

Ambiguous Signals and Information Asymmetry in the Initial Public Offering Process: Examining Ownership Concentration, Process Time, and Underpricing

Group & Organization Management
2022, Vol. 0(0) 1–36

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DOI: 10.1177/10596011221090036

journals.sagepub.com/home/gom



G. Tyge Payne, Lori Tribble
Trudell, Curt B. Moore , Oleg V.
Petrenko, and Nathan T. Hayes

Abstract

Initial public offerings (IPOs) represent an important stage of development for many firms as they try to gain access to the resources needed for growth and development. Due to the information asymmetry that accompanies the process, there is extensive research examining what factors might signal quality to potential investors such that the IPO might be more optimally valued and priced. Herein, we hypothesize and empirically explore how a mixed or ambiguous signal about a firm—the signal of ownership concentration in this case—might be overcome with more opportunities for information disclosure and, thus, lessen underpricing; IPO stocks tend to be underpriced (i.e., the offer price of a stock is lower than the inherent market value), which means that owner’s “leave money on the table.” Using

E.J. Ourso College of Business, Louisiana State University, Baton Rouge, LA, USA
Wilbur O. & Anne Powers College of Business, Clemson University, Clemson, SC, USA
Spears School of Business, Oklahoma State University, Stillwater, OK, USA
Sam M. Walton College of Business, University of Arkansas, Fayetteville, AR, USA
E.J. Ourso College of Business, Louisiana State University, Baton Rouge, LA, USA

Corresponding Author:

Curt B. Moore, Spears School of Business, Oklahoma State University, Stillwater, OK, USA.

Email: curt.moore@okstate.edu

a generalized structural equation model of data on 601 U.S. IPO firms, we find support for our model by demonstrating that longer IPO process times (i.e., days from the IPO firm's filing date to the actual issue date)—representing opportunities to disclose and disseminate information—act as a mediator between ownership concentration and underpricing. Further, we show that the age of the firm also influences this process model arguing that more historical data and other information is more readily available to the potential investor with increased firm age. Overall, our study contributes to the literature by demonstrating how more disclosure and dissemination of relevant information might reduce asymmetries associated with more ambiguous or difficult-to-interpret signals and improve outcomes.

Keywords

information asymmetry, initial public offerings, IPO process, ownership concentration, signals, signaling, time, underpricing

Introduction

The initial public offering (IPO) of a firm's stock is a vital stage in the organization's lifecycle as it transitions from survival and emergence to professionally managed and publicly traded (Zahra & Filatotchev, 2004). The benefits of "going public" include gaining access to new sources of capital, increasing prestige through greater exposure to potential investors and consumers, and allowing the company to attract more qualified employees (Brau & Fawcett 2006; Bruton, Chahine, & Filatotchev, 2009; Koba, 2012). The costs and risks are potentially high, however. The process can involve significant legal and marketing expenses, extensive time commitments, loss of company control, and the need to disclose proprietary information (Arthurs, Hoskisson, Busenitz, & Johnson, 2008; Ritter, 1987). These many factors have led to a wide variety of studies considering the IPO process and subsequent outcomes such as market timing (Yang, Zimmerman, & Jiang, 2011), withdrawal decisions (Fan & Yamada, 2020), survival (Baluja & Singh, 2016), and, most commonly, underpricing (Daily, Certo, Dalton, & Roengpitya, 2003).

Central to understanding the IPO process—and its outcomes—is signaling theory, in which a primary concern is how information asymmetry is reduced between two parties (Bergh, Ketchen, Orlandi, Heugens, & Boyd, 2019; Spence, 2002). In the case of IPOs, the presence of proprietary or more obscure information—typically involving subjective factors such as leadership capabilities, strategic intentions, unique business processes, and

intellectual capital—can lead to asymmetries between owners and potential investors. To optimize resource acquisition, information asymmetry about the qualities and future value of the firm is mitigated through signals to potential investors, which are disseminated and more fully discussed within the prospectus and IPO road show. Higher levels of information asymmetry incite investors to dictate that the IPO firm (e.g., its founders) absorbs the uncertainty associated with the valuation of the firm, which leads to underpricing (e.g., Cohen & Dean, 2005; Heeley, Matusik, & Jain, 2007). IPO underpricing, therefore, serves as a key measure of IPO performance because it represents “the irrecoverable costs associated with unresolved information asymmetry” (Connelly, Certo, Ireland, & Reutzel, 2011, p. 42).

Building on signaling theory, and the associated concept of information asymmetry, this study explores if more ambiguous signals—or signals that have different meanings of quality to different signal receivers (e.g., potential investors)—might be enhanced or clarified through mechanisms that provide additional opportunities for information disclosure and, subsequently, improve outcomes. This builds on previous work that demonstrates that less ambiguous information creates a more reliable signal about the quality of the IPO firm (Park & Patel, 2015). Specifically, we theorize and empirically test a model where IPO process time—as a proxy for the degree of information disclosure and dissemination opportunities—serves as a mediator between ownership concentration and underpricing. Ownership concentration, which refers to the relative percentage of shares that shareholders own (Bruton, Filatotchev, Chahine, & Wright, 2010), has been theoretically argued and empirically examined in relation to underpricing (Daily et al., 2003; Ritter 1998) and can potentially send conflicting signals to different investor groups about the quality and future direction of the firm. For instance, higher concentration may represent a positive solution to agency costs and the alignment of interests, while it may also signal the ability of controlling shareholders to expropriate minority shareholders. Hence, we argue that increased opportunity for information disclosure and dissemination reduces underpricing by clarifying the role of ownership in the firm; this allows for heterogeneous investors to better determine if their investment goals are aligned with those of the IPO firm. We also argue that when older firms are going through the IPO process, the relationship between ownership concentration and IPO process time will be partially mitigated by the age of the IPO firm. Older firms are less dependent on signals of quality to resolve information asymmetries because investors can rely on available historic information (e.g., firm performance, market penetration and adoption, strategy implementation, and operations) apart from that presented in the prospectus (Bell, Moore, & Al-Shammari, 2008). These informational advantages of

older firms lessen the need for active information dissemination and ownership involvement during the pre-IPO promotional activities referred to as the road show.

By theoretically and empirically examining these relationships—using generalized structural equation modeling of data on 601 U.S. IPO firms—our study makes two key contributions. First, our study provides insight into how ambiguous signals might be clarified through opportunities to explain and disseminate information; signal receivers are boundedly rational and may need additional sources of information and time to gain confidence in interpreting the signal. Specific to the IPO literature, we empirically demonstrate how ownership concentration—representing an ambiguous signal—might be better understood or interpreted with additional time and increased information flows during the road show. Ultimately, more confidence with interpreting a signal effects underpricing. In other words, when an IPO firm discloses more or better information about itself during the prospectus development and road show period, it can effectively reduce information asymmetries between the owners of the IPO firm and potential investors, who may have varying expectations and definitions of quality. This addresses a previously unexplored mediating relationship and speaks to previous calls for signaling to be considered more comprehensively and from a temporally dynamic perspective (Etzion & Pe'er, 2014). It also allows for the theoretical understanding that all receivers may not—due to biases or varying motivations—interpret signals similarly in terms of high or low quality (Daily, Certo, & Dalton, 2005).

As a second contribution, this study demonstrates that firm age—presenting availability of information—has a moderating influence on the ownership concentration to process time relationship. We argued that older firms, presumably with more written documentation, financial data, and established processes, can better mitigate information asymmetry and decrease uncertainty surrounding the IPO process and its subsequent outcomes. Underpricing, as the key outcome in this case, can then be reduced because investors can more precisely estimate the true market value of the firm, and make better decisions, with increased information availability (e.g., Cohen & Dean, 2005; Heeley et al., 2007; Sanders & Boivie, 2004). Our findings, however, reveal a more complex relationship between age, ownership, and process time, while still underscoring their importance. For although the moderation hypothesis is supported, the nature of the relationship suggests that firm age is especially important for firms with low ownership concentration. This suggests that additional factors may need further exploration regarding process time, including the issues of hype, where short-term

expectations that are related to new technologies may lead to overoptimistic and inflated responses, and opportunism (Li & Liu, 2017).

Theory and Hypotheses Development

Signals are utilized to overcome information asymmetries and reduce uncertainty inherent in the acquisition of resources (Connelly et al., 2011). For new or unproven firms (e.g., many IPO firms), in particular, it is difficult to overcome information asymmetries between owners and prospective investors concerning the quality of the firm because of a lack of history or information needed to support quality claims (Amit, Brander, & Zott, 1998; Payne, Moore, Bell, & Zachary, 2013). Indeed, signaling resides at the very heart of IPO research because signaling theory, and the associated concept of information asymmetry, clearly address the key question of how do private, often unknown, companies best convey true value to the public investor (Carpenter, Pollock & Leary, 2003; Ritter & Welch, 2002; Payne et al., 2013). Signals allow senders to transmit information about the high- or low-quality attributes in situations of high information asymmetry; the costs associated with sending or acquiring the attributes is said to create a separating equilibrium (Spence, 2002; Bergh, Connelly, Ketchen, & Shannon, 2014). For example, underwriter reputation has been extensively studied as a signal of the quality of an IPO because only high-quality firms (or firms with greater potential) can secure the services of the most reputable underwriters (Daily et al. 2003; Lowry, Michaely, & Volkova, 2017). Similarly, other signals have been associated with IPO underpricing including top management team reputations (Cohen & Dean, 2005), innovativeness (Heeley et al., 2007), and media attention (Pollock & Rindova, 2003), among others.

As shown in such studies utilizing signaling theory, often within the IPO context, much of the previous work has focused solely on the sending firm, essentially ignoring contextual factors and the role of the receiver (Park & Patel, 2015). Further, results associating some signals to key outcomes, including underpricing, have shown to be equivocal (Connelly et al., 2011; Etzion & Pe'er, 2014). Consequently, signal credibility and universality may be questioned, particularly among potential investors who may be required to evaluate the firm on subjective, ambiguous, and unverifiable signals, which can lead to mixed and, likely, less than optimal outcomes for one or more involved parties (Maxwell, Jeffrey, & Levesque, 2011; Sanders & Boivie, 2004). Consider, for example, when a signal does not consistently send a high-quality message across all receiving groups; a signal may represent high quality to some groups but low quality for others. In such cases, where a pooling rather than a separating equilibrium forms, the assumption that

signals are consistently and unambiguously sent and received does not hold; they often must be interpreted (Park & Patel, 2015; Perkins & Hendry, 2005). As Etzion and Pe'er (2014) specifically recognize, markets—and the firms within them—can vary greatly in terms of competitive forces and dynamics creating the likelihood that some signals may vary in terms of interpretation.

In relation to our context, Colombo (2021) noted—based on the highly uncertain nature of market conditions—that prospective equity investors may be particularly influenced by extraneous factors that call into question the credibility of a signal. However, it is important to recognize that the ambiguity of a signal resides in the information being received, not in the signal itself, since some ambiguous signals may be objectively verifiable. Indeed, time and contingencies may obscure a signal such that different investors may perceive or interpret the same basic signal in different ways (or allow their own biases to influence their perceptions). Such considerations lead us to question how opportunities that allow for the disclosure of additional information, and time to process it, might help overcome asymmetries associated with signals that are mixed or unclear due to variations in receiver expectations or beliefs. Bruton and colleagues (2009) refer to these ambiguous signals as idiosyncratic, arguing that they are paramount to investors and the IPO process. Specific to the IPO context, we ask: In the presence of a mixed or ambiguous signal, does the opportunity to disclose additional information about the IPO firm mitigate ambiguity and improve underpricing?

Based on this research question, we now turn to developing our specific hypotheses that are visually modeled in Figure 1. Note, however, that we begin with a discussion regarding the relationship between ownership concentration and underpricing because our model is based on the general assumption that ownership concentration is an ambiguous signal that can be interpreted differently by potential investors and, therefore, influence underpricing in varying ways. So, while we do not provide a formal hypothesis regarding this foundational relationship, we do explore the theoretical arguments and empirical findings that support ownership concentration as a salient, but unclear or disputed, signal to investors who may vary widely in their investment goals. This discussion then leads to formal hypotheses about the other relationships in the model, which demonstrates the central role and importance of time and information asymmetry in the IPO process.

Ownership Concentration and Underpricing

Within the IPO literature, many key attributes have been utilized to relay information about the quality of the firm, including signals about individuals (e.g., CEOs), teams, organizations, industries, and countries (Colombo,

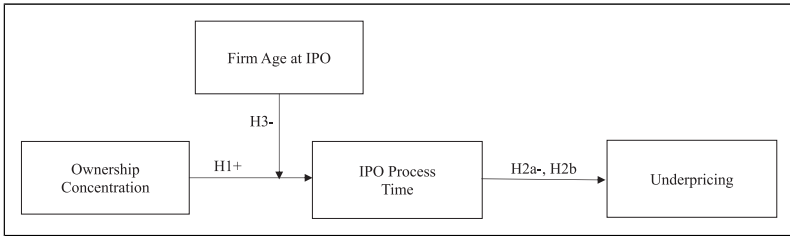


Figure 1. Hypothesized model.

2021). Among these various attributes, governance structures and composition of ownership of the firm has been extensively studied (Certo, Holcomb, & Holmes, 2009; Connelly et al., 2011). Governance and ownership concerns, which are largely rooted in agency issues, are considered exceedingly important to IPO outcomes and require the disclosure of critical information via signals. Indeed, Ibbotson and Ritter (1995) noted three unique agency issues that are salient to IPOs: 1) information asymmetry, 2) adverse selection, and 3) moral hazard. The latter two issues are components of the first (Bruton et al., 2009). Adverse selection costs, for instance, may occur when owners or managers of the firm do not fully disclose proprietary information (e.g., past sales performance) to potential investors in efforts to increase personal rewards (Shane & Cable, 2002). Relatedly, moral hazard costs may be incurred if owners or managers are able to engage in opportunistic behaviors (e.g., manipulating the IPO stock price for personal gains) through hidden or unobservable actions (Sanders & Boivie, 2004). In general, firms disclose critical information about governance and ownership (e.g., top management team composition, compensation contracts, underwriter agreements) to help address these agency problems and associated costs (Certo, Daily, Cannella, & Dalton, 2003; Kennedy, Sivakumar, & Vetzal, 2006). Indeed, the ownership structure and governance of the firm represent some of most important issues of concern to potential investors (e.g., Bell, Moore, & Filatotchev, 2012; Bruton et al., 2010).

Ownership concentration is a key governance signal that has been previously utilized in IPO research, but one that may be interpreted contrarily by investors; interpretation is largely based on previous experiences and beliefs about how different ownership structures might lead to different objectives and decision-making both during and after the IPO process. This has also led to some variation regarding the relationship between ownership concentration and IPO outcomes, including underpricing (e.g., Chen & Strange, 2005; Habib & Ljungqvist, 2001; Pham et al., 2003; Venkatesh & Neupane, 2006).

On the one hand, investors may believe that owners desire to maximize their economic gains (or minimize possible losses) from the IPO. In other words, an economically rational argument would suggest that owners desire to set the IPO stock price at a point that maximizes sales of stock and minimizes underpricing—where there is little money left on the table. With more concentrated ownership, the primary shareholders would have a larger stake in the business and thus be incentivized to lower coordination costs, maintain more involvement in the process, and create more incentive alignment (Allen & Faulhaber, 1989; Brav & Gompers, 2003; Dharwadkar, George, & Brandes, 2000). Alternatively, dispersed ownership erodes the willingness and ability to monitor the process, allowing for more information asymmetry and agency costs (Arthurs et al. 2008; Barry, Muscarella, Peavy, & Vetsuypens, 1990; Shleifer & Vishny, 1997), resulting in higher underpricing. In fact, research by Bruton and colleagues (2010) supports this perspective; these scholars found that a more concentrated ownership structure improves IPO performance in the United Kingdom and France. In sum, owners that maintain high ownership stakes signal optimism and a longer temporal orientation for the IPO (i.e., a desire to remain involved post-IPO). In such cases, the handicap is less burdensome for high-quality firms (i.e., those with owners staying with the firm post-IPO) than for low-quality firms (i.e., those with less concentration or with owners wishing to exit after the IPO).

On the other hand, investors may believe that higher ownership concentration may lead owners to place personal or non-economic considerations (e.g., control and reputation) above the economic considerations of traditional investors (e.g., Brennan & Franks, 1997; Chandler, Payne, Moore, & Brigham, 2019; Leitterstorf & Rau, 2014). Several arguments support this perspective. First, large shareholders tend to be more risk averse, which may discourage larger and more costly investments—especially in early startup stages—that benefit the long-term performance of the firm (Sears, McLeod, Evert, & Payne, 2020). Likewise, higher ownership concentration is associated with increased monitoring activities that slow down decision-making processes. Second, higher levels of ownership concentration may allow owners in controlling positions to extract private and personal benefits from the firm, at the expense of minority owners. Hence, the increased risk to potential investors of the IPO would require a risk premium be factored into the valuation of the IPO, resulting in increased underpricing (Chandler et al., 2019). Third, higher levels of ownership concentration might be interpreted by investors that existing shareholders desire to maintain control after the IPO. In fact, Brennan and Franks (1997) study demonstrates that some initial owners purposefully underprice an IPO in efforts to attract more applications and ensure that there are many small, rather than few large, shareholders in the IPO. Additionally, Certo, Covin, Daily, and Dalton

(2001) found that founder-led firms have greater levels of underpricing—a finding which further suggests that investors are concerned with concentrated control. Altogether, concentrated control of an IPO firm may be associated with restricted investment prior to IPO, a need for increased monitoring, and the ability of controlling shareholders to pursue personal benefits at the expense of the other investors, all of which increase IPO underpricing.

The potential for varying and opposing perspectives about the costs and benefits associated with ownership concentration suggests that this signal is ambiguous or unclear in isolation. So, without additional information that clarifies how the owners intend to manage the IPO process and, subsequently, be involved in the firm after the IPO, uncertainty will remain high. Information asymmetry increases uncertainty, complicates the valuation of firms, and can influence offer prices and investor decisions (Rock, 1986). Research generally reveals that disclosure may reduce problems related to information asymmetry and uncertainty (e.g., Healy & Palepu, 2001). This leads us to consider a more complete model that accounts for the opportunity—specifically through the road show and prospectus development period in the IPO process—to clarify the ownership concentration signal.

Ownership Concentration and IPO Process Time

Higher ownership concentration, where fewer individuals or entities own shares, has shown to increase levels of ownership involvement in the firm leading to a reduction in agency conflicts and lessened coordination costs (Arthurs et al., 2008; Bruton et al., 2010; Lin & Chuang, 2011). However, higher ownership concentration has also been argued to have negative implications; it has been linked to increased conflict amongst stakeholders (Lins, 2003), lower levels of innovation (Morck, Wolfenzon, & Yeung, 2005), lower dividends payout (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 2000), inefficient strategic decisions (Filatotchev, Wright, Uhlenbruck, Tihanyi, & Hoskisson, 2003), and expropriation of minority shareholders (Mitton, 2002). Such implications, as noted in the previous section, suggest that there is a need to clarify ambiguous signals to improve firm outcomes.

The IPO process represents the key period when the owners and managers can disclose and disseminate information about the firm. In the first stage of the process, an investment bank and underwriter are chosen to advise the firm and provide underwriting services. Owners with larger stakes in the firm will likely be more involved in this process because there may be differing opinions about who might be the best potential investors for the firm (Daily et al., 2003; Lowry et al., 2017). Underwriters generally have strong ties to institutional (outside) investors, which may lead to suboptimal (from the

shareholders' perspective) activities as underwriters may place more emphasis on their repeated transactions with their institutional investors than on the relatively infrequent transactions with an IPO firm's owners (Arthurs et al., 2008). Although reputational effects may limit the likelihood of self-interested behavior on the part of the underwriter (Daily et al., 2003), this potentially problematic conflict of interest makes selecting the right underwriter vital for the pre-IPO shareholders (Lowry et al., 2017).

The second stage of the process involves the road show, which represents the primary mechanism by which the firm—through the underwriter—garners interest in the IPO by presenting the firm's prospectus and other information to potential investors (Daily et al., 2003; Lowry et al., 2017; Ritter, 1998). The road show is basically designed to provide potential investors with more and different information than can be found in the written prospectus or easily discerned from existing signals. For example, owners and managers may discuss reasons for the offering, expected governing structures, intentions for the use of proceeds, and growth plans. Additionally, the road show often involves a question-and-answer period allowing investors to ask specific questions about the various qualities of the firm.

The road show—involving both information disclosure and feedback mechanisms—helps determine the stock price, secure early investors, and gauge the potential demand for the firm's stock in the open market (Daily et al., 2003). Primarily, potential investors involved during the road show are either venture capital firms (i.e., firms using other people's money for investing) or business angels (i.e., individuals investing their own personal funds) that have relationships with the underwriter. However, more and more frequently, the road show involves “less road and more show,” meaning that technology is being more specifically utilized to disseminate information about the IPO to investors beyond those directly connected to the underwriter. As such, the specific role that owners play in the past and future operations of the business may be more fully revealed to “outside” investors than ever before. That said, without face-to-face interactions, there may be less opportunity to expose information related to ambiguous signals.

With the multiple relationships that are inherent in the IPO process, information asymmetry and related costs are generally high (Arthurs et al., 2008). Further, as previously noted, investors will vary in their values and beliefs about the firm and have different temporal orientations (Engelen et al., 2020). For example, business angels tend to invest their own capital in early-stage ventures and, therefore, generally do not plan on exiting quickly after the IPO (Drover et al., 2017; Madill, Haines Jr., & Riding, 2005). However, venture capital firms, raise funds from partners (e.g., university endowments and pension funds), and generally “seek to provide a return to these investors through selective

investments into a portfolio of young, innovative companies” (Drover et al. 2017, p. 1821). With venture capitalists, there is often a focus on exiting the IPO quickly so that they may have a quick turnaround for their investment and invest elsewhere (Bruton et al., 2010; Drover et al., 2017). Recognizing that some investors want a quick turnaround of their investment, while others are more committed to the long-term success of the firm (Bruton et al., 2010), the dissemination and clarity of information will be more important to owners with a larger stake in the firm. Hence, more concentrated ownership will likely be associated with a slower process, as larger shareholders will be more involved and promote information dissemination activities.

Overall, when there is higher ownership concentration, owners have more insight and knowledge of the firm and a greater incentive to be involved and oversee the IPO process (Arthurs et al., 2008; Florin, 2003). Therefore, although the underwriter, and some owners, may have incentives to go through the IPO process quickly, high ownership concentration will likely make the process longer and more arduous by demanding more extensive screening procedures and more complex contracts (Bruton et al., 2010). Further, since institutional investors report that the quality of the road show is the key nonfinancial measure in their buying decisions (Ernst & Young, 2008), owners with high ownership concentration are likely to take more time to ensure that all stakeholders (including potential investors) are well informed. Essentially, ownership concentration is likely related to IPO process time because majority owners will attempt to address information asymmetry issues so that their interests are being clearly portrayed. Formally, we state:

Hypothesis 1. Ownership concentration is positively related to IPO process time.

IPO Process Time and Underpricing

The first hypothesis suggests that ownership concentration will influence IPO firm processes such that the overall process time will be extended; this represents the first part of our model that is visually shown in Figure 1. For the second component of the model, we link IPO process time to performance and hypothesize that IPO process time is an important intervening variable (i.e., mediator) between ownership concentration and IPO performance because of its ability to alleviate information asymmetries associated with ambiguous signals.

IPO performance can be measured in a multitude of ways, but the most common indicator is underpricing (Carter & Manaster, 1990; Daily et al., 2003). Underpricing is the percentage difference between the offer price of the

stock immediately prior to the IPO and the stock price at closing of the first day of trading (Daily et al., 2003; Ibbotson, 1975; Ritter, 1998). For the pre-IPO shareholders, money is left on the table if the initial price was undervalued compared to what the market was willing to pay (Daily et al., 2003). For example, if the firm sells 10 million shares at \$15 per share, but the shares trade at \$30 by the end of the day, the share was underpriced by 50%; this value essentially represents unrealized capital of \$150 million. As of result of this misestimation of the firm's market value, new investors capture this value, instead of the initial shareholders.

From a signaling perspective, IPO underpricing represents the costs of information asymmetry about the quality of the firm that goes unresolved (Connolly et al., 2011, p. 42). In other words, underpricing of IPOs can generally be explained by the existence of information asymmetry, where each party associated with the firm has different amounts or qualities of information (Katti & Phani, 2016; Lowry et al., 2017). However, when an IPO firm discloses more information about both past and future intentions, "this information flow shrinks the informational gap between the focal firm and potential investors," reducing underpricing as "potential investors can more precisely estimate the firm's market value" (Bergh et al., 2019, p. 15). Essentially, when there is more information readily available regarding the firm, there is less underpricing because uncertainty is decreased. Therefore, a decrease in information asymmetry results in a decrease in the amount of underpricing (Heeley et al., 2007).

As previously noted, the IPO process represents the important period when information about the firm is disclosed and disseminated. The development and refinement of the prospectus, along with the road show, allow for more detailed information about the firm to be articulated and distributed to potential investors. The road show, in particular, allows for more subjective information—beyond the more objective information provided in the prospectus, like financial statements—to be presented to potential buyers (Daily et al., 2003; Lowry et al., 2017; Ritter, 1998). Essentially, as the IPO process time extends, information is more fully disseminated about missing or ambiguous realities about the firm, lessening asymmetry between all parties (e.g., investors, managers, underwriters, and owners). This decrease in information asymmetry allows a more accurate estimation of the value of the stock, reducing underpricing. Formally, we state,

Hypothesis 2a. IPO process time is negatively related to IPO underpricing.

Considering the arguments presented above, our theoretical model suggests a relationship where the IPO process time—allowing for more

information disclosure and dissemination—mediates the relationship between signals and IPO outcomes. Fundamentally, the information sharing between the signal sender and signal receiver is improved with longer time frames and associated dissemination opportunities; this improves the accuracy of firm valuation. For the IPO, and as previously noted, valuation begins with underwriters setting an initial proposed IPO price before the road show presentation; this price is then adjusted based on investor responses. Hence, there is considerable exchange of information between involved parties, with various stakeholders maintaining different and, often, conflicting interests in the IPO firm (Allcock & Filatotchev, 2010; Arthurs et al., 2008; Bruton et al., 2010). Through the discourse associated with a longer IPO process, involved parties will gain a better understanding of the various qualities of the firm, including the type of ownership and their level of involvement, and how those factors might influence the future of the firm.

Our third hypothesis (labeled as Hypothesis 2b), then, builds on the previous two by arguing that ambiguous or difficult-to-interpret signals regarding the ownership of the firm, and its influence on IPO performance, might be better explained by utilizing an information asymmetry perspective. Specifically, IPO process time is a temporal construct that allows for an improved understanding of the relationship between ambiguous signals and outcomes by measuring the information-based sequential activities that extend the IPO process. Formally, we suggest:

Hypothesis 2b. IPO process time mediates the relationship between ownership concentration and underpricing.

The moderating influence of firm age

In addition to ownership concentration, many studies in the IPO literature have used firm age at the time of IPO as a measure of risk or uncertainty, with results indicating a positive relationship between firm age and IPO performance (Daily et al., 2003; Hoskisson, Johnson, & Moesel, 1994; Mikkelsen, Partch, & Shah, 1997). Indeed, firm age has been shown to increase performance stability because more information is available regarding the firm as it gets older (Daily et al., 2003; Zimmerman & Zeitz, 2002). Research has also shown that, as firms age, more reliable organizational structures and governance processes are developed (Chaganti, Zimmerman, Kumaraswamy, Maggitti, & Arkles, 2016; Renders & Gaeremynck, 2012). In fact, countries with lower average underpricing tend to be those where most IPO firms are relatively large, with longer operating histories (Loughran et al., 1994).

Potential investors can use the additional information available with older firms to learn what the firm has done in the past and inform them about how the firm is likely to handle future decisions; this decreases information asymmetry and associated uncertainty associated with the ownership of the firm (Loughran & Ritter, 2004; McLeod et al., 2018). Generally, we argue that with firm age comes more publicly and readily available information about the firm that can be used in the prospectus and limits or modifies the need for the issuer to divulge more private information about the IPO firm in the road show. In other words, as the firm ages, owners need less time for the road show due to the availability of key information in other forms; the more tangible information already available will decrease the need to disclose and disseminate. Further, more established organizational structures, governance systems, and processes that are found in older firms can reduce the control that majority shareholders (i.e., high ownership concentration) have over the firm, such as diverting assets and cash flows (Renders & Gaeremynck, 2012). This can effectively decrease the ability of owners to influence the IPO process. Indeed, older firms that have these established structures and procedures leave less opportunity for more powerful owners to promote longer process times. This likely smooths the IPO process because routines and governance structures reduce uncertainty about how the IPO process should be accomplished. In contrast, in younger firms—where governance structures are not as developed—ownership concentration may be even more important due to the need to establish monitoring and controls that ensure underwriters are acting in the best interest of the owners. Because mechanisms are already in place in older firms, the firm can proceed through the IPO process quickly, while still ensuring owner interests are being addressed.

Overall, we expect that firm age mitigates the relationship between ownership concentration and IPO process time. First, there may be a lessened need for firms with high ownership concentration to extend the road show due to the availability of information that comes with age. Firm age may essentially serve as a competing or complementary signal since age can be equated with survival and, hence, long-term performance. Second, more established governance mechanisms that come with age may limit the ability of the owners to influence the IPO process. Underwriters will likely speed up the process with less involvement from owners. This mechanism lends itself to better understanding and explaining our theoretical arguments about the role that information asymmetry plays in the level of underpricing in IPOs. Formally, we suggest:

Hypothesis 3. Firm age moderates the ownership concentration to IPO process time relationship such that an increase in firm age will mitigate the positive relationship between ownership and IPO process time.

Data and Methodology

Our sample consists of all United States firms that declared an IPO from 2009 to 2014. Following previous studies of this kind (e.g., Bell, Moore, & Al-Shammari, 2008; McLeod, et al., 2018), data were largely obtained from the Thompson Financial Securities Data Company (SDC) New Issues database and the prospectus of each firm. Only firms making their initial offerings were included; the sample does not include firms that were cross-listed or made seasoned equity offers. We also excluded firms with stock declarations resulting from mergers, acquisitions, spin-offs of publicly listed firms, units, warrants, or rights offerings. Our final sample contained 601 IPO firms.

Variables

Dependent Variable

The dependent variable in our study is *underpricing*. From the SDC Platinum database, we calculated underpricing as the percentage difference between the initial offering price and the stock price at the end of the first day of trading (Daily et al., 2003; Ibbotson, 1975; Ritter, 1998). Therefore, a firm that is underpriced (i.e., the market value of the stock is underestimated) will have a positive number with larger numbers representing higher levels of underpricing, while a negative number indicates the offer price was overpriced (i.e., the offer price was higher than the closing price after the first day of trading) (Krigman, Shaw, & Womack, 1999). A variable that demonstrates a negative relationship with IPO underpricing should be interpreted as having a positive relationship to IPO performance.

Independent, Mediating, and Moderating Variables

Ownership concentration was measured using the Herfindahl index (HHI) of the shareholder ownership of all shareholders owning five percent or more immediately before going public (Herfindahl, 1950; Hernández-Cánovas, Minguéz-Vera, & Sánchez-Vidal, 2014). The HHI is calculated as the sum of the squares of the shareholder ownership

$$H = \sum_{i=1}^N P^2$$

where P is the percentage of shares held by each shareholder, including pre-IPO venture capitalists and institutional investors. Thus, the index considers all pre-IPO shareholders (founders, family member, venture capitalists, and institutional investors) in the calculation of ownership concentration as all must jointly agree on the offer price and the number of shares to be sold (Lowry et al., 2017).

IPO process time is operationalized by the number of days from the company's initial filing date of the IPO to its actual issue date, as reported in SDC Platinum. For example, consider a firm that files a shelf registration on January 1, 2014, for issuing up to \$250 million securities within the next 2 years. Then, half a year later the issuer decides to issue \$150 million off that shelf and files a preliminary prospectus for the offering on July 1, 2014. In this example, the filing date is January 1, 2014, and the launch date is July 1, 2014. If the firm actually issues securities on July 1, 2014, then this would be the issue date as well and the IPO process time would be 181 days. However, if the firm issues securities after the launch, say September 1, 2014, the process time would be 243 days.

Firm age was computed as the number of years between the founding of the firm and the IPO listing year as suggested by Daily et al. (2003).

Control Variables

Many controls were utilized in the analyses including firm size, net proceeds, risk factors, pre-money market valuation, founder involvement, underwriter prestige, and industry effects. Given our focus on signals, our controls built on previous research to help isolate the signal of ownership concentration from other signals or sources of information about the firm.

Firm size is a common control variable used in IPO studies due to its influence on IPO outcomes (Carter & Manaster, 1990; Daily et al., 2003; Ritter, 1991). Following previous research, total assets in millions of U.S. dollars is used as a proxy for firm size (Waddock & Graves, 1997; McLeod et al., 2018). However, as an additional control, we also controlled for *net proceeds* (Moore, Bell, Filatotchev, & Rasheed, 2012).

Risk factors, as listed in the IPO prospectus, are generally used as a control variable in related research (Moore, Bell, & Filatotchev, 2010; Pollock & Rindova, 2003). Firms are required to list the risks that can be associated with investing in the firm, helping investors to determine the uncertainty associated

with any given IPO (Bell et al., 2012; Certo et al., 2001). We summed the number of risk factors listed in each firm's prospectus to produce the risk factor control variable for each firm. In a related fashion, we controlled for *IPO Quality* by using the IPO firm's pre-money market valuation, which is its valuation before the first day of trading (Evert, Payne, Moore, & McLeod, 2018). This measure includes the IPO subscription price, number of shares outstanding, and the number of shares offered in the IPO (Gulati & Higgins, 2003). Further, because founder involvement can also affect the IPO process, we controlled for *founder ownership* as the percentage of equity ownership by the founder(s) prior to IPO.

Underwriter reputation is the prestige associated with an underwriter based on how the underwriter has performed in the past and has been related to IPO performance (McLeod et al., 2018). To operationalize underwriter reputation, we used the underwriter prestige measure developed by Carter and Manaster (1990) that has been extensively utilized in similar studies (e.g., Bell et al., 2012; McLeod et al., 2018; Moore et al., 2012). Underwriter prestige is measured by identifying each underwriter's name in the "tombstone announcements" across IPO prospectuses over yearly time periods. This placement in the tombstone announcement is seen as an important signal of reputation for underwriters (Jensen, 2003; Pollock & Rindova, 2003). This scale ranges from zero to nine and depends on the patterns of name hierarchy in the tombstone announcements.

Finally, *industry* differences can influence IPO outcomes (Bell et al., 2012). Following previous research (Bell et al., 2012; McLeod et al., 2018; Payne et al., 2013), we coded dummy variables to control for eight industries by their Standard Industrial Classification (SIC) code.

Descriptive statistics and correlations for all variables are provided in Table 1.

Analysis and Results

Since our hypothesized model includes conditional indirect effects (moderated mediation), we followed the procedures of Edwards and Lambert (2007) and Hayes (2009) to test our hypotheses utilizing generalized structural equation modeling (GSEM) in Stata 14. GSEM was deemed appropriate because it could test multiple relationships simultaneously and accommodate different forms of variables, such as continuous, binary, ordinal, count, or multinomial (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Shaver, 2005). GSEM is essentially a combination of generalized linear modeling (GLM) estimation and SEM estimation (Zhang & Zhang, 2018); it employs a maximum likelihood estimator and provides consistent and normal

Table 1. Descriptive statistics and correlations.

Variable	Mean	SD	1	2	3	4	5	6	7	8
1 Underpricing	18.29%	40.06%								
2 Ownership concentration (HHI)	0.155	0.184	-0.028							
3 IPO process time	135.945	153.652	-0.086	0.174**						
4 Firm age	10.568	13.768	-0.020	0.170**	0.070					
5 Firm size	579.939	1916.098	-0.038	0.123**	0.055	-0.003				
6 Risk factors	50.083	12.795	-0.172**	-0.133**	-0.032	-0.112**	0.016			
7 Underwriter reputation	7.207	3.275	-0.109*	0.194**	0.062	0.070	0.075	0.186**		
8 Net proceeds (in billions)	0.186	0.702	-0.046	0.078	0.012	0.018	0.063	0.036	0.100*	
9 Founder ownership	0.168	0.271	0.136**	0.014	0.010	-0.089*	-0.078	-0.076	-0.270**	-0.003
10 IPO quality (market valuation in billions)	0.586	2.800	0.003	0.076	-0.011	-0.001	0.063	0.014	0.093*	0.911**
11 Industry 1	0.035	0.184	-0.066	0.066	-0.017	-0.012	0.002	0.002	-0.026	0.026
12 Industry 2	0.223	0.417	-0.030	-0.096*	-0.115**	-0.043	-0.121**	0.130**	0.042	-0.086*
13 Industry 3	0.132	0.338	0.009	0.026	0.046	0.035	-0.035	-0.065	-0.026	-0.035
14 Industry 4	0.033	0.180	-0.045	-0.005	0.071	0.042	-0.021	-0.080	0.005	0.033
15 Industry 5	0.062	0.241	0.118**	0.131**	-0.008	0.213**	0.084*	-0.181**	-0.029	0.005
16 Industry 6	0.213	0.410	-0.181**	-0.125**	0.078	-0.107*	0.119**	0.187**	-0.012	0.028
17 Industry 7	0.253	0.435	0.144**	0.022	-0.009	-0.023	-0.043	-0.083*	0.048	0.065
18 Industry 8	0.048	0.215	0.071	0.141**	-0.014	0.019	0.070	-0.070	-0.063	-0.017
Variable	9	10	11	12	13	14	15	16	17	

(continued)

Table 1. (continued)

Variable	Mean	SD	1	2	3	4	5	6	7	8
10 IPO quality (market valuation)	0.013									
11 Industry 1	0.001	0.008								
12 Industry 2	-0.149**	-0.069	-0.102*							
13 Industry 3	0.030	-0.014	-0.074	-0.209**						
14 Industry 4	0.005	-0.007	-0.035	-0.100*	-0.072					
15 Industry 5	0.045	0.020	-0.049	-0.138**	-0.100*	-0.048				
16 Industry 6	0.003	-0.063	-0.099*	-0.279**	-0.203**	-0.097*	-0.134**			
17 Industry 7	0.071	0.127**	-0.111**	-0.312**	-0.227**	-0.108*	-0.149**	-0.303**		
18 Industry 8	0.040	-0.006	-0.043	-0.121**	-0.088*	-0.042	-0.058	-0.117**	-0.131**	

* p < 0.05; ** p < 0.01.

estimates for paths (Finney & DiStefano, 2006). Consistent with previous GSEM research, our results are not shown in a comparison of models but, rather, are discussed in text and shown in the full model labeled Figure 2 (Welsh, Kaciak, & Shamah, 2018). Finally, we used 1000 bootstraps to compute bias-corrected standard errors in our tests of hypotheses (Hayes, 2009; 2017).

Analysis of outliers identified five observations with large, positive values for underpricing that overly influenced parameter estimates in our statistical analyses. Upon investigation, we found each of these observations was penny stocks that met our sampling criteria, and none were errors. Therefore, to control for extreme values and reduce the effects of outliers, we winsorized underpricing at the one percent level (Petrenko, Aime, Ridge, & Hill, 2016; Singal & Singal, 2011). We compared the results of GSEM analyses using winsorized values for IPO underpricing to the results with non-winsorized values that excluded these observations (Aguinis, Gottfredson, & Joo, 2013). While the patterns of signs and significances did not vary between analyses, the non-winsorized values of the sample without these observations resulted in larger effect sizes. Given their more conservative effect sizes, we utilized the winsorized values for underpricing in the results reported below.

The results of the GSEM supported all four of our hypotheses. As stated in Hypothesis 1 (H1), ownership concentration—as measured by the HHI index—has a positive and significant relationship to IPO process time ($\beta = 196.91, \sigma = 45.64, p = 0.000$). In support of Hypothesis 2a (H2a), our results

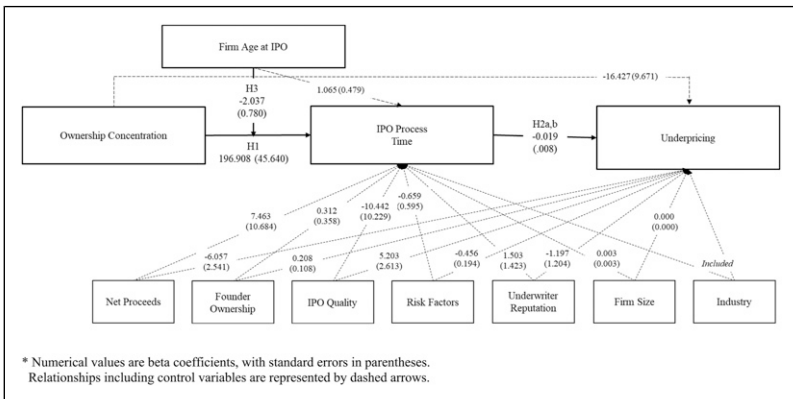


Figure 2. Full model with results and control visually demonstrated.

show IPO process time has a significant, negative effect on underpricing ($\beta = -0.019$, $\sigma = .01$, $p = 0.020$) while controlling for ownership concentration; this indicates that IPO process time reduces underpricing. In Hypothesis 2b (H2b), we hypothesized IPO process time would mediate the relationship between ownership concentration and underpricing. The results from H1 and H2a suggest support of our mediation hypothesis based on the following: 1) our IV (ownership concentration) is significantly related to our mediator (IPO process time), 2) our mediator is significantly related to our DV (IPO underpricing), and 3) the direct effect of our IV on IPO underpricing is insignificant when our mediator is also included as predictor variable (Baron & Kenny, 1986). We further assessed mediation using 1000 bootstraps to compute bias-corrected standard errors in our tests of hypotheses (Edwards & Lambert, 2007; Hayes, 2009; 2017); this test indicates that ownership concentration has a significant, unconditional, and indirect effect on IPO underpricing through the mediation of IPO process time ($\beta = -3.78$, $\sigma = 1.71$, $p = 0.026$). Coupled with the statistical results for H1 and H2a, our findings suggest that IPO process time fully mediates the relationship between ownership concentration and underpricing. Additionally, results of testing conditional indirect effects also support Hypothesis 2b (one standard deviation below the mean: $\beta = -3.91$, $\sigma = 1.76$, $p = 0.026$; one standard deviation above the mean: $\beta = -2.83$, $\sigma = 1.31$, $p = 0.031$). Finally, firm age at the time of IPO shows to negatively moderate the relationship between ownership concentration and IPO process time, thus supporting Hypothesis 3 ($\beta = -2.04$, $\sigma = 0.78$, $p = 0.009$). However, upon visual examination of the moderating relationship (see Figure 3), the relation appears more complex than initially expected. It is worth noting that while the slope of the line changes in the expected direction with the moderation, the firm age variable largely influences cases that are lower in ownership concentration. These findings are considered further in the Discussion section.

To confirm the performance of the GSEM, we calculated two information criteria to compare the accuracy of the GSEM model to SEM, assuming all observed variables to be continuous and all relationships to be linear. We used the goodness-of-fit indices offered by the GSEM procedure (Welsh et al., 2018): Akaike's (1974) information criterion (AIC) and Schwarz's (1978) Bayesian information criterion (BIC). AIC (Akeike, 1974) is defined as

$$AIC = -2\ln L + 2k$$

where $\ln L$ is the maximized log-likelihood of the model and k is the number of parameters estimated. Similarly, BIC (Schwarz, 1978) is defined as

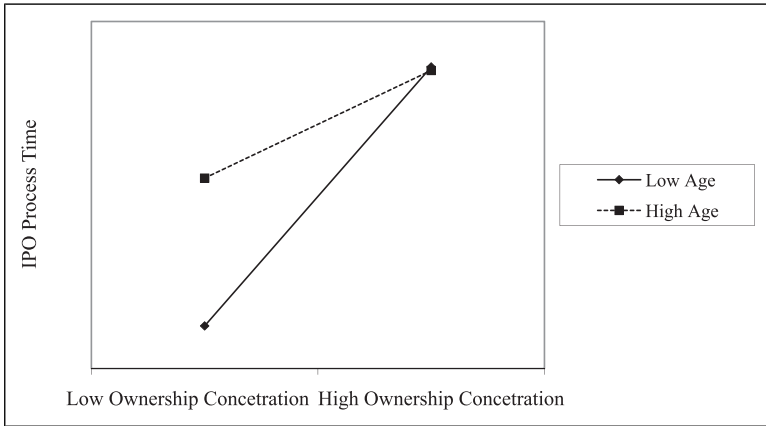


Figure 3. Moderating effect of firm age on the ownership concentration—IPO process time relationship.

Table 2. Generalized structural equation model results.

Variable	DV = IPO Process Time		DV = IPO Underpricing	
	Coef. (SE)	<i>p</i>	Coef. (SE)	<i>p</i>
Intercept	89.011 (40.889)	*	41.446 (18.167)	*
Industry 2	1.815 (19.592)		10.224 (5.484)	
Industry 3	36.813 (21.628)		11.121 (6.366)	
Industry 4	66.043 (43.920)		3.884 (8.154)	
Industry 5	-0.448 (32.401)		28.796 (12.165)	*
Industry 6	46.054 (22.385)	*	-1.110 (4.835)	*
Industry 7	18.063 (17.960)		19.054 (6.037)	*
Industry 8	-6.657 (25.994)		25.130 (16.983)	*
Risk factors	-0.659 (0.595)		-0.456 (0.194)	*
Firm size	0.003 (0.003)		0.000 (0.000)	
Net proceeds	7.463 (10.684)		-6.057 (2.541)	*
Founder ownership	0.312 (0.358)		0.208 (0.108)	*
IPO quality (market valuation)	-10.442 (10.229)		5.203 (2.613)	*
Underwriter reputation	1.503 (1.423)		-1.197 (1.204)	
Firm age at IPO	1.065 (0.479)	*		
Ownership concentration (HHI)	196.908 (45.640)	*	-16.427 (9.671)	
Firm age × IPO process time	-2.037 (0.780)	*		
IPO process time			-0.019 (0.008)	*

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

$$\text{BIC} = -2\ln L + k\ln N$$

where N is the sample size. For the AIC and BIC, the smaller the values are, the better the goodness of fit. The GSEM procedure resulted in smaller values of both AIC and BIC (AIC = 11,622.41; BIC = 11,732.13) than the corresponding SEM model (AIC = 22,486.33; BIC = 22,543.99), each of which indicates better fit of the model estimated using GSEM.

Overall, the findings indicate that the GSEM was, in fact, the correct model to use. However, we ran an additional model—as a robustness check—that included a control variable for *Geography*. Geography has been shown to influence the IPO process (Zacharakis & Shepherd, 2001) and significantly reduce IPO underpricing (Bell et al., 2008). Therefore, we controlled for this by the state in which the IPO is located using indicator dummy variables for each state. The model remained consistent and significant, showing general support for the model ($\beta = -2.703$, $\sigma = 1.218$, $p = 0.026$). However, because the AIC and BIC (AIC = 11,669.27; BIC = 12,009.61) for this model were higher than the corresponding model (that did not include the control for geography), we report results using the original GSEM (Table 2).

Discussion

Our findings are generally consistent with the foundational work of Rock (1986), as well as more recent studies that show the importance of information asymmetry to IPO underpricing (e.g., Boone, Floros, & Johnson, 2016; Chaplinsky, Hanley, & Moon, 2017). However, while we support an asymmetric information perspective of IPOs and underpricing, our model allows for a more comprehensive and informative study that helps clarify the mechanisms through which signals ultimately influence outcomes. Essentially, by theorizing and testing a process model, we demonstrate how the time devoted to disseminating information via the road show and prospectus can influence signal interpretation and related outcomes. As such, our study makes some unique contributions to the extant literature and has implications for both the more specific context of IPOs and the broader research domain surrounding signaling theory and information asymmetry.

As a first contribution, and more specific to IPOs, our study demonstrates that the time utilized for the development of the prospectus and the IPO road show is an essential component in understanding how underpricing can be managed through the reduction of information asymmetry associated with some signals. In situations of incomplete or imprecise information, investors—presumably along with other stakeholders—must rely on ambiguous signals to make sense of firm information; this leads to less-than-ideal

outcomes. To address information asymmetry concerns, owners, managers, and underwriters of IPO firms should consider the various ways to manage the process, particularly regarding the distribution of information that is tied to the IPO (e.g., Mumi, Oba, & Yang, 2019). As shown in our study, when the IPO process time is extended (assuming activities are ongoing regarding the dissemination of important information), asymmetry is reduced for all parties involved, which enables more accurate valuation of the IPO firm and more optimal outcomes. This is consistent with and builds upon Park and Patel's (2015) findings that IPO underpricing is lower when the prospectus contains less ambiguous information, as it creates a more reliable signal that conveys the true quality of the IPO firm.

Some recent work on the marketing of IPOs is supportive of our findings as well. For instance, Ma, Dewally and Huang (2017) demonstrated that marketing expenditures or marketing intensity can improve a firm's information transparency post-IPO. Generally, this body of work supports the argument that marketing intensity is associated with perceptions of quality and value (Luo, 2008; Kurt & Hulland, 2013). While we do not measure marketing efforts, there is the underlying expectation that the IPO process, through the efforts of the underwriter, is essentially "marketing" the firm to investors. And, with adequate time and effort, the amount and quality of information disseminated to the audience is higher. Additionally, past research demonstrates the important and unique role that the media—both traditional and social—plays in signaling qualities of an IPO (e.g., Mumi et al., 2019; Pollock & Rindova, 2003). We suggest that future research should extend on our work—and those using a marketing or media-based perspective—to better understand the type of activities that take place during this IPO process period and how those activities specifically influence outcomes. Further, research should more thoroughly examine how signals are portrayed to audiences to better understand mechanisms through which signal receivers assimilate and utilize information. For example, a recent study by McLeod and colleagues (2022) finds that framing the IPO prospectus using more logos (i.e., logical) argumentation to support financial data may be counterproductive. Rather, prospectus authors should focus more on framing with stronger pathos (i.e., emotional) and ethos (i.e., ethical) arguments to supplement the more objective data provided in the prospectus.

The importance of the IPO process time mediator, however, can only be fully recognized in the presence of a signal that has the potential to be interpreted in multiple ways by the intended audience or audiences. As previously discussed, ownership concentration was utilized because it can be perceived of differently by different groups of receivers, also referred to as signal interpretation (e.g., Suazo, Martinez, & Sandoval, 2009). In other

words, this signal has potentially different meanings for different investors. Ownership concentration can signal positive qualities such as better monitoring, improved coordination, and smaller agency costs. However, concentrated ownership can also signal innovation limitations, inefficient strategic decision-making, and increased conflict (Bruton et al., 2009). As such, concentrated ownership will likely lead to an extension of the IPO process in efforts to both resolve the ambiguity and reduce information asymmetry associated with the signal. Restated, when there is higher ownership concentration, owners are more likely to ensure that monitoring processes are in place and information is accurately disseminated to all potential investors by extending the road show and slowing the IPO process; this is an important practical finding because it provides a mechanism that helps explain how ownership structure might be linked to IPO outcomes. This contributes to the extensive governance research that has explored the role of ownership in IPOs—in various forms—and in other business contexts (Bruton et al. 2010; La Porta et al., 2000; Lins, 2003).

As a second contribution, we also find that the relationship between ownership concentration and IPO process time can be moderated by firm age. Specifically, we argue (and test) that older firms ease investor concerns due to the decrease in information asymmetry. Essentially, we contend that, in the presence of more information about the firm (due to firm age), highly concentrated owners will feel less compelled to extend the IPO process time. While logically sound, this argument may be lacking in its comprehensiveness, as Figure 2 seems to suggest. It appears that in situations where there is less concentration of owners, young firms will see a speedier IPO process. Perhaps there is less information to divulge and verify in younger firms, making the process less time intensive. As such, less information-intensive and/or more subjective signals may become more important. Alternatively, younger firms may be compelled to quickly enter new or fast-growing markets because of time-sensitive consumer issues or a desire to be first to market with a new technology. Previous research has noted the importance of “hot” markets where high public market valuations and multiple high-profile IPOs can initiate a rush of founders, investors, and capital into a particular industry (Bermiss, Hallen, McDonald, & Pahnke, 2017; Gulati & Higgins, 2003). Examining signals and process speed within hot and cold IPO markets, or across varying industries, might reveal new insights into when and how ambiguous signals matter.

While the implications to the IPO literature are relatively straightforward, the importance of signal clarity and information asymmetry cannot be understated. Associated research has discussed the importance of many related attributes of a signal, including strength, fit, and consistency, which are terms

commonly used synonymously (Connelly et al., 2011). As demonstrated herein, the opportunity to disclose and disseminate information about a firm can influence how a signal—particularly an ambiguous or mixed signal—is received and acted upon. Broadly, our results highlight the importance of time in signaling theory, as it can play a role in reducing information asymmetry between signal senders and receivers. Future research should expand on this study to explore additional signals that may allow for mixed interpretations, both in the IPO context and outside of it. More specifically, practitioners could benefit from understanding practical ways that ambiguous signals might be improved or managed so that they are more effective mechanisms for communication. For instance, job applicants may view potential employers differently, based on the same exact signal, according to their social identity (Highhouse, Thornbury, & Little, 2007). Properly managed, signals can be tailored toward attracting or dissuading certain receiver groups.

This study also has limitations that can suggest areas of future research. For example, we focused on U.S. IPO firms. Although we expect findings to be generalizable to other developed economies, future research should ask if similar results would be found in emerging markets. It has been documented that emerging markets and transition economies may behave differently than developed economies (Faccio, Lang, & Young, 2001; Dharwadkar et al., 2000; Su, Xu, & Phan, 2008). Second, we primarily considered the ambiguous signal of ownership concentration, while many signals must be considered simultaneous by investors. Wang, Qureshi, Deeds, and Ren (2019), using a configurations perspective (e.g., Short, Payne, & Ketchen, 2008), demonstrate that ventures should present multiple signals—covering a variety of content such as technology development, venture officers, and early investors—to raise the most capital in an IPO. Future research should give further consideration to how signals—particularly ambiguous or mixed signals—might substitute or complement each other. Indeed, we only identified firm age as a potential moderator of the ownership concentration to IPO process time relationship. Other potential moderators of this relationship could be examined instead of, or in addition to, firm age; such studies might reveal new and interesting findings. For example, top management team research is growing in the IPO literature (Chaganti et al., 2016). Future research could examine how TMT characteristics and governance structures moderate the signal to process time relationship, or even consider a direct relationship. Also, the issues of opportunism and hype may be key topics that are worthy of exploring in relation to IPO process time. Underwriters, in particular, have reportedly utilized self-interested hyping strategies—laddering (e.g., Hao, 2007), spinning (e.g., Loughran & Ritter, 2004), and

gaining favorable analyst coverage (e.g., Dambra, Field, Gustafson, & Pisciotta, 2018)—to influence outcomes.

Conclusion

Our research provides strong evidence of the importance of signals and information asymmetry in the IPO process and IPO outcomes. Specifically, we show that IPO process time—as an opportunity to alleviate information asymmetry—can be a powerful way of overcoming ambiguous or mixed signals and, subsequently, improve underpricing. It also demonstrates that IPO process time is affected by ownership concentration, which can be partially mitigated by firm age at the time of IPO. Increased levels of ownership concentration have a strong impact on IPO process time and the role of ownership should be a major consideration for firms starting the IPO process. Future research should build on the findings of this study to further explicate the constructs in this model to better understand how firms can demonstrate their quality and perform better long term. More broadly, a better understanding of the nature of ambiguous or mixed signals—where receiver groups may differ in their perceptions, and subsequent actions—is particularly needed.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Curt B. Moore  <https://orcid.org/0000-0002-8757-2858>

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Submitted Date: August 31, 2020

Revised Submission Date: February 25, 2022

Acceptance Date: March 7, 2022