79)
Remaining Controls	Included	Included	Included	Included
Industry Fixed Effects	Included	Included	Included	Included
Time Fixed Effects	Included	Included	Included	Included
Observations	224	224	224	224
Adjusted *R*-squared	0.628	0.619	0.579	0.332

Panels A and B present the results from an OLS regression of firms' IPO outcomes on various CEO, firm, and offering characteristics. *L(MVE_Proposed)* is the natural log of the firm's market value of common equity calculated using the proposed offer price. *L(MVE_Offer)* is the natural log of the firm's market value of common equity calculated using the final offer price. *L(MVE_Final)* is the natural log of the firm's market value of common equity calculated at the end of its first day trading on the secondary market. *Underwriter* is the average Carter-Manaster IPO ranking for the firm's lead underwriters. *Perception* is the average of *Competent*, *Trustworthy*, and *Attractive* (based on surveys using videos of the CEO). *Perception_Pic* is the CEO-specific average of *Competent*, *Trustworthy*, and *Attractive* (based on surveys using a picture of the CEO). See appendix B for all other variable definitions. Standard errors are double-clustered by Fama-French 48 industry and year-week. *T*-statistics are provided in parentheses below the coefficients.*** designates two-tailed statistical significance at 1%, ** at 5%, and * at 10%.

attributes by at least 40 individual raters per CEO. We refer to this picture-based perception as *Perception_Pic*.

We address question one by including both the dynamic- and static-based perception measures in a single regression. Ex ante there are several possible outcomes. We may find that both variables consistently explain some portion of the variation in price, suggesting that they capture different components of perception. Alternatively, we may find that one measure consistently explains valuation, while the other is less useful. That would suggest that the consistent measure is a better construct for capturing market perceptions. As shown in table 8, panel A, we continue to find a positive significant relation between *Perception* and the valuation levels and underwriter quality, even after including *Perception_Pic*. In contrast, *Perception_Pic* has a significant positive coefficient in only one of the four

specifications. Thus, the evidence suggests that perception based on video clips is the superior proxy for individuals' perceptions of management.

We appreciate that there are times when researchers may only have static evidence to create proxies for perceptions based on interactions. This leads us to the second question of whether perceptions based on static pictures would be sufficient to capture our construct. Simple correlation tests suggest that the dynamic- and static-based perceptions share some variation. The overall rating (*Perception_Pic*) has a mean of 4.17, median of 4.2, and standard deviation of 0.41, similar to *Perception*, and the two measures are positively correlated (0.5224). As shown in table 8, panel B, when we repeat our main tests using only *Perception_Pic*, the static perception has a positive and significant coefficient in three of the four main tests. For those three tests, though, the significance is slightly weaker than for *Perception* (*t*-stats of 2.13 to 2.49 rather than 2.99 to 3.54). Based on this second test, we conclude that perception based on static pictures captures some portion of the market perception construct, but with additional noise. Thus, it appears that static pictures may serve as a proxy when dynamic videos are not available. However, researchers should be aware that static-based measures are likely a lower power construct for creating a measure of perception.[30]

5.4 POST-IPO PERFORMANCE

Our finding that perceptions of management are positively related to firm value raises the question of whether investors are rationally pricing this information about firms. This is difficult to test empirically as there is not an obvious time horizon to examine for an unraveling of the valuation premium. Despite these limitations, we examine the association between *Perception* and subsequent returns for our sample of firms. Specifically, we re-estimate equation (3) using $BHAR_{2Y}$ as the dependent variable, where $BHAR_{2Y}$ is a firm's post-IPO buy-and-hold abnormal returns over the subsequent two years minus the buy-and-hold returns earned by that firm's Fama–French 10×10 portfolio (i.e., the matrix of 100 portfolios formed on deciles for the market value of equity and the book-to-market ratio) over the same period.[31] Control variables are included similar to the price revision model (equation (3)) and are as defined in appendix B. While a two-year post-IPO horizon is admittedly ad hoc, we choose this period of time for two reasons. First, our sample concludes at the end of 2013, making two

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[30] Of course, static pictures may be the preferred approach if they capture the experience that would actually occur in the research question. For example, Pope and Sydnor [2011] study biases in online lending. Their research question addresses the impact of a picture that shows that an applicant is African American. In that setting, a picture would obviously be the appropriate construct. Similarly, Duarte, Siegel, and Young [2012] examine perceptions of online borrowers, again using pictures because they are the actual evidence available to online lenders making decisions.

[31] Results are robust to using raw returns or CRSP value-weighted returns instead.

years the longest horizon we are able to examine for the entire sample. Second, using a two-year horizon allows for the expiration of two prominent features that impact the secondary market pricing of IPOs (insiders' lockup provisions (Field and Hanka [2001]) and underwriters' overallotment options (Lewellen [2006])), removing concerns that the final price is not a true market price.

As columns 1 and 2 of table 9, panel A, shows, we fail to find a statistically significant relation between perception and post-IPO stock returns, whether or not control variables are included (t-stats 1.12 and 0.32). This suggests that incorporating perceptions of management into firm value during the IPO process was either rational, or at least that investors did not unwind the pricing of perception during the two years after the IPO. As shown in columns 3 and 4, we continue to find no evidence of a relation with future stock performance when we expand the BHAR period to the maximum post-IPO period available for each firm (three years for the average firm).[32]

To better understand why perception would be rationally incorporated into price, we examine several avenues. First, we test whether CEOs with worse perceptions are more likely to experience turnover after the IPO. If the perception of the CEO captures some aspect of manager ability, low perception could predict future job loss. As shown in table 9, panel B, columns 1 and 2, there is no evidence of a relation between perception and CEO turnover in the two years after IPO (t-stats 0.15 and 0.27). However, columns 3 and 4 expand the post-IPO period to all available years (which is three years on average), and in this slightly longer time period, we find a significant, negative relation between perception and future CEO turnover (t-stats 2.15 and 1.82 for models without and with control variables). *Perception*'s ability to predict which CEOs retain their jobs suggests that it captures meaningful aspects of manager quality and provides one reason for the market's incorporation of perception into price.

As a second test, we explore why poorly perceived CEOs might need to be replaced in the future: poor subsequent performance. As a proxy for poor performance, we examine subsequent accounting performance (i.e., two-year post-IPO cumulative return on assets (ROA_{2Y})). As shown in columns 1 and 2 of table 9, panel C, we do not find evidence of a relation between *Perception* and future ROA (t-stats 0.32 and 0.25). When we extend ROA to include all future periods for each firm (columns 3 and 4), we again do not find evidence of a relation. These results do not provide a reason for the rational incorporation of perceptions into long-run price or the subsequent turnover of poorly perceived CEOs. However, it is possible that a difference

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[32] Although CEO turnover is a binary variable, we estimate the CEO turnover model using OLS due to the difficulty of incorporating fixed effects in probit models. However, when we repeat the analysis using a probit model, we find similar results for both periods under consideration.

T A B L E 9
Perception and Post-IPO Performance

Panel A: Perception and subsequent stock returns

Variables	$BHAR_{2Y}$		$BHAR_{Max}$	
	(1)	(2)	(3)	(4)
Perception	0.1556	0.0701	0.0311	0.1614
	(1.12)	(0.32)	(0.16)	(0.64)
Remaining Controls	Excluded	Included	Excluded	Included
Industry Fixed Effects	Included	Included	Included	Included
Time Fixed Effects	Included	Included	Included	Included
Observations	224	224	224	224
Adjusted *R*-squared	0.033	0.104	0.090	0.170

Panel B: Perception and subsequent CEO turnover

Variables	$Turnover_{2Y}$		$Turnover_{Max}$	
	(1)	(2)	(3)	(4)
Perception	0.0094	−0.0271	−0.1145**	−0.1598*
	(0.15)	(−0.27)	(−2.15)	(−1.82)
Remaining Controls	Excluded	Included	Excluded	Included
Industry Fixed Effects	Included	Included	Included	Included
Time Fixed Effects	Included	Included	Included	Included
Observations	224	224	224	224
Adjusted *R*-squared	0.006	0.018	0.023	0.016

Panel C: Perception and subsequent operating performance

Variables	ROA_{2Y}		ROA_{Max}	
	(1)	(2)	(3)	(4)
Perception	−0.0014	−0.0019	−0.0009	0.0013
	(−0.32)	(−0.25)	(−0.18)	(0.15)
Remaining Controls	Excluded	Included	Excluded	Included
Industry Fixed Effects	Included	Included	Included	Included
Time Fixed Effects	Included	Included	Included	Included
Observations	224	224	224	224
Adjusted *R*-squared	0.368	0.486	0.316	0.463

Panels A, B, and C present the results from an OLS regression of post-IPO buy-and-hold abnormal returns, post-IPO CEO turnover, and post-IPO operating performance, respectively, on various CEO, firm, and offering characteristics. $BHAR_{2Y}$ is the firm's buy-and-hold return over the two years following the close of its first day of trading minus the buy-and-hold returns earned by that firm's Fama-French 10×10 portfolio over the same period. $Turnover_{2Y}$ is an indicator variable that takes the value of one if the firm's CEO exits the firm prior to the two-year anniversary of the firm's initial public offering. ROA_{2Y} is the firm's average quarterly net income divided by average quarterly total assets subsequent to its IPO. $BHAR_{Max}$, $Turnover_{Max}$, and ROA_{Max} are defined similarly to the first set of variables, but extend the time period under considerations through December 31, 2015. *Perception* is the average of *Competent*, *Trustworthy*, and *Attractive*. See appendix B for all other variable definitions. Standard errors are double-clustered by Fama-French 48 industry and year-week. *T*-statistics are provided in parentheses below the coefficients. *** designates two-tailed statistical significance at 1%, ** at 5%, and * at 10%.

in value due to perception would not manifest in ROA within a few years of the IPO. IPO firms are typically young and unprofitable when going public (Barth, Landsman, and Taylor [2016]) and are still maturing several years post-IPO. In summary, we do not find evidence of a stock price reversal in the years after the IPO, suggesting that perceptions are rationally included in price. Although future performance does not emerge as a mechanism or reason for the market's incorporation of perception into price, we do find evidence of perception affecting CEO employment duration as well.

6. *Additional Analyses*

6.1 DETERMINANTS OF PERCEPTION

Another interesting area for analysis is examining the determinants of *Perception.* Our motivation for this analysis is to investigate how CEO, roadshow, and firm characteristics influence perceptions of management, and to confirm that these perceptions are more strongly associated with CEO characteristics than with roadshow or firm characteristics. To do so, we estimate the following pooled OLS model:

$$
\begin{aligned}
Perception_i = {} & \beta_0 + \beta_1 Female_i + \beta_2 Foreign_i + \beta_3 CEO\_Age_i \\
& + \beta_4 Grad\_School_i + \beta_5 Experience_i + \beta_6 Founder_i \\
& + \beta_7 WHR_i + \beta_8 Live_i + \beta_9 Sitting_i + \beta_{10} Background_i \\
& + \beta_{11} Assets_i + \beta_{12} Profitability_i + \beta_{13} R\&D\_Inten_i \\
& + \beta_{14} Firm\_Age_i + \beta_{15} VC_i + FixedEffects + \varepsilon_i, \quad (4)
\end{aligned}
$$

where *Perception* and the CEO characteristics are as previously defined. We also include variables relating to the roadshow presentation that could influence investor perceptions. *Live* is an indicator variable for whether the retail roadshow appears to be recorded from an actual presentation made to institutional investors. *Sitting* is an indicator variable for whether the CEO is sitting during the presentation. *Background* is an indicator variable that takes the value of one if an investment bank's logo is visible in the background during the CEO's presentation. Finally, we also include several firm characteristics in our model. If higher-quality CEOs match with higher-quality firms, then it is possible that firm characteristics will be informative about *Perception.* Variables are as defined in appendix B.

Table 10, panel A, provides the results of estimating equation (4). Columns 1, 2, and 3 present the results of regressing *Perception* on the CEO-specific, roadshow presentation, or firm characteristics, respectively. Consistent with perceptions about an individual being primarily determined by individual-specific information, we observe that the adjusted *R*-squared is much larger in column 1 than in columns 2 and 3. Further, column 4 includes all the variables and indicates that six of the seven

TABLE 10
Determinants of Perception

Panel A: Determinants of aggregate perception

	Perception			
Variables	(1)	(2)	(3)	(4)
Female	0.5043***			0.4645***
	(5.62)			(5.16)
Foreign	−0.1074*			−0.1257*
	(−1.76)			(−1.87)
CEO_Age	−1.2011***			−1.1647***
	(−7.97)			(−6.84)
Grad_School	0.0783			0.0929*
	(1.60)			(1.76)
Experience	−0.0384			−0.0356
	(−0.83)			(−0.72)
Founder	−0.1242**			−0.1275**
	(−2.59)			(−2.44)
WHR	−0.3059**			−0.3368**
	(−2.23)			(−2.43)
Live		0.0009		0.0853
		(0.02)		(1.48)
Sitting		−0.1555		−0.0825
		(−1.36)		(−0.79)
Background		−0.0775		−0.1858***
		(−1.07)		(−2.65)
Tone_Roadshow		0.0254		0.0251
		(0.83)		(0.69)
Assets			0.0030	0.0175
			(0.13)	(0.85)
Profitability			−0.0815	−0.0464
			(−1.29)	(−0.70)
R&D_Inten			−0.0070	0.0425
			(−0.06)	(0.37)
Sales_Growth			0.0969	0.1064
			(1.20)	(1.60)
Firm_Age			0.0323	0.0268
			(0.92)	(0.84)
VC			0.0866	0.0721
			(1.07)	(1.10)
Industry Fixed Effects	Excluded	Excluded	Included	Included
Observations	224	224	224	224
Adjusted R-squared	0.249	0.006	0.022	0.272

Panel B: Determinants of perception components

	Competent	Trustworthy	Attractive
Variables	(1)	(2)	(3)
Female	0.2343**	0.5310***	0.6155***
	(2.42)	(5.75)	(4.72)
Foreign	−0.0860	−0.1721**	−0.1167

(*Continued*)

TABLE 10—*Continued*

Panel B: Determinants of perception components

Variables	Competent (1)	Trustworthy (2)	Attractive (3)
	(−1.18)	(−2.10)	(−1.09)
CEO_Age	−0.5382***	−0.6506***	−2.3284***
	(−3.15)	(−3.42)	(−9.12)
Grad_School	0.0921*	0.0812	0.1164
	(1.79)	(1.38)	(1.44)
Experience	−0.0257	−0.1159**	0.0406
	(−0.51)	(−2.02)	(0.54)
Founder	−0.0737	−0.1191**	−0.1939**
	(−1.36)	(−2.03)	(−2.34)
WHR	−0.2626*	−0.1075	−0.6327***
	(−1.88)	(−0.65)	(−2.66)
Live	0.1327**	0.0968	0.0309
	(2.45)	(1.60)	(0.33)
Sitting	−0.0641	−0.0678	−0.1225
	(−0.73)	(−0.68)	(−0.72)
Background	−0.0536	−0.2770***	−0.2217*
	(−0.82)	(−4.29)	(−1.80)
Tone_Roadshow	0.0292	0.0315	0.0145
	(0.78)	(0.75)	(0.25)
Assets	0.0163	0.0215	0.0146
	(0.82)	(0.94)	(0.43)
Profitability	−0.0532	−0.0262	−0.0593
	(−0.91)	(−0.39)	(−0.54)
R&D_Inten	0.0151	0.0710	0.0336
	(0.14)	(0.53)	(0.20)
Sales_Growth	0.0753	0.0788	0.1667
	(1.18)	(1.15)	(1.54)
Firm_Age	0.0412	0.0386	−0.0066
	(1.35)	(1.16)	(−0.12)
VC	0.0474	0.1046	0.0467
	(0.74)	(1.38)	(0.47)
Industry Fixed Effects	Included	Included	Included
Observations	224	224	224
Adjusted *R*-squared	0.076	0.145	0.358

Panel A presents the results from an OLS regression of Perception on various CEO, firm, and offering characteristics. Panel B presents the results from an OLS regression of the individual components of *Perception* (*Competent*, *Trustworthy*, and *Attractive*) on the same CEO, firm, and offering characteristics included in panel A. *Perception* is the average of *Competent*, *Trustworthy*, and *Attractive*. See appendix B for all other variable definitions. *T*-statistics are provided in parentheses below the coefficients. *** designates two-tailed statistical significance at 1%, ** at 5%, and * at 10%.

significant variables are CEO-specific variables. Specifically, *CEO_Age, Foreign, Founder,* and *WHR* are all negatively associated with *Perception,* while *Female* and *Grad_School* are both positively associated. Table 10, panel B, provides the determinants at the attribute level. The relations previously noted are similar across attributes, with some differences in statistical significance. Overall, table 10 provides new insight into how a CEO's personal character-

istics influence investor perception. In addition, the adjusted R-squared of only 0.272 highlights the fact that investor perception encompasses more than just observable characteristics, which is consistent with our findings of a relation between perception and firm value even controlling for these characteristics.

6.2 SELECTION CONCERNS

When examining the relation between CEO perception and firm valuation, a potential concern is the existence of correlated omitted variables or endogenous matching between firms and CEOs. If the observed relation between perception and valuation is driven instead by another variable such as the quality of the firm, it is difficult to draw conclusions about the role of CEO perception. However, our research design and observed results mitigate such concerns.

Our research design was created to ex ante address potential confounding variables. It includes an extensive set of controls for firm, CEO, and environmental variables such as firm performance, underwriter and auditor quality, market conditions, information content of roadshows, etc. To the extent that our *Perception* variable is somehow proxying for one of these items, or some combination of them, inclusion of the control variables should remove any correlation.

Turning to our observed results, several findings suggest that correlated variables or endogenous matching are not the primary driver of our findings. First, we find evidence of higher future job turnover for more poorly perceived CEOs. This evidence is consistent with Allgood and Farrell's [2003] findings of frictions in firm-CEO matching that result in high CEO turnover in the early years of tenure.[33] In our sample, this suggests that not all CEOs were ideally matched at the IPO date and that the market appears to assess these CEOs distinct from the firm.

Second, in our analysis of the determinants of *Perception*, the majority of the correlations observed are with CEO characteristics. Very few firm or event characteristics are correlated with CEO perception. This again indicates that firms and CEOs are not perfectly matched based on perception of the CEO. Even observable CEO characteristics found to matter for firm value in prior studies explain only a portion of *Perception* (*R*-squared of 0.249), and the relation between *Perception* and valuation remains after controlling for these characteristics. Finally, we find that *Perception* is not only related to valuation and underwriter matching, but also to price revision.

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[33] The classic assumption in the assortative matching literature of firms and managers perfectly matching has been questioned by a number of papers. Suggested frictions preventing perfect matches include geographic segmentation and local hiring bias (Law [2016], Yonker [2016]), a minimum length of time or stability to create the match (Mendes, van den Berg, and Lindebook [2010]), and the need to optimize over several firm and CEO characteristics (Pan [2015]).

Additionally, we find that the relation varies based on the firm uncertainty. This pattern of findings is consistent with our interpretation of perception and its role in the market. If the valuation relation is driven by some other correlated omitted variable, that variable would need to explain this larger set of results as well, which becomes less likely. The combination of these research design choices and results reduces the likelihood that the observed relation between perception and valuation is due to firms selecting CEOs of the same quality or other correlated omitted variables.

7. *Robustness Tests*

7.1 GENDER OF CEO

In the psychology literature on perception, the gender of the subject is often raised as a consideration or a conditioning variable. Accordingly, studies not specifically studying gender often choose to examine only one gender, especially in the corporate setting, where the majority of CEOs are male (e.g., Rule and Ambady [2008], Graham, Harvey, and Puri [2016]). In our primary results, we include both male and female CEOs. However, to ensure that our findings are not affected by gender considerations, we repeat our analyses using the subsample of male CEOs. As shown in table 11, panel A, the coefficients of interest are similar and remain statistically significant at the 10% level or better.

7.2 RESULTS INCLUDING ALL ATTRIBUTES INDIVIDUALLY

Our focus throughout the draft is on the overall perception of management, although we also tabulate results using the individual attributes separately. An alternative way to examine their relation with firm valuation is to include all three attributions within the same regression. We provide the primary regression results using this alternative specification in table 11, panel B. As shown, at least one of the three attributes maintains the positive and significant relation for each specification, with the coefficients on *Attractive* and *Competent* being significant more often than *Trustworthy*. Including them all in the same regression enables easier comparison across coefficients and significance. However, it also raises the concern of multicollinearity, given the high correlation between the individual attributes (i.e., 0.80 Pearson correlation between *Competent* and *Trustworthy*, 0.46 between *Competent* and *Attractive*, and 0.41 between *Trustworthy* and *Attractive*). Our goal in using the average of the three components is to incorporate different aspects of perception, and our focus throughout has been on the overall perception. When we perform a principal component analysis of the three measures, we find that one common factor clearly emerges, with an eigenvalue of 2.13 for the principal component and loadings of 0.63 for *Competent*, 0.61 for *Trustworthy*, and 0.47

TABLE 11
Additional Tests

Panel A: Primary results excluding female CEOs

Variables	L(MVE_Proposed) (1)	L(MVE_Offer) (2)	L(MVE_Final) (3)	Underwriter (4)
Perception	0.2839***	0.3368***	0.4195***	0.3006**
	(2.95)	(3.08)	(3.62)	(2.19)
Remaining Controls	Included	Included	Included	Included
Industry Fixed Effects	Included	Included	Included	Included
Time Fixed Effects	Included	Included	Included	Included
Observations	216	216	216	216
Adjusted *R*-squared	0.627	0.621	0.578	0.338

Panel B: Primary results including all three perception components

Variables	L(MVE_Proposed) (1)	L(MVE_Offer) (2)	L(MVE_Final) (3)	Underwriter (4)
Competent	0.2729	0.2477	0.3077*	0.4779*
	(1.32)	(1.36)	(1.74)	(1.77)
Trustworthy	−0.1223	−0.1471	−0.1631	−0.1123
	(−0.83)	(−1.01)	(−1.05)	(−0.47)
Attractive	0.1263***	0.1994***	0.2385***	0.0161
	(2.83)	(4.57)	(5.05)	(0.16)
Remaining Controls	Included	Included	Included	Included
Industry Fixed Effects	Included	Included	Included	Included
Time Fixed Effects	Included	Included	Included	Included
Observations	224	224	224	224
Adjusted *R*-squared	0.624	0.622	0.582	0.346

Panel A presents the results from running equations (1) and (2) restricting the sample to exclude the eight firms with female CEOs. Panel B presents the results from running equations (1) and (2) modified to include each of the individual components of *Perception* (*Competent*, *Trustworthy*, and *Attractive*) in each of the regressions. *Perception* is the average of *Competent*, *Trustworthy*, and *Attractive*. Standard errors are double-clustered by Fama-French 48 industry and year-week. *T*-statistics are provided in parentheses below the coefficients. *** designates two-tailed statistical significance at 1%, ** at 5%, and * at 10%.

for *Attractive*. This provides additional support for the use of the overall factor.[34]

7.3 DATA QUALITY

Prior research indicates that several data-quality concerns may arise when using MTurk to perform behavioral research (Mason and Suri [2012], Crump, McDonnell, and Gureckis [2013]). In this section, we examine whether these concerns are present in our data and investigate their impact on our results.

We used every rating that we received from the MTurk workers in our calculation of *Perception, Competent, Trustworthy,* and *Attractive*. However,

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[34] In addition, if we use the first principal component instead of the average of the three attributes, the first principal component has a positive and statistically significant coefficient at the 5% level for all regressions included in our primary analysis (tables 4 and 5).

some of the MTurk worker ratings may be compromised either because the rater recognized the CEO, wasn't paying close attention, or was engaged in otherwise suspicious behavior (Crump, McDonnell, and Gureckis [2013]). This suspicious behavior may include providing the same response to each request or providing responses that are uncorrelated with the group average. Accordingly, we exclude the ratings that manifest these behaviors from the data and re-estimate each of the main regressions in our paper.

Table 12 provides the results of re-estimating the main regressions in our paper after excluding abnormal ratings provided by MTurk workers. Panel A provides the results after excluding all ratings where an MTurk worker indicated having recognized the CEO in the video. Panel B provides the results after excluding all ratings where MTurk workers failed to answer our two attention-check questions correctly. Panel C provides the results after removing all ratings where MTurk workers indicated the same value for a characteristic across the videos they rated. Panel D provides the results after excluding all raters whose ratings were not positively correlated with the group average (p-value < 0.10). Panel E provides the results after removing all ratings that were excluded in panels A–D. In each panel, we note that the qualitative inferences made when using the restricted set of ratings are identical to those made when using the complete set of ratings.

7.4 RATER CHARACTERISTICS

Perceptions are unconscious assessments made without effort or awareness, independent of intelligence or working memory (Ambady, Bernieri, and Richeson [2000], Evans [2008]). Because these are fundamental, universal perceptions, we do not expect results to be driven by rater characteristics. In addition, we follow the content analysis literature's recommendation to use a large number of raters when capturing variables that involve judgment (Neuendorf [2002]), with the goal of estimating a common perception. Thus, we are hesitant to estimate perceptions using significantly smaller groups of raters. Nevertheless, we repeat our analyses using ratings from various subsamples of raters to examine whether we observe this fundamental assumption in our setting. We find qualitatively similar inferences for our main tests when using subsamples limited to any of the following demographics: male raters, female raters, raters under 30 years old, raters 30 years of age or greater, Caucasian raters, non-Caucasian raters, raters that have attended at least some college or have a college degree, and raters that have not attended college.[35] These findings provide support that we

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[35] Specifically, we continue to find a positive relation between investor perception of managers and proposed firm valuation, final offer valuation, final market valuation, and underwriter matching across all subsamples, with 29 out of 32 specifications significant at the 10% level or better.

TABLE 12
Robustness Tests Using Alternative Measures of Perception

Panel A: Robustness: Recognized the speaker

Variables	L(MVE_Proposed) (1)	L(MVE_Offer) (2)	L(MVE_Final) (3)	Underwriter (4)
$Perception_{Recognized}$	0.2863***	0.3308***	0.4132***	0.3067**
	(2.99)	(2.97)	(3.50)	(2.34)
Remaining Controls	Included	Included	Included	Included
Industry Fixed Effects	Included	Included	Included	Included
Time Fixed Effects	Included	Included	Included	Included
Observations	224	224	224	224
Adjusted *R*-squared	0.626	0.622	0.582	0.343
Ratings Retained	99.3%	99.3%	99.3%	99.3%

Panel B: Robustness: Incorrectly answered the attention check questions

Variables	L(MVE_Proposed) (1)	L(MVE_Offer) (2)	L(MVE_Final) (3)	Underwriter (4)
$Perception_{Attention}$	0.2567***	0.2956***	0.3761***	0.3250**
	(2.73)	(2.76)	(3.37)	(2.52)
Remaining Controls	Included	Included	Included	Included
Industry Fixed Effects	Included	Included	Included	Included
Time Fixed Effects	Included	Included	Included	Included
Observations	224	224	224	224
Adjusted *R*-squared	0.625	0.620	0.580	0.346
Ratings Retained	84.4%	84.4%	84.4%	84.4%

Panel C: Robustness: Provided a constant rating

Variables	L(MVE_Proposed) (1)	L(MVE_Offer) (2)	L(MVE_Final) (3)	Underwriter (4)
$Perception_{Constant}$	0.2713***	0.3164***	0.3927***	0.3047**
	(2.89)	(2.85)	(3.39)	(2.35)
Remaining Controls	Included	Included	Included	Included
Industry Fixed Effects	Included	Included	Included	Included
Time Fixed Effects	Included	Included	Included	Included
Observations	224	224	224	224
Adjusted *R*-squared	0.626	0.621	0.581	0.344
Ratings Retained	94.2%	94.2%	94.2%	94.2%

Panel D: Robustness: Uncorrelated to the average rating

Variables	L(MVE_Proposed) (1)	L(MVE_Offer) (2)	L(MVE_Final) (3)	Underwriter (4)
$Perception_{Uncorrelated}$	0.2728***	0.3161***	0.3914***	0.2638**
	(2.75)	(2.92)	(3.53)	(2.19)
Remaining Controls	Included	Included	Included	Included
Industry Fixed Effects	Included	Included	Included	Included
Time Fixed Effects	Included	Included	Included	Included
Observations	224	224	224	224
Adjusted *R*-squared	0.626	0.622	0.582	0.341
Ratings Retained	93.3%	93.3%	93.3%	93.3%

(Continued)

TABLE 12—*Continued*

Panel E: Robustness: Violated criteria specified in panels A–D

Variables	L(MVE_Proposed) (1)	L(MVE_Offer) (2)	L(MVE_Final) (3)	Underwriter (4)
Perception$_{Net}$	0.2320**	0.2645**	0.3312***	0.2571**
	(2.40)	(2.49)	(3.12)	(2.34)
Remaining Controls	Included	Included	Included	Included
Industry Fixed Effects	Included	Included	Included	Included
Time Fixed Effects	Included	Included	Included	Included
Observations	224	224	224	224
Adjusted *R*-squared	0.625	0.620	0.579	0.342
Ratings Retained	74.5%	74.5%	74.5%	74.5%

Table 12 presents the results from running equations (1) and (2) modified to exclude *Perception* and instead include adjusted versions of *Perception* that are the average of *Competent*, *Trustworthy*, and *Attractive* after excluding specific ratings, detailed as follows. Panel A uses *Perception_Recognized*, which excludes all ratings that indicated recognition of the CEO. Panel B uses *Perception_Attention*, which excludes all raters that did not correctly answer the two attention-check questions included in the survey. Panel C uses *Perception_Constant*, which excludes all raters that indicated the same value for a characteristic for each of the videos that they rated. Panel D uses *Perception_Uncorrelated*, which excludes all raters whose responses were uncorrelated with the group average (p-value < 0.10). Panel E uses *Perception_Net*, which excludes all ratings that were excluded in Panels A–D. Standard errors are double-clustered by Fama-French 48 industry and year-week. *T*-statistics are provided in parentheses below the coefficients. *** designates two-tailed statistical significance at 1%, ** at 5%, and * at 10%.

are capturing fundamental human perceptions that are not unique to any particular demographic.

8. Conclusion

This study examines how investors' perceptions of management are associated with firm valuation. We examine whether perceptions of management, formed from watching 30-second content-filtered video excerpts of a CEO's IPO roadshow presentation, are correlated with investors' assessment of firm value, controlling for known determinants of firm value. We find that a composite measure of perception based on competence, trustworthiness, and attractiveness is positively associated with an IPO firm's market value at the initial proposal price date, the final offer date, and the end of the first day of trading. We also examine how this information influences IPO price formation process, finding that our composite measure of perception is positively associated with underwriter quality and the price revision that occurs from the proposed price to the closing price on the firm's first day of trading on the secondary market. Finally, we find that our proxy of perception based on dynamic behavior is preferable to a measure based on static photos, although a photo-based measure does serve as a noisier proxy of investors' perception.

We contribute to the existing literature in several areas. First, we provide evidence that perceptions of management are associated with timely measures of firm value. Second, our study contributes to the literature examining perceptions of management by (1) focusing on the market impacts of

perceptions and (2) using a construct of perception based on information-rich dynamic behavior. Third, our study contributes to the disclosure literature by providing evidence that valuable information about management is conveyed through visual and auditory nonverbal behavior. Fourth, we contribute to the IPO literature by providing the first empirical evidence that investors learn valuable, nontangible information from attending an IPO firm's roadshow.

Although we have a unique setting that allows us to match perception with concurrent valuation, three caveats apply. First, when constructing ratings of management, we remove contextual information about the firm, firm performance, the history of the CEO, and even the fact that the presentation is part of an IPO. Our goal is to focus on the most basic human perceptions, irrespective of additional information, and this approach is consistent with the vast prior literature of perceptions. However, this means that we do not capture a measure of investor perception that is influenced by the content of conversations or historical information about management. Second, we rely on prior literature's findings that intuitive perceptions are unconscious, automatic, and not easily influenced by outside factors such as cognitive load or intelligence. To the extent that these basic perceptions could be influenced by financial incentives, our measure of perception would be incomplete because our raters are not making investment decisions based on their assessments. Third, although the IPO setting provides several advantages for a clean research design, it is not clear whether results learned from our chosen setting are generalizable to other settings.

APPENDIX A

Survey Design and Implementation

Each survey consisted of an introductory paragraph explaining that respondents would be rating speakers, several demographic questions as discussed in section 3.3, and then a series of 30-second videos followed by the competence, trustworthy, and attractiveness rating questions portrayed in figure 2. A practice video and attention check questions were also included, as discussed below. When creating the MTurk survey, we employed several techniques common in survey design to reduce concerns about bias in the responses. First, we organized CEO videos by randomly assigning each video to one of 20 groups or cells, and we then randomly assign each of our respondents to view and rate one cell or group of videos. In this way, each video is watched by at least 40 respondents (and on average, 45).[36] In addition, respondents were only allowed to view and rate one group of videos,

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[36] Respondents are required to view and rate all videos in the group to obtain credit for completing the survey, and we receive only complete responses. Thus, the difference in raters per cell is a result of the random assignment of raters. On average, each cell will be assigned

reducing concerns about rater fatigue or differences in rater learning over time. Second, within each group of videos, we randomized the order of the videos' appearance to the respondent to minimize the potential for different responses based on when CEO videos are viewed during the rating exercise. Third, we randomized the order of the three characteristic questions (Competent, Trustworthy, and Attractive) for each rater to avoid systematically different responses due to the ordering of the traits. (We did, however, leave the question order the same for all videos rated by a *given* rater to avoid unnecessary confusion during a series of videos and questions.) Fourth, we provided a practice video and questions before the sample videos to familiarize respondents with the format, and we required raters to confirm their ability to see and hear the practice video before allowing the survey to begin. Respondents who respond that they cannot see or hear the video were not allowed to complete the survey. In addition, during the survey, we did not allow the rater to progress to the questions until the time required to view the video had elapsed. In this way, we minimize the risk that respondents ignore the video and respond with random ratings.[37]

In addition, we followed the recommendations for maximizing data quality from studies that examine the reliability of data originating from MTurk. Specifically, we required that each MTurk worker requesting to complete our Human Intelligence Task (HIT) be located in the United States and have an approval rating of at least 95% on their previous assignments. We also included an attention-check question at both the beginning and the end of the HIT. The questions followed the same format as the primary perception questions (with the Likert scale as displayed in figure 2), and consisted of the following text: (First question) Mt. Everest is the tallest mountain in the world, measuring 29,029 feet high. On a scale of 1 (Not at all) to 7 (Very), how likely is it that Mt. McKinley, a mountain in North America, is taller than Mt. Everest? (Second question) Lake Baikal is the deepest lake in the world, at 5,369 feet deep. On a scale of 1 (Not at all) to 7 (Very), how likely is it that Lake Superior, a lake in North America, is deeper than Lake Baikal? We perform robustness tests in section 5 using only responses from MTurk workers that correctly answered these attention-check questions.

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45 raters. However, in practice, cells were assigned between 43 and 47 raters. Accordingly, all cells (and thus videos) were rated by at least 43 respondents.

[37] Also see robustness tests in section 5.2 eliminating ratings that are potentially of lower quality.

APPENDIX B
Variable Definitions

Perception	CEO-specific average of CEO *Competent, Trustworthy*, and *Attractive* ratings from MTurk survey
Competent	CEO-specific average *Competent* rating across MTurk raters
Trustworthy	CEO-specific average *Trustworthy* rating across MTurk raters
Attractive	CEO-specific average *Attractive* rating across MTurk raters
L(MVE_Proposed)	Log transformation of firm's market value of equity calculated using the midpoint of the proposed offer price range[38]
L(MVE_Offer)	Log transformation of firm's market value of equity calculated at the final offer price
L(MVE_Final)	Log transformation of firm's market value of equity calculated at the close of the firm's first day of trading on a public exchange
Underwriter	Average Carter–Manaster ranking of the firm's lead underwriters
Revision	Percentage change between firm's closing price per share on the first day of trading on the secondary market and the midpoint of the proposed offer price per share range
Price_Update	Percentage change between firm's midpoint of the proposed offer price per share range and the final offer price per share
Initial_Returns	Percentage change between firm's final offer price per share and the closing price per share on the first day of trading on the secondary market
$BHAR_{2Y}$	Firm's post-IPO buy-and-hold return over the subsequent two years minus the buy-and-hold returns earned by that firm's Fama–French 10×10 portfolio (i.e., the matrix of 100 portfolios formed on deciles for the market value of equity and the book-to-market ratio) over the same period
$BHAR_{Max}$	Firm's abnormal post-IPO buy-and-hold return calculated as above, over all subsequent available trading days for each firm through December 31, 2015
ROA_{2Y}	Firm's average net income divided by their average assets for all reported periods during the two years subsequent to the IPO
ROA_{Max}	Firm's average net income divided by their average assets for all reported periods subsequent to the IPO available for each firm through December 31, 2015
$Turnover_{2Y}$	Indicator variable that takes the value of one if the firm's CEO leaves the firm prior to the firm's two-year anniversary as a public firm
$Turnover_{Max}$	Indicator variable that takes the value of one if the firm's CEO leaves the firm prior to December 31, 2015
L(Net_Income)	Log transformation of the firm's net income for the four quarters prior to IPO
L(R&D_Expense)	Log transformation of the firm's research and development expense for the four quarters prior to IPO
L(Sales_Growth)	Log transformation of the firm's change in quarterly revenues prior to IPO

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[38] As motivated in section 4.1, we use a log transformation process to determine many of the variables included in the study. This transformation consists of taking the log of (1+value) for all positive values and the –log (1–value) for negative values. This process is used to retain the negative values included in the original data while also maintaining the monotonic relationship that exists among the realized values.

APPENDIX B—*Continued*

Filing_Size	Log transformation of the firm's initial filing amount. The initial filing amount is calculated by multiplying the final filing amount by the midpoint of the initially proposed pricing range as a percentage of the final offer price.
Assets	Log transformation of the firm's total book value of assets for the quarter prior to IPO
Revenues	Sum of the firm's net income for the four quarters prior to IPO divided by the firm's total assets for the quarter prior to IPO
Profitability	Sum of the firm's net income for the four quarters prior to IPO divided by the firm's total assets for the quarter prior to IPO
R&D_Intensity	Sum of the firm's research and development expense for the four quarters prior to IPO divided by the firm's total assets for the quarter prior to IPO
Sales_Growth	The firm's change in quarterly revenues prior to IPO divided by the firm's total assets for the quarter prior to IPO
Firm_Age	Log transformation of the firm's age at IPO
Uncertainty	Percent of words in the firm's final registration statement that are in the uncertain, negative, or weak modal word lists of Loughran and McDonald [2013]
Tone_Roadshow	The difference between the number of positive words and the number of negative words in the CEO's roadshow presentation divided by the total number of words in the CEO's presentation, using the Loughran and McDonald dictionary
VC	Indicator variable equal to one if the firm has venture capital backing
Big4	Indicator variable equal to one if the firm has a Big4 auditor at the time of the IPO
Secondary_Shares	Percentage of a firm's shares being offered that are owned by existing shareholders
Insider_Retention	Percentage of a firm's total shares that are retained by executives and directors after the offering
Mkt_Cond_Level	Average closing price of the NASDAQ composite index (in thousands) between the time the firm files its initial registration statement and completes its IPO
Mkt_Cond_Change	Average daily percentage change of the NASDAQ composite index between the time the firm files its initial registration statement and completes its IPO
Female	Indicator variable equal to one if the firm's CEO is female
Foreign	Indicator variable equal to one if the firm's CEO completed a degree from a university located outside of the United States
CEO_Age	Log transformation of the age of the firm's CEO at IPO
Grad_School	Indicator variable equal to one if the firm's CEO earned a postgraduate degree
Experience	Indicator variable equal to one if the previous employer of the firm's CEO was publicly traded
Founder	Indicator variable equal to one if the firm's CEO is the firm's founder

APPENDIX B—*Continued*

WHR	The width to height ratio of the firm's CEO face. This measure is calculated as the distance between the upper lip and the highest point of the firm's eyelids divided by the distance between the left and right cheekbones. Refer to Jia, van Lent, and Zeng [2014] for additional information.
Live	Indicator variable equal to one if the retail roadshow appears to be recorded from an actual presentation made to institutional investors
Sitting	Indicator variable equal to one if the CEO is sitting during the roadshow presentation
Background	Indicator variable equal to one if an investment bank's logo is visible in the background during the CEO's presentation

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