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SMALL-FIRM UNIQUENESS AND SIGNALING THEORY

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ABSTRACT

The purpose of this paper is two-fold. First, we develop a theory of small firm uniqueness. Instead of using an exogenous definition of firm size typical of the extant literature, we allow firms to choose whether they are a "small firm" through the instrument of the SEC's SB-2 program. Second, we test empirical hypotheses that follow from the theory. We find strong empirical evidence in support of the small-firm uniqueness theory.

1. INTRODUCTION

Are small firms unique—different from the traditional large corporations studied in the extant literature? Ang (1991) is one of the first to offer the small-firm uniqueness hypothesis. We extend his argument through both theory and empirics. To effectively address this research question, two crucial objectives must be achieved. First, to justify testing, a thoughtful theory must be built to validate whether the question adds value to the field. We rely on the entrepreneurial finance and mainline finance literature to build such a theory. Second, an empirical instrument must be found that can reasonably define a *small firm*. The SB-2 program offers a unique instrument (that to our knowledge has not been used before) to define small firms. With the SB-2 instrument, we are able to design new empirical models to test predictions of the small-firm uniqueness theory. The SB-2 program does not base its definition of size on annual sales, market capitalization, number of employees, or any of the other traditional measures. Instead, we only examine firms with less than $25 million in annual sales and market capitalization. These size firms have the options of participating in the SB-2 (i.e., small business) offering prospectus program or in offering a mainline IPO (using the SEC's S-1 prospectus program). In our tests, we match SB-2 firms with S-1 firms by traditional measures of size so the instrument of the SB-2 program is the instrument of separation.

Extending the IPO lockup theory of Brau, Lambson, and McQueen (2005), we argue that if small firms are unique from non-small firms, various signals will create a separating equilibrium between the two types of firms and small firms will have distinct factors from non-small firms. From the extant literature, we draw four measures of signaling: lockup length, auditor prestige, underwriter reputation, and venture capital backing (Brau and Johnson (2009) among many others). Our empirical analysis, using both pooled and paired-sample matching, indicates that small firms are unique. For example, small firms have on average 170- to 178-day longer lockup periods. This difference is startling, considering the typical S-1 firm has a boilerplate number of 180 days in lockup (Brau, Carter, Christophe, and Key (2004)). Non-small firms use a Big-Six auditor 95% of the time to go public, compared to 58% of SB-2 IPOs. For the underwriter reputation measurement, non-small firms' underwriters have a reputation that is 10 times better than small firm underwriters. Finally, non-small firm IPOs in our sample are backed by venture capitalists 69% of the time, compared to only 22% for small-firm IPOs. In multivariate tests, controlling for possible confounding effects, all of these findings persist. In sum, our tests strongly support the notion that the SB-2 instrument is effective in defining small firms from large firms and in providing evidence in favor of the small-firm uniqueness hypothesis.

2. LITERATURE REVIEW

For our purposes, assume that two types of firms exist, small firms and non-small firms.[1] We base our theory of small firm uniqueness on three theoretical concepts, signaling theory, agency theory, and asymmetric information.

2.1 Ipo Lockup Period Length and Signaling Theory

Signaling theory advances the notion that certain firms can take actions that are too costly for mimickers to take. For example, pertaining to IPOs, Brau, Lambson, and McQueen (2005) show that the retained ownership and the IPO lockup period can serve as such signals. Consider their Equations 2 and 3,

(2) $\beta\mu_g - k\beta^2\sigma^2(L,\alpha)$, subject to

(3) $\beta\mu_g - r\beta(\mu_g - \mu_b) - k\beta^2(\mu_g - \mu_b)^2(r - r^2) - k\beta^2\sigma^2(L,\alpha) \leq \mu_b$.

Where β is the fraction of firms retained by insiders in the IPO, L is the lockup length, μ_g is defined as $\mu_b + C + (B\text{-}C)$ where μ_b is the value of a mimicking firm, C is the investment required to substantiate the signal, B is the return of the investment, (so B-C is the net present value), $\sigma^2(L,\alpha)$ is the idiosyncratic risk of the post-lockup payment due to uncertainty of the firm's project where α denotes greater variance, $\beta^2(\mu_g - \mu_b)^2(r - r^2)$ is the information risk, and *k* follows from the assumption of standard mean-variance utility of insiders. As can be seen from this constrained maximization problem, IPO issuers choose β and *L* to maximize their utility. So, good firms will choose β and *L* that are too high for mimickers to accept and thus a separating equilibrium is achieved.[2] Just as with retained ownership and lockup length, non-small firms may be able to send signals that small firms cannot send. Thus, signaling theory suggests that non-small firms may be able to send signals that small firms cannot send. This general theoretical statement generates four specific, empirical hypotheses.

First, following Courteau (1995) and Brau, Lambson, and McQueen (2005) the length of the lock up period may be a separating equilibrium for small firms vis-à-vis non-small firms. Previous empirical literature provides evidence that the length of the lockup is viewed as a positive signal (e.g., Field and Hanka (2001). The longer the lockup, the greater the probability any negative news withheld by an issuing firm will be revealed to the market. On average, the great majority of IPOs have a lockup period of exactly 180 days in the US (Field and Hanka (2001)). Among mainline IPO studies, any variation from the boilerplate 180 sends a significant signal (Brau, Lambson, and McQueen (2005)). If small firms are unique in the sense that they cannot send the same signals that non-small IPOs can send, and if small firms are of greater risk, then the signaling theory outlined above specifically predicts our first testable hypothesis:

H1: Small-firm IPOs have higher average lockup lengths than non-small-firm IPOs.

2.2 Third-Party Certification and Signaling Theory

Another component of signaling theory is the role of third-party certifiers in the IPO process (see Brau and Johnson (2009)). The theoretical link is as follows. Issuing firms can hire prestigious third-party certifiers, such as auditors and underwriters as a positive signal to the market. These third-party certifiers possess valuable reputation capital ((Dunbar (2000) and Karpoff, Lee, and Martin (2008)). Consistent with the argument that underwriters have considerable reputation capital at stake, Dunbar (2000) documents significant investment bank market share impacts (both positive and negative) depending on how underwritten securities perform. Additionally, Karpoff, Lee, and Martin (2008) find significant reputation damages (the market cap drop is 12 times the sum of all penalties imposed through the legal and regulatory process) to parties involved in negative SEC enforcement.

If small firms differ from non-small firms based on signaling theory, then the loss of reputation capital of the third-party is the cost that creates the separating equilibrium. Prestigious third-parties are not willing to take the risk of losing reputation capital on certain firms, in our testable case, small firms.

[1] In the next section we will cover our definition of small firm, along with those previously used in the literature.
[2] For a complete derivation of the theoretical economic model, see Brau, Lambson, and McQueen (2005), especially Appendix A.

2.3 Auditor Prestige and Signaling Theory

Firms must report three years of audited financial statements in the IPO offering prospectus. Previous literature argues that engaging a prestigious auditor to do this is a signal of firm quality (Titman and Trueman (1986), Beatty (1989), Datar, Feltham, and Hughes (1991), Teoh and Wong (1993), and Michaely and Shaw (1995)). Firms that have high quality accounting standards can certify this via the prestigious accounting firms (Daily, Certo, Dalton, Roengpitya (2003) and Brau and Johnson (2009)). As an example of how prestigious auditors can impact the IPO process, consider the work on earnings management by Teoh, Welch, and Wong (1998A), Teoh, Wong, and Rao (1998), DuCharme, Malatesta, and Sefcik (2004), Teoh and Wong (2002), Darrough, and Rangan (2005), and Brau and Johnson (2009). Firms conducting an IPO can work within the Financial Accounting Standards Board's (FASB) Generally Accepted Accounting Principles (GAAP) to legally and strategically manage accruals to make their financial statements look as strong as possible. Under GAAP, the accrual accounting system provides managerial discretion as to recognizing both the timing and amount of revenues and expenses (Teoh, Welch, and Wong, 1998A, B). Brau and Johnson (2009) provide evidence that prestigious auditors are significantly correlated with more conservative earnings management. Couple this finding with that of Teoh, Welch, and Wong (1998A) who show that IPOs with conservative-earnings management significantly outperform IPOs with aggressive-earnings management and one can see how a prestigious auditor can serve as a positive signal of IPO firm quality.

Relying on the theoretical development above, if signaling theory can discern if small firms differ uniquely from non-small firms, then we arrive at our second testable hypothesis:

H2: Small-firm IPOs will have lower-prestige auditors vis-à-vis non-small-firm IPOs.

2.4 Underwriter Prestige and Signaling Theory

Along with prestigious auditors, firms may hire highly-ranked investment banks to underwrite the IPO issue.[3] Underwriters can serve as either brokers (a best efforts issue) or as dealers (firm commitment issue) (Chua, 1995, and Guenther, 1992). In a best efforts issue, the underwriter works to arrange buyers for the original IPO shares, but the underwriter never takes possession of the shares. In this sense, a best efforts issue is like a real estate broker, who will find a buyer and seller for a property, but will never own the property during the transaction. In a firm commitment issue, the underwriter purchases the shares at a discount from the issuing firm, owns them temporarily, and then sells them into the primary market. In a firm commitment, the underwriter is more like a car dealer, who must buy the vehicles, own them temporarily, and then sell them. Although in the 1970s and 1980s, best efforts issues were fairly common, by the 1990s, firm commitments dominated the IPO landscape. When an IPO firm hires a prestigious underwriter for a firm commitment issue, a positive signal is sent that the underwriter will take the risk of owning the shares during the offering process. Even though the time of ownership is not great, the risk of ownership is real (Booth and Smith, 1986) and Beatty and Ritter, 1986)). Previous studies have shown that prestigious underwriters have measurable impacts on the initial underpricing and long-run performance of IPOs, adding evidence that they can serve as a positive signal (Carter and Manaster, 1990; Carter, Dark, and Singh, 1998; and Bruton, Chahine, and Filatotchev, 2009). Thus, signaling theory offers this testable hypothesis:

H3: Small-firm IPOs will have lower-prestige underwriters vis-à-vis non-small-firm IPOs.

2.5 Venture-Capital Backing and Signaling Theory

A final third-party certifier that can serve as a signal is the backing of a venture capitalist (Megginson and Weiss, 1991; Barry, Muscarella, Peavy, and Vetsuypens, 1990; Brav and Gompers, 1997; and Cyr, Johnson and Welbourne, 2000). For an entrepreneurial firm to obtain VC financing, it must successfully make it through multiple screens. As practitioners and academics know alike, obtaining VC financing is very difficult. The presence of VC backing thus can serve as another separating equilibrium according to signaling theory. Firms that possess VC backing send a positive signal to the market (Cyr, Johnson, and Welbourne, 2000; Brau and Johnson, 2009). Several studies and much of the extant literature examine and present venture capitalists as value-added investors who assume an active role in their entrepreneurial enterprises (Bygrave and Timmons, 1992). They are highly incentivized to add value to the companies they back because their compensation is tied to that firm's performance. They are motivated to provide the necessary resources, including their knowledge of raising capital, suppliers, and customers to assure the success of the venture.

[3] See Ellis, Michaely, and O'Hara (1999) for an excellent overview of the IPO process.

In sum, VC-backed firms signal that they have taken an action that non-VC-backed firms cannot or do not choose to make. Thus, signaling theory predicts:

H4: Small-firm IPOs have less VC-backing than non-small-firm IPOs.

2.6 Small Firm Instrumentation

A debate has existed in the entrepreneurship literature pertaining to the definition of "small" or "entrepreneurial" firms for decades (see Ang, 1991; Osteryoung and Newman, 1993; and Constand, Osteryoung, and Pace, 1994). The one similarity between all of the definitions of small firms is that they are defined by exogenous sources, such as the SBA, analysts, researchers, or banks. What if there was a way to allow firm insiders to self-select or classify their own firms as either a small firm or not a small firm? The SB-2 program allows this precise choice, which makes the definition of a small firm an endogenous decision of insiders.

Consider two firms, one a small firm and one a non-small firm. We follow the literature by parsing firms into small firms for the sake of entrepreneurial study. It is important to note, however, that the actual size of a firm may not be the defining characteristic of a "small firm". The SBA defines a small business as having less than a certain number of employees depending on industry classification. For example, in the manufacturing sector, the SBA classifies a small firm as one with less than 500 to 1000 employees depending on the type of product manufactured. In the wholesale sector, the maximum number of employees may range from 100 to 500 depending on the product being provided[4]. While this objective cutoff allows for precise definitions of small firms, it ignores other dimensions of size, such as market capitalization, sales, assets, etc. Perhaps more importantly, it also ignores the vision and intent of the principals of the firm. Constand, Osteryoung, and Pace (1994) attempt to substantiate the efficacy of the SBA's employee-based definition of a small business. The primary approach of their study is to test for relationships between a firm's number of employees and a variety of financial and operating ratios. Constand, et al. (1994) find that employee count explains less than two percent of the variation in firm characteristics. They conclude that there is little evidence that supports using the number of employees as a method of defining a small business Constand et al.'s lack of support for the standard SBA definition of a smaller firm motivates our proposal of a new approach.

Although we believe we are the first to use the SB-2 as an instrument to define firm size, we are not the first to study small firm uniqueness in an entrepreneurial finance setting. Ang (1991) presents a conceptual discussion with most of his comparisons between privately-held and publicly traded firms. Ang builds his theory of small-business uniqueness based on agency theory, asymmetric information, failure costs, taxes, and transaction costs. Using a combination of these theories, he defines seven possible identifiers that may help classify a firm as a "small firm". From Ang, "For the sake of being able to present a more interesting analysis and to stimulate discussions, a business is classified as small if it possesses most of the following characteristics: a) no publicly traded securities, b) owners have undiversified personal portfolios, c) limited liability is absent or ineffective, d) first generation owners are entrepreneurial and prone to risk taking, e) the management team is not complete, f) experiences high cost of market and institutional imperfections, g) relationships with stockholders are less formal, and h) it has high degree of flexibility in designing compensation schemes" (1991). While informative, Ang's list is difficult to quantify, particularly into one instrument. The SB-2 program presents a unique laboratory for us to test the small-firm uniqueness hypothesis. We extend the premise that small firms are unique from non-small firms by comparing firms that raised capital using the SB-2 program to firms that used the traditional S-1 IPO program.

2.6.1 Direct comparison of SB-2 and S-1 IPOs

The empirical implication of our paper is to determine if SB-2 IPOs differ from mainline S-1 IPOs based upon the four previously-discussed testable predictions of signaling theory. One possibility is that SB-2 IPOs are simply firms that would like to be mainline (i.e., use the S-1 form), but are not strong enough to do so. Another possibility is that SB-2 IPOs are of equivalent quality to S-1 IPOs but wish to take advantage of the "streamlined" SB-2 process. In this section, we test to determine if such theories have efficacy. As previously discussed, signaling theory suggests that better firms can signal their higher quality by engaging prestigious third-party certifiers (i.e., auditors, underwriters, and VCs). We proxy for prestigious auditors by creating a dummy variable that equals one if the firm used a Big Six accounting firm to audit the IPO prospectus financial statements. We consider Arthur Andersen, Coopers and Lybrand, Deloitte and Touche, Ernst and Young, KPMG, and PriceWaterhouseCoopers as the Big Six auditors. We include international arms and predecessors as part of the Big Six. We retrieve the identification of the auditor from Security Data Company's New Issues

[4] http://www.sba.gov/content/what-sbas-definition-small-business-concern

Database (SDC). A few key articles that have studied auditor impact on firm quality are Titman and Trueman (1986), Beatty (1989), Datar, Feltham, and Hughes (1991), Teoh and Wong (1993), and Michaely and Shaw (1995). Our measure of underwriter prestige, *UW Rank*, is a modification of Brau and Johnson's (2009) measure which creates a ranking of 1–100 based on the number of IPOs each lead underwriter facilitated in a given year. We define the lead underwriter using SDC. For deals with more than one lead underwriter, we average the scores of the co-lead underwriters. Examples of articles that examine underwriter reputation and quality certification are Booth and Smith (1986), Beatty and Ritter (1986), Carter and Manaster (1990), and Carter, Dark, and Singh (1998).

The other certification variable, venture capital backing, takes the value of one if the IPO had VC-backing prior to the issue date and zero otherwise. We use SDC to classify an IPO as VC or non-VC backed. Articles that discuss the impact of VC-backing include Megginson and Weiss (1991), Barry, Muscarella, Peavy, and Vetsuypens (1990), Brav and Gompers (1997), and Cyr, Johnson and Welbourne (2000). The non-certification variable we use to proxy for a signal in the IPO is the lockup length. We retrieve the number of days in lock up from SDC. Prior literature documents that the typical lockup length is 180 days for the large majority of IPOs (Field and Hanka (2001) and Brau, Carter, Christophe, and Key (2004)).

2.6.2 Control Variables

Empirically, we must control for other factors which may explain the signaling theory variables so we do not attribute explanatory power to the SB-2 instrument when it is actually some other effect. We rely on previous literature to identify these proxies. The objective is to control for factors which may measure quality or some other impact on the signaling variables, as opposed to the classification of being an SB-2 or SB-1 IPO. We introduce these control variables only briefly, as they are not the focus of the paper and we provide citations for the interested reader. Measures that have been used as proxies for firm quality previously have been *Sales* (Purnanandan and Swaminathan (2004)), *Cash flows* (Livnat and Lopez-Espinosa (2008)), the *Exchange* the firm is listed on (Bradley and Jordan (2002)), *Return on assets* (*ROA*) (Chen, Novy-Marx, and Zhang (2010)), *Age* of the firm (Loughran and Ritter (2004)), firm *Debt ratios* (Cotter and Peck (2001)), the state of incorporation (*Delaware corp*) (Boulton (2010)), IPO offer size (i.e., the public float) (Bradley and Jordan (2006)), internet-IPO offering (Loughran and Ritter (2004), and dual-class IPO offering (Smart and Zutter (2003)). We retrieve sales, cash flows, ROA, total debt, total assets, and state of incorporation from Compustat for the fiscal year immediately prior to the IPO date. The listing exchange, VC-backing status, offer size, and lockup length are retrieved from SDC's New Issues database. We create a dummy variable for Exchange which equals one if the firm listed on the NYSE, AMEX, or Nasdaq's National Market and zero otherwise. Age is computed as the IPO date minus the firm founding date. IPO dates are taken from SDC and founding dates are taken from Jay Ritter's data website based on Loughran and Ritter (2004). For subsequent regression models, we use the natural logarithm of one plus the firm age. Internet-IPO flag and Dual-Class IPO flag are from Jay Ritter's data webpage and based on Loughran and Ritter (2004).

3. METHODOLOGY AND DATA

Our initial sample of SB-2 and S-1 IPOs is drawn from SDC's New Issues database. From 1/1/1993 through 12/31/2008, SDC reports 4,411 IPOs. These dates are chosen because they represent the period in which the SB-2 program is in place and for which CRSP data is available to create one-year abnormal returns. Next, we merge the sample with Compustat data to obtain the pre-IPO sales level, the qualifier for the SB-2 program. We are able to successfully match 4,118 of our SDC firms with Compustat data. Our initial desired sample is all SB-2 and S-1 firms with less than $25 million in sales in the fiscal year immediately before the IPO. Firms that have less than $25 million in sales at the IPO can theoretically choose between filing an SB-2 or an S-1 form with the SEC.[5] After removing IPOs with greater than $25 million in sales, we are left with 1,930 observations. We then successfully merge all 1,930 of these observations with CRSP data. We exclude all financial firms which leaves 1,899 IPOs in our final pooled sample with 1,356 S-1 IPOs and 543 SB-2 IPOs. We perform all of our analyses using the pooled subsamples of all SB-2s and all S-1 IPOs.

[5] Firms under $25 million in sales could also choose to file Form SB-1. SB-1 filings, however, are not comparable to S-1 filings because SB-1's are restricted to raising a maximum of $10 million in any 12-month period.

Next, we construct a pair-matched sample of SB-2 IPOs and S-1 IPOs based on size and industry.[6,7] We repeat all of our tests using the pair-matched samples. In our tables, we report the pooled and pair-matched results to ameliorate any possible size-effect between SB-2 and S-1 IPOs. Because firm size (i.e., sales) is often used as a measure of firm quality (Purnanandan and Swaminathan, 2004), we want to make sure we isolate any SB-2-effects from any possible size-effects. Table 1, Panel A reports the frequency distribution for the pooled and pair-matched samples of 1,356 S-1 IPOs and 543 SB-2 IPOs, respectively. For mainline S-1 IPOs, 1999 was the most populated year with 245 (18.1% of S-1 sample) occurring. The second and third most populated years were 2000 with 205 IPOs (15.1%), and 1996 with 201 IPOs (14.8%). The least populated year for S-1s is 2008 seeing only four IPOs (0.3%). Recall, these counts are not the total number of S-1 IPOs during these years; they represent the number of S-1 IPOs with less than $25 million in revenues. The right two columns of Panel A report the frequency for the pair-matched S-1 benchmark sample. We will leave inspection to the reader. Note that we formed our pair-match bases on size (sales) and industry (2-digit Kahle and Walking (1996) class). As such, the years do not perfectly align between the SB-2 and S-1 pair-matched sample. For this reason, we include year dummies in our multivariate models and compute year cluster-adjusted t-statistics for robustness.

Table 1, Panel B reports a similar distribution for SB-2 IPOs. The 1993–1996 years show high frequencies of issues ranging from 82 IPOs (15.1%) in 1993 to 128 IPOs (23.6%) in 1996. In fact, if we compare 1995 for S-1 and SB-2 IPOs, the count is 119 S-1s and 100 SB-2s. The SB-2 program seems to have started out with vigor beginning in 1993 and peaking in 1996. From 1996 to 2002, we see a monotonic decrease in the number of SB-2 IPOs. From 2001 to 2008, the number of SB-2 IPOs only range from 0–6 issues per year, with 2008 seeing zero issues. Table 2, Panels A and B report the sample frequency based on industry. We base our industry categories on Kahle and Walkling (1996). The table shows that choice of offering program (SB-2 or S-1) does not seem conditioned on industry. Both samples report Manufacturing and Services as the highest frequency industries with manufacturing comprising 42.3% of the S-1sample and 45.5% of the SB-2 sample. Services make up 43.4% of the S-1sample and 35.7% of the SB-2 sample. The other six industry groups are fairly evenly distributed within and between the S-1 and SB-2 samples. The pair-matched S-1's and SB-2's have identical industry frequencies as a result of our matching algorithm.

4. RESULTS

4.1 Univariate Analyses

4.1.1 Signaling Theory Variables

The univariate tests for Hypotheses 1-4 are reported in Table 3. All of the proxies except for *Lockup Length* are predicted to have a negative sign for the difference in means and medians (i.e., SB-2 minus S-1) if SB-2 IPOs are of lesser-quality than S-1 IPOs. The *Lockup Length* prediction is positive based on Brau, Lambson, and McQueen (2005). *Big Six*, *UW Rank* (underwriter reputation), and *VC* all have the predicted negative sign and are significantly different for both means and medians. *Lockup length* has the predicted positive sign and is significant for both means and medians.

4.1.2 Control Variables

In Table 4, *Sales*, *Exchange*, *Book/Market*, *Delaware Corp*, *Offer Size*, *Internet IPO*, and *Dual Share Class* all have negative sign and are significantly different for both means and medians for SB-2 IPOs minus S-1 IPOs. *Cash Flow*, *ROA*, and *Debt/Assets* have positive and significant differences in means and/or medians. In the aggregate, it appears that even though both samples include only "small firms" (less than $25 million in sales prior to the IPO), SB-2 IPOs are fundamentally different than S-1 IPOs. Eight of the proxies indicate SB-2 IPOs are of lesser quality vis-à-vis S-1 IPOs, whereas three proxies indicate they are of superior quality as measured by traditional proxies.

[6] We thank Keith Gamble who served as a discussant for this paper for this suggestion.

[7] We match each SB-2 company to the S-1 company closest in size (sales) within the same industry. We represent size using Compustat annual sales (REVT). Industry classification follows the Kahle and Walking (1996) methodology.

4.2 Multivariate Analysis

Tables 5 and 6 report the multivariate results of four limited dependent variable models for both the pair-matched and pooled samples. For *Lockup Length* and *UW Rank*, we use Tobit methods because both variables are truncated on the left tail of the distribution at zero. For *Big Six* and *VC*, we use logistic regression because the dependent variable for both is binary in nature (i.e., equaling either 1 or 0). The general model is:

Signaling variable (Lockup Length or Big Six or UW Rank or VC) =

$$\beta_1 log(Sales) + \beta_2 Cash\ Flow + \beta_3 Exchange + \beta_4 ROA + \beta_5 log(Age) + \beta_6 Debt/Assets + \beta_7 Delaware\ Corp + \beta_8 Offer\ Size + \beta_9 Internet\ IPO + \beta_{10} Dual\ Share\ Class + \beta_{(years)} Years + \beta_{(industries)} Industry_{1(A\text{-}I)} + \varepsilon, \quad (2)$$

The multivariate results demonstrate that SB-2's have significantly longer *Lockup Lengths* (114 days, pair-matched sample; 124 days, pooled sample), indicating at least by signaling theory (e.g., Arthurs, Busenitz, Hoskisson, and Johnson (2009)), they are of lower quality than S-1 IPOs. For completeness, we discuss the other four control variables which are statistically significant in both the pair-matched (Table 5) and pooled (Table 6) samples although they are not the focus of our testing. In the Lockup Tobit model, the negative sign in *log(sales)*, indicates that companies with more sales tend to spend less time in lockup. The negative sign in E*xchange*, the variable for listing on the Nasdaq, American, or NYSE, indicates that companies listing on these exchanges also have less time in lockup. The positive sign on *ROA* indicates that companies with more return on assets spend more time in lockup. The other control variables are not statistically significant. In each of the following models, we report all control variables in the tables and leave the detailed inspection to the interested reader.

The multivariate results in both the pair-matched and pooled samples also confirm the significance of the SB-2 variable on *Big Six*, *Underwriter Rank*, and *VC*. Even after employing all of the control variables, many of which are statistically significant, we find that SB-2s are negatively correlated ($p < 0.0001$ in both samples) with all three dependent variables. Our results indicate that small companies employ less prestigious auditor and underwriters and are less likely to have venture capital backing. In the aggregate, the models reported in Tables 5 and 6 demonstrate that SB-2 and S-1 IPOs are significantly different from one another along the four signaling proxies. Hypotheses 1–4 are strongly supported. We have identified several dimensions in which proxies measuring greater quality suggest that higher-quality firms choose an S-1 filing in lieu of the SB-2 program, despite being small enough to qualify for the SB-2 program. The results of the head-to-head comparison tests in this section suggest that firms that complete an IPO using an S-1 may signal they are superior firms, relative to SB-2 issuers.

5. CONCLUSION

The purpose of this paper has been to test the small firm uniqueness hypothesis—the notion that small firms are materially different than non-small firms. We do so using the instrument of the SEC's SB-2 IPO program. We believe we are the first to use the SB-2 vehicle to make such a distinction. Firms that have less than $25 million in sales the year before the IPO may raise an unlimited amount of capital through a public offering by filing form SB-2 instead of the traditional form S-1. We compare SB-2 IPOs, which we use to designate as small firms, to S-1 IPOs, which we designate as non-small firms. Our empirical analysis, using both pooled and paired-sample matching, indicates that small firms are unique. We find that small firms have on average 170 to 178-day longer lockup periods. Non-small firms use a Big-Six auditor 95% of the time to go public, compared to 58% of SB-2 IPOs. As for underwriter reputation, non-small firms' underwriters have reputations that are 10 times better than small firm underwriters. Finally, non-small firm IPOs in our sample are backed by venture capitalists 69% of the time, compared to only 22% for small firm IPOs. In multivariate tests, controlling for possible confounding effects, all of these findings persist. In sum, our tests strongly support the notion that the SB-2 instrument is effective in defining small firms from large firms and in providing evidence in favor of the small-firm uniqueness hypothesis.

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Table 1. Sample Frequencies by Issue Year

Panel A: S-1 IPOs				
Issue Year	**Pooled Sample**		**Pair-Matched Sample**	
	Frequency	**Percent**	**Frequency**	**Percent**
1993	123	9.1	67	12.3
1994	106	7.8	45	8.3
1995	119	8.8	47	8.7
1996	201	14.8	71	13.1
1997	122	9.0	54	9.9
1998	72	5.3	30	5.5
1999	245	18.1	105	19.3
2000	205	15.1	79	14.6
2001	18	1.3	4	0.7
2002	5	0.4	2	0.4
2003	7	0.5	2	0.4
2004	40	3.0	12	2.2
2005	25	1.8	8	1.5
2006	30	2.2	4	0.7
2007	34	2.5	12	2.2
2008	4	0.3	1	0.2
Panel B: SB-2 IPOs				
Issue Year	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
1993	82	15.1	82	15.1
1994	83	15.3	165	30.4
1995	100	18.4	265	48.8
1996	128	23.6	393	72.4
1997	64	11.8	457	84.2
1998	31	5.7	488	89.9
1999	15	2.8	503	92.6
2000	10	1.8	513	94.5
2001	4	0.7	517	95.2
2002	3	0.6	520	95.8
2003	4	0.7	524	96.5
2004	6	1.1	530	97.6
2005	2	0.4	532	98.0
2006	6	1.1	538	99.1
2007	5	0.9	543	100
2008	0	0.0	543	100

Table 2. Sample Frequencies by Industry Group

Panel A: S-1 IPOs				
Industry	**Pooled Sample**		**Pair-Matched Sample**	
	Frequency	**Percent**	**Frequency**	**Percent**
A	1	0.1	1	0.2
B	30	2.2	4	0.7
C	6	0.4	6	1.1
D	574	42.3	247	45.5
E	87	6.4	22	4.1
F	16	1.2	25	4.6
G	46	3.4	37	6.8
I	588	43.4	194	35.7
Missing	8	0.6	7	1.3

Panel B: SB-2 IPOs				
Industry	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
A	1	0.18	1	0.2
B	4	0.74	5	0.9
C	6	1.1	11	2.0
D	247	45.49	258	47.5
E	22	4.05	280	51.6
F	25	4.6	305	56.2
G	37	6.81	342	63.0
I	194	35.73	536	98.7
Missing	7	1.29	543	100

Industry description	**SIC Manual Division**	**Two-Digit Major Group**
Agriculture, Forestry, and Fishing	A	01-09
Mining	B	10-14
Construction	C	15-17
Manufacturing	D	20-39
Transportation, Communications, Electric, Gas, and Sanitary Services	E	40-49
Wholesale Trade	F	50-51
Retail Trade	G	52-59
Finance, Insurance, and Real Estate	H	60-67
Services	I	70-89
Public Administration	J	91-97

Table 3. Descriptive Statistics and Difference Tests of Signaling Variables

							Difference from SB-2 Means & Medians			
	SB-2		Pooled Sample		Paired Sample		Pooled Sample		Paired Sample	
Variable	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Lockup Length (days)	372.3	365.0	194.4	180.0	201.9	180.0	177.8 (<.0001)	185.0 (<.0001)	170.3 (<.0001)	185.0 (<.0001)
Big Six	0.58	1.00	0.95	1.00	0.96	1.00	-0.37 (<.0001)	0 (<.0001)	-0.38 (<.0001)	0.00 (<.0001)
UW Rank	0.33	0.02	3.92	1.54	3.64	1.35	-3.59 (<.0001)	-1.52 (<.0001)	-3.31 (<.0001)	-1.33 (<.0001)
VC	0.22	0.00	0.69	1.00	0.68	1.00	-0.47 (<.0001)	-1.00 (<.0001)	-0.46 (<.0001)	-1.00 (<.0001)

Table 4. Descriptive Statistics and Difference Tests of Control Variables

	SB-2		Pooled Sample		Paired Sample		Pooled Sample		Paired Sample	
Variable	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Sales ($ mil)	4.57	2.85	6.36	5.25	4.79	3.03	-1.79	-2.397	-0.22	-0.18
							(<.0001)	(<.0001)	(0.4373)	(0.6775)
Cash Flow ($ mil)	-0.38	-0.21	-3.95	-1.94	-4.23	-2.21	3.57	1.724	3.86	2.00
							(<.0001)	(<.0001)	(<.0001)	(<.0001)
Exchange	0.55	1.00	0.94	1.00	0.93	1.00	-0.39	0	-0.38	0.00
							(<.0001)	(<.0001)	(<.0001)	(<.0001)
ROA	-0.85	-0.09	-0.81	-0.38	-1.17	-0.46	-0.04	0.295	0.32	0.37
							(0.8528)	(<.0001)	(0.4434)	(<.0001)
Age (years)	7.42	5.00	7.06	5.00	6.95	5.00	0.36	0	0.47	0.00
							(0.4364)	(0.7395)	(0.4165)	(0.3894)
Book/Market	0.02	0.02	0.04	0.02	0.04	0.02	-0.02	-0.003	-0.02	0.00
							(0.0005)	(0.0007)	(<.0001)	(0.0353)
Debt/Assets	0.35	0.09	0.20	0.04	0.18	0.04	0.15	0.042	0.16	0.04
							(0.1300)	(0.0002)	(0.0909)	(0.0002)
Delaware Corp	0.53	1.00	0.79	1.00	0.76	1.00	-0.26	0.00	-0.24	0.00
							(<.0001)	(<.0001)	(<.0001)	(<.0001)
Offer Size ($ mil)	7.51	5.31	40.72	29.47	40.99	28.15	-33	-24	-33	-23
							(<.0001)	(<.0001)	(<.0001)	(<.0001)
Internet IPO	0.03	0.00	0.15	0.00	0.14	0.00	-0.12	0	-0.12	0.00
							(<.0001)	(<.0001)	(<.0001)	(<.0001)
Dual Share Class	0.02	0.00	0.03	0.00	0.03	0.00	-0.02	0	-0.01	0.00
							(0.0231)	(0.0484)	(0.1125)	(0.1125)

Table 5. Pair-Matched Multivariate Models

	Lockup Tobit		**Big Six Logit**		**UW Rank Tobit**		**VC Logit**	
	Estimate	**p-value**	**Estimate**	**p-value**	**Estimate**	**p-value**	**Estimate**	**p-value**
Intercept	295.13	<.0001	-0.130	0.8443	0.011	0.1029	-0.7705	0.0936
SB	114.67	<.0001	-1.918	<.0001	-0.019	<.0001	-1.3643	<.0001
log(Sales)	-23.39	0.0004	0.401	0.0038	0.003	0.0973	0.1481	0.1574
Cash Flow	-0.48	0.7363	-0.174	0.0034	-0.002	<.0001	-0.1549	<.0001
Exchange	-70.94	<.0001	0.902	<.0001	0.007	0.0489	0.9177	0.0001
ROA	5.90	0.0252	-0.058	0.4009	0.001	0.0473	0.0472	0.2978
log(Age)	-1.03	0.8897	0.086	0.5239	-0.002	0.2726	0.0132	0.9100
Debt/Assets	7.79	0.1086	-0.039	0.7906	0.002	0.1333	-0.5340	0.0137
Delaware	10.85	0.3320	0.099	0.6324	0.006	0.0226	0.6078	0.0005
Offer Size	-0.67	0.0195	0.033	0.0101	0.000	<.0001	-0.0030	0.3934
Internet IPO	-20.84	0.3985	0.980	0.1313	0.009	0.0863	0.3396	0.3032
Dual Share	29.59	0.3634	-0.001	0.9989	0.001	0.9244	-0.7997	0.1334

Table 6. Pooled Multivariate Models

	Lockup Tobit		**Bix Six Logit**		**UW Rank Tobit**		**VC Logit**	
	Estimate	**p-value**	**Estimate**	**p-value**	**Estimate**	**p-value**	**Estimate**	**p-value**
Intercept	282.04	<.0001	0.318	0.5426	0.012	0.0636	-0.931	0.0089
SB	124.50	<.0001	-2.100	<.0001	-0.020	<.0001	-1.302	<.0001
log(Sales)	-13.20	0.0005	0.243	0.0288	0.004	0.0059	0.038	0.6104
Cash Flow	0.13	0.8360	-0.142	<.0001	-0.001	<.0001	-0.129	<.0001
Exchange	-70.15	<.0001	1.055	<.0001	0.007	0.0428	1.099	<.0001
ROA	5.52	0.0035	-0.033	0.5296	0.001	0.0913	0.057	0.1722
log(Age)	-3.47	0.4586	0.034	0.7822	-0.004	0.0082	0.083	0.3403
Debt/Assets	7.40	0.0298	-0.008	0.9501	0.001	0.3617	-0.328	0.0096
Delaware	6.16	0.3867	0.354	0.0532	0.011	<.0001	0.668	<.0001
Offer Size	-0.31	0.0256	0.014	0.0305	0.000	<.0001	-0.004	0.0812
Internet IPO	-4.98	0.7100	1.279	0.0220	0.003	0.4602	0.526	0.0226
Dual Share	8.12	0.6565	-0.106	0.8404	0.000	0.9677	-1.101	0.0019