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Index Membership and Small Firm Financing

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Abstract. This paper investigates the extent to which index membership affects small firm financing. Using a regression discontinuity specification around the lower cutoff of the Russell 2000 small-cap index, we find that index membership causes small firms to transition away from bank financing in favor of seasoned equity offerings. These effects are concentrated in the year following Russell 2000 additions and do not reverse immediately upon deletions. Liquidity, the elasticity of demand for equity, and analyst coverage also significantly increase following Russell 2000 additions but do not significantly decrease following deletions. Finally, firms added to the Russell 2000 obtain lower spreads and have fewer covenants on the bank loans that they do initiate. Our findings are consistent with index membership mitigating the financing frictions of small firms by improving their information environment through increased investor awareness.

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1. Introduction

Small firms face several challenges compared to large firms when raising capital. Small firms are neglected by analysts and institutional investors (O'Brien and Bhushan 1990, Gompers and Metrick 2001) and have less liquid stocks and higher trading costs (Chan and Lakonishok 1997, Keim and Madhavan 1997). This results in a narrower institutional shareholder base and less incentive for investors to acquire firm-specific information, which affects the method and cost of financing. For example, small firms rely heavily on bank lenders who provide monitoring and access to capital (Diamond 1991, Petersen and Rajan 1994) but also exploit their informational advantage to extract rents (Rajan 1992).

We examine whether index membership represents a shock to these financing frictions that changes how small public firms raise capital. Although existing literature motivates several channels through which indexing may affect the financing decision, there is little evidence of such a link, perhaps because the indexing literature typically focuses on large firms, which face fewer financing frictions.[1] Given the reliance of small firms on bank financing, the most likely effect of index membership on small firm financing is a transition away from bank lending in favor of equity issuance. There are at least three broad channels through which this transition may occur. First, the increased number of passive institutional shareholders attributable to index membership may directly affect corporate behavior, perhaps because of improved governance (Chen et al. 2007, Appel et al. 2016). Second, index membership may improve the information environment. This could occur because of any combination of increased visibility (Chen et al. 2004), reduced trading costs, or lower costs to obtaining firm-specific information (Boone and White 2015, Bird and Karolyi 2016). Finally, the positive returns following index additions may make equity issuance more attractive relative to other financing sources.[2]

To empirically investigate the effect of index membership on small firm financing, we employ a regression discontinuity design (RDD) that estimates the differential financing behavior between the smallest firms in the Russell 2000 small-cap index and the largest firms just outside the index. Russell 2000 membership is defined using a mechanical, but difficult to manipulate, index inclusion criterion whereby the Russell 2000 Index includes the 1,001st through 3,000th largest firms according to their May 31 total market capitalization. As long as firms cannot perfectly control whether they are the 3,000th or 3,001st largest firm as of May 31, small and random changes in stock price leading up to May 31 generate discrete changes in Russell 2000 membership. This setting lends itself to RDD because the firms on either side of the Russell 2000 cutoff are similar, except with respect to Russell 2000 membership. To identify the effect of Russell 2000 membership we control for the distance a firm is away from the Russell 2000 cutoff and examine whether there are discontinuous changes in financing behavior around the threshold for Russell 2000 inclusion. We achieve this by replicating Russell Investments' May 31 market capitalization with publicly available data and employing a fuzzy RDD to account for any mismeasurement in the index assignment variable. Our estimated Russell 2000 membership is a highly significant predictor of actual membership (with a *t*-statistic of over 35). We next verify the local continuity assumption of RDD by showing that the firms ending up on either side of the Russell 2000 cutoff are similar prior to index assignment.

Following Russell reconstitution, significant differences emerge in how firms on either side of the Russell 2000 cutoff obtain financing. RDD estimates suggest that Russell 2000 membership results in firms issuing twice as many seasoned equity offerings (SEOs) and initiating 35% fewer bank loans compared to firms just outside the index. As a result, Russell 2000 firms raise significantly more capital via SEOs and significantly less bank loan proceeds. We find little evidence that Russell 2000 membership affects the use of other financing sources, such as convertible bonds, private investments in public equity (PIPEs), or nonbank debt offerings.

To understand why index membership affects small firm financing, we investigate whether the change in financing behavior is symmetric following index additions and deletions and whether it is accompanied by changes in the information environment, institutional ownership, or stock returns. We find that Russell 2000 membership impacts the financing decision following additions, but not following deletions. Compared to firms staying outside the index, firms added to the Russell 2000 initiate 75% fewer bank loans and conduct almost five times as many SEOs. In contrast, we find no significant difference in the financing behavior of firms deleted from the Russell 2000 compared to those remaining in the index.

Chen et al. (2004) argue that index additions generate consequences that do not immediately reverse upon deletion because index membership increases firm visibility, which persists for some time after deletion. If a postaddition increase in visibility contributes to the observed change in financing behavior, then it is likely to do so via an improved information environment. For example, Grullon et al. (2004) and Chemmanur and Yan (2009) find that visibility increases liquidity and improves the information environment, resulting in a lower cost of raising equity. To explore this possibility, we investigate how the information environment changes following Russell 2000 additions and deletions. We find that being added to the Russell 2000 Index results in more analyst coverage, stock liquidity, and elasticity of demand for equity, while being deleted does not significantly affect these outcomes. This is consistent with an improved information environment, because of increased visibility, being one reason why Russell 2000 Index membership affects how small firms raise capital.

We also conduct several analyses to determine whether an increased number of institutional shareholders or the positive stock returns following index additions are likely contributors to the postaddition change in financing behavior. We find a symmetric effect of Russell 2000 membership on institutional ownership around index additions and deletions. This does not align with the asymmetric change in financing behavior that we observe following Russell 2000 additions. However, it remains possible that institutional shareholders cause changes in governance that persist after the institutions disinvest and affect the firm's financing behavior. We find little evidence that positive stock returns drive either the increased SEO activity or the reduction in bank borrowing. Specifically, firms added to the Russell 2000 Index experience abnormal returns, but these returns reverse by the end of August and excluding the months of July and August have little effect on our findings.

Finally, we descriptively investigate how Russell 2000 membership relates to financing terms. Using a sample that is restricted to firm years with a financing event, RDD estimates suggest that firms initiating bank loans after being added to the Russell 2000 take out smaller loans and experience a 20% to 30% reduction in both spreads over London Inter-bank Offered Rate (LIBOR) and covenant use. We find no evidence that SEO costs, such as underwriter fees, SEO underpricing, or the price drop surrounding SEO announcements, are smaller for Russell 2000 members. This null result could be due to a lack of power or the fact that other SEO characteristics differ for firms in the Russell 2000. For instance, we find that Russell 2000 members conduct larger SEOs. Importantly, this evidence on the relation between Russell 2000 membership and financing terms should be interpreted descriptively, since the sample is conditional on firms obtaining a given type of financing and we have already shown that the type of financing firms seek depends on index membership.

Our findings provide new evidence on how information and market frictions shape small firm financing. Santos and Winton (2008), Hale and Santos (2009), and Schenone (2010) find that bank loan spreads decline when a firm's information environment improves because of events such as initial debt or equity offerings. We introduce index inclusion as an event that affects both the cost of bank capital and how firms raise capital. This extends the idea in Houston and James (1996) and Faulkender and Petersen (2006) that market frictions, such as lending relationships or the presence of credit ratings, determine how firms develop their capital structure.

The percentage of shares owned by passive institutions has risen fourfold over the past two decades (Appel et al. 2016), making the consequences to index membership important to understand. Several recent studies provide evidence on how index membership and passive institutional investors affect large firms' corporate policies, such as governance (Appel et al. 2016, Schmidt and Fahlenbrach 2017), disclosure (Boone and White 2015, Bird and Karolyi 2016), and payout (Crane et al. 2016). Even though this recent literature that links passive index investors to corporate policies focuses on large public firms, the trend toward passive index investing does not. For instance, as of 2016, Blackrock's Ishares exchange traded funds tracking the Russell 2000 Index owned over $40 billion in equity, which is approximately equal to the total amount of passive investments tracking the Russell 2000 in 2003. Thus, in addition to introducing index membership as an important determinant of how small public firms raise capital, our findings highlight the need for more research on the consequences of index membership to small public firms.

2. Motivation

Two strands of literature motivate our investigation into the effect of index membership on small firm financing. The first establishes that small firms face significant frictions when raising capital, while the second introduces several channels through which index membership may mitigate these frictions.

2.1. Small Firm Financing Frictions

Small firms are characterized by financing frictions, which affect how and at what cost they raise capital. Two contributors to these frictions are low institutional demand for equity and a poor information environment. Gompers and Metrick (2001) show that small firms have narrower institutional shareholder bases, and O'Brien and Bhushan (1990), Keim and Madhavan (1997), and Chan and Lakonishok (1997) provide evidence that the costs to trading and acquiring firm-specific information are higher for small firms.

Consistent with these financing frictions affecting how small firms raise capital, Gomes and Phillips (2012) find that small public firms are more reliant on bank financing. Rajan (1992) shows that an important cost to this reliance is that banks can use the firm-specific information they gather via monitoring to extract rents from the borrower. Several subsequent studies provide empirical evidence consistent with this "bank hold-up" problem being an economically meaningful financing friction.[3]

2.2. Index Membership and Small Firm Financing

Given the role that financing frictions play in determining how small firms raise capital, any shock to financing frictions has the potential to change the way that small firms obtain financing. The literature investigating the consequences of index membership suggests several reasons why index membership may represent such a shock. Yet, to our knowledge no link between index membership and financing behavior has been established. For example, Chen et al. (2004) find that S&P 500 membership has no effect on equity issuance behavior. This lack of evidence may be because of the fact that the existing literature focuses primarily on large firms or employs samples from earlier time periods, when passive index investing was less common.

We posit three nonmutually exclusive channels through which index membership may affect small firm financing: direct effects of passive institutional shareholders, enhanced visibility and improved information environment, and stock returns surrounding changes in index membership.

2.2.1. Direct Effects of Passive Institutional Shareholders. The most direct channel through which index membership may affect the financing decision is by increasing the number of institutional shareholders. Beginning with Pruitt and Wei (1989), there is ample evidence that index inclusion increases institutional ownership. Although most of this increase is in the form of passive institutional investors, there is evidence that this change in ownership structure can meaningfully affect corporate behavior. Chen et al. (2007) and Appel et al. (2016) provide evidence that long-term passive institutional shareholders actively monitor firm performance and that this monitoring leads to more profitable acquisitions and improves performance.[4]

Increased institutional shareholders may also affect financing by reducing a firm's demand for debt or increasing its demand for equity. Debt serves as a commitment device to mitigate agency problems between managers and shareholders (Jensen 1986, Zwiebel 1996). To the extent that institutional monitoring substitutes for this commitment, index membership may reduce a firm's demand for debt. Increased passive institutional shareholders may also increase a firm's demand for equity, since these investors often track the Russell 2000 and therefore must purchase a portion of the offering to avoid tracking error. This is consistent with the idea in Alti and Sulaeman (2012) that new institutional shareholders result in increased equity issuance.

2.2.2. Increased Visibility and an Improved Information Environment. A second way that index membership may affect financing frictions is by improving the information environment. This improvement may occur via increased visibility, reduced trading costs, or reduced information acquisition costs. Chen et al. (2004) provide evidence that index inclusion increases visibility. Specifically, they find positive returns following S&P 500 additions, but no negative returns following deletion and conclude that visibility (i.e., investor awareness), which increases following additions, but does not easily diminish following deletions, likely explains this asymmetry.

There are several ways in which index membership may increase visibility. First, significant media attention is paid to Russell reconstitutions, which are posted on Russell's website and picked up by news outlets.[5] Outlets such as the *Wall Street Journal* also frequently discuss Russell reconstitution day and the firms being added or deleted from the index.[6] Second, even if institutional shareholders do not directly affect corporate policy, any increase in institutional breadth brought on by an index addition is likely to increase the number of investors that are aware of and informed about the firm. Finally, Boone and White (2015) and Bird and Karolyi (2016) find that the institutional ownership increase surrounding index inclusion results in more analyst coverage.

Perhaps in part because of increased visibility, index membership may improve the information environment. Beneish and Whaley (1996), Hedge and McDermott (2003), and Boone and White (2015) provide evidence that index membership increases liquidity and/or share turnover. In addition, the evidence in D'Avolio (2002) and Prado et al. (2016) suggests that if index inclusion increases the number of institutional shareholders it will also reduce the costs to short selling. These changes, which reduce trading costs and increase investors' ability to act on negative information, increase investors' incentive to acquire firm-specific information.

2.2.3. Stock Returns Surrounding Changes in Index Membership. Finally, the favorable returns following index additions and negative returns following deletions may affect small firm financing. Beginning with Shleifer (1986) and Harris and Gurel (1986), the most established empirical result in the indexing literature is that stock prices increase following inclusion in a major stock market index. Biktimirov et al. (2004) and Chang et al. (2015) show that this evidence extends to small firms. To the extent that being added to an index results in elevated price levels for small firms, equity will be cheap relative to other forms of financing. This may cause indexed small firms to be less reliant on debt financing compared to unindexed small firms.

3. Empirical Methods

Most evidence on the consequences of index membership stems from event studies surrounding index additions and deletions. One limitation to these studies is the assumption that the stocks added are otherwise identical to a nonadded matched sample or that firms joining the index are not themselves changing for other reasons. Chang et al. (2015) point out that this assumption is unlikely to hold because focusing on additions (or deletions) biases the sample toward growing (or shrinking) firms.[7]

3.1. Russell Indices and RDD Identification

Recent literature, beginning with Chang et al. (2015), exploits the mechanical, but difficult to manipulate, manner in which Russell Investments annually recreates its indices to better identify the consequences of index membership. At the end of May, Russell ranks all U.S. common stocks by total market capitalization.[8] The Russell 2000 Index contains stocks ranked 1,001 through 3,000, and the Russell Micro Index contains stocks ranked 2,001 through 4,000 (or all eligible stocks if there are less than 4,000).

This reconstitution process creates a discontinuity in Russell 2000 membership for stocks ranked near 3,000. Moreover, random changes in stock price around May 31 affect index assignment. For example, the difference in market capitalization between the 25th largest firm outside the Russell 2000 and the 25th smallest firm in the index is approximately \$10 million or 7% of market capitalization. Given that the weekly standard deviation of stock returns for firms around the threshold is 9.3%, it is unlikely that firms are able to control which side of the Russell 2000 threshold they end up on. This quasirandom index assignment means that firm characteristics are likely to be locally continuous across the 3,000 threshold prior to reconstitution. This setting lends itself to RDD as a means of identifying the effect of index membership on the financing behavior of small public firms.

RDD identifies the effect of Russell 2000 membership by comparing outcomes for the smallest firms included in the Russell 2000 (i.e., the 3,000th largest firm) with those of the largest firms not included in the index (i.e., the 3,001st largest firm), after controlling for the small differences in size for the firms on either side of the Russell 2000 cutoff. Equation (1) demonstrates this in the case of a sharp RDD:

$$\begin{aligned} Y_{it} = \beta_0 + R2000_{it}(\beta_1 + \beta_2(RANK_{it} - 3{,}000)) \\ + \beta_3(RANK_{it} - 3{,}000) + \varepsilon_{it}, \end{aligned} \tag{1}$$

where Y_{it} represents outcomes, such as the financing behavior for firm i at time t, $R2000_{it}$ equals 1 if Russell indicates that firm i is included in the Russell 2000 as of the end of June of year t and 0 otherwise, and $RANK_{it}$ is the size rank of firm i at time t. The coefficient β_1 estimates how an outcome differs for a firm at the Russell 2000 cutoff depending on whether or not they are in the index.[9]

3.2. Implementing Fuzzy RDD

We employ a fuzzy RDD to account for the fact that we do not have Russell's May market capitalization rankings—Russell Investment only provides us with their annual constituent list. Fuzzy RDD directly deals with this measurement error. According to Roberts and Whited (2013, p. 536), one can think of "fuzzy RDD as akin to misassignment relative to the cutoff value in sharp RDD. This misassignment could be due to the use of additional variables in the assignment that are unobservable to the econometrician." In our case, this misassignment comes from our approximation of Russell's market capitalization measure.

Fuzzy RDD is a two-stage procedure. As suggested by Roberts and Whited (2013), we estimate the system of equations using two-stage least squares. In our case, we have two endogenous second-stage variables—Russell 2000 membership and its interaction with the distance a firm is away from the Russell 2000 cutoff. Formally, the second-stage equation is written as

$$Y_{it} = \beta_0 + \beta_1 \widehat{R2000_{it}} + \beta_2 \widehat{R2000_{it}(RANK_{it} - C_t)} + \beta_3(RANK_{it} - C_t) + \varepsilon_{it}, \quad (2)$$

where Y_{it} represents outcomes such as the financing behavior for firm i at time t, $\widehat{R2000_{it}}$ equals the predicted probability that a firm is in the Russell 2000 (from the first-stage regression), $RANK_{it}$ is the rank of firm i at time t, and C_t is the rank of the smallest firm in the Russell 2000 Index at time t.

Our two instruments are a *Treated* indicator equaling 1 for firms that should be in the Russell 2000 according to our market capitalization approximation and 0 otherwise as well as the interaction between *Treated* and the distance a firm is away from the Russell 2000 cutoff. We construct our instrument, *Treated*, with the following seven step procedure:

1. Acquire Russell Investments' annual constituent list for the Russell Micro and Russell 2000 indices from the inception of the Russell Micro Index in 2000 through 2012.
2. Compute May 31 market capitalization using the Center for Research in Securities Prices (CRSP) and Compustat for Russell Micro firms.[10]
3. Rank firms in the Micro index according to our estimated May 31 market capitalization.
4. Obtain the lower Russell 2000 market capitalization cutoff from Russell's website.[11]
5. Define an annual cutoff rank by inserting the cutoff (step 4) into the Micro rankings (step 3).
6. Assign annual size ranks relative to the annual cutoff rank (i.e., Rank – Annual Cutoff Rank). For example, −10 reflects our estimated 10th smallest firm in the Russell 2000 each year.
7. Define a treated firm as a firm with a size rank less than the annual cutoff rank.

We have two first-stage regressions, corresponding to the two endogenous variables and two instruments. The main first stage regresses actual Russell 2000 membership on the treated firm indicator along with controls for a firm's distance from our estimated annual size cutoff for Russell 2000 membership. A second first-stage regression obtains the fitted value of the endogenous interaction term, $R2000_{it}(RANK_{it} - C_t)$. Equations (3) and (4) formally illustrate these two first stages:

$$R2000_{it} = \alpha_0 + TREATED_{it}(\alpha_1 + \alpha_2(RANK_{it} - C_t)) + \alpha_3(RANK_{it} - C_t) + \eta_{it}, \quad (3)$$

$$R2000_{it}(RANK_{it} - C_t) = \alpha_{10} + TREATED_{it}(\alpha_{11} + \alpha_{12}(RANK_{it} - C_t)) + \alpha_{13}(RANK_{it} - C_t) + \varphi_{it}, \quad (4)$$

where $TREATED_{it}$ is an indicator that is equal to 1 when firm i's Russell Micro rank is smaller than the annual cutoff rank in year t, and $R2000_{it}$, $RANK_{it}$, and C_t are defined the same as in Equation (2).

A notable feature of this design is that the coefficient on the term $(RANK_{it} - C_t)$ takes on different values for treated and untreated firms. Although we find similar results excluding this interaction term, a benefit to including the interaction is that the coefficient estimates on either side of the threshold do not depend on data from firms on the other side of the threshold (Lee and Lemieux 2010). This implementation of RDD is akin to running separate regressions on each side of the threshold to predict an outcome for the threshold firm, with β_1 measuring the difference between these two predicted outcomes and representing the effect of crossing over the threshold.

3.3. Sample and Descriptive Statistics

An important consideration is how many firms on either side of the Russell 2000 cutoff to include in the sample, referred to as the bandwidth. Including observations too far from the threshold can induce bias, but not including enough observations reduces power. In specification 1 of all tables we use a bandwidth of 200 firms on either side of the cutoff. Our sample runs from 2000 to 2012 and we exclude financial (SIC 6000–6999) and regulated utility (SIC 4900–4999) firms from the analysis.[12] This leaves us with 3,686 firm-year observations in our sample for this benchmark analysis. We also replicate our tests using the optimal bandwidth procedure described in Imbens and Kalvanaraman (2012).[13] Typically, the optimal bandwidths are larger than 200 ranks on either side of the cutoff. Finally, we employ a triangular kernel (as Calonico et al. 2014 indicate is common), which places more weight on observations near the cutoff. Unreported results are similar using a uniform kernel.

To provide context for our subsequent analyses, Table 1 presents descriptive statistics for a pooled sample of firm years within 50 ranks of the annual Russell cutoff rank. The market capitalization of the typical firm near the Russell 2000 cutoff is approximately \$150 million, with the annual Russell cutoff ranging from \$78 million to \$262 million over our sample period. The average sample firm has about 15%

Table 1. Descriptive Statistics

	Units	Mean	Median	Std. dev.
Preconstitution firm characteristics				
Market Cap	$Mln	153.7	147.4	48.2
Total Assets	$Mln	243.5	144.5	371.2
Market to Book Equity	%	322.7	181.6	449.1
Cash/Total Assets	%	8.4	0.0	17.6
Capital Expenditures/Total Assets	%	5.4	2.9	7.6
Leverage	%	14.8	3.8	20.2
Credit Rating Indicator	Indicator	0.10	0.0	0.30
Annual Standard Deviation of Returns	%	67.2	58.4	34.8
Annual Abnormal Returns	%	7.4	−19.1	116.2
Preconstitution market quality measures				
Bid-Ask Spread	%	1.26	0.83	1.35
Log Inelasticity		2.60	2.38	1.28
Information acquisition costs				
Analysts	Count	4.30	4.00	3.20
Forecasts	Count	27.3	20.0	25.7
Preconstitution ownership variables				
Number of Institutional Owners	Count	43.1	41.0	20.7
Percentage Institutional Ownership	%	42.5	41.6	23.4
Preconstitution financing variables				
Bank Debt Count	Count	0.21	0.00	0.58
Bank Debt to Market Cap.	%	10.7	0.0	37.4
Primary Public Equity Count	Count	0.09	0.00	0.37
Primary Public Equity to Market Cap.	%	2.0	0.0	9.1
Traditional PIPE Count	Count	0.04	0.00	0.24
Traditional PIPE to Market Cap.	%	0.3	0.0	1.8
Other Equity/Conv. Debt Count	Count	0.01	0.00	0.12
Other Equity/Conv. Debt to Market Cap.	%	0.2	0.0	2.0
Nonbank Debt Count	Count	0.01	0.00	0.17
Nonbank Debt to Market Cap.	%	0.3	0.0	4.0

Notes. This table contains descriptive statistics for the 50 firms we estimate to be on either side of the lower Russell 2000 Index cutoff. The sample consists of (nonfinancial and nonutility) Russell Micro Index constituents between 2000 and 2012. The table reports pooled averages, medians, and standard deviations computed over all firm-year observations. All variables are measured preconstitution, unless indicated otherwise. Thus, all flow or market-based measures are computed from July through May prior to reconstitution and all stock measures are presented as of the fiscal quarter end during the first calendar quarter in the year of reconstitution. Detailed variable definitions are provided in the appendix. The number of observations is between 870 and 935 depending on the availability of the characteristics information at different times during the year preconstitution.

book leverage, invests in capital expenditures at an annual rate of 5% of their total assets, and has average bid-ask spreads of approximately 1.3% of their share price. On average, 43 unique institutions hold 42.5% shares. Finally, only 10% of firms have credit ratings, suggesting that sample firms may face financing frictions (Hale and Santos 2009).

The most common financing sources are bank borrowing and public SEOs. Sample firms initiate a new bank loan every 5 years and conduct an SEO every 11 years. Each year, the average firm initiates bank loans with total proceeds of 10.7% of their market capitalization and issues SEOs with total proceeds equal to approximately 2.0% of their market capitalization, although a direct comparison of these proceeds is complicated by the fact that most bank loans are revolving lines of credit, which are not typically fully drawn. Other forms of financing are less common. Firms do occasionally conduct private investments in public equity or issue convertible bonds, but nonbank debt financing is uncommon.

Finally, unreported statistics indicate that the probability of being in the Russell 2000 in future years is similar for firms just inside and just outside the index in a given year. This highlights the substantial volatility in annual returns. See the appendix for variable definitions.

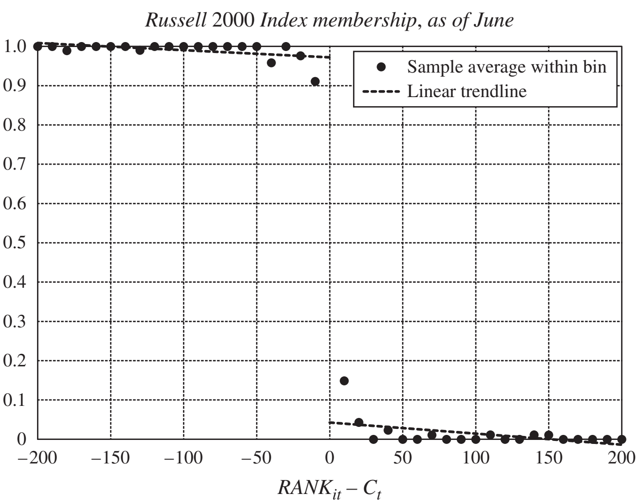
3.4. Fuzzy RDD Assumptions and Interpretation

3.4.1. A Discontinuous Jump in Russell 2000 Membership. The first assumption underlying RDD is that there is a discontinuous jump in the probability of Russell 2000 membership as the size rank crosses the annual cutoff rank (i.e., when the treated indicator becomes 1). Figure 1 visually supports this assumption. Firms on the left half of the figure (with negative

Rank – Cutoff Rank) are firms that we expect to be included in the Russell 2000 Index. Each dot represents the percentage of firms that are in the Russell 2000 within a 10 rank bin—approximately 100 firm-year observations total since our sample lasts 13 years, but excludes financial and regulated firms. The fitted lines are estimated based on a bandwidth of 200 on either side of Russell 2000's lower cutoff. The illustration shows that even the firms within 10 ranks of the threshold in a given year are approximately 75 percentage points more likely to be in the Russell 2000 if their rank is less than the cutoff rank.

Table 2 formally tests the significance of this discontinuous jump in the probability of Russell 2000 membership by estimating several specifications similar to Equation (2). Panel A shows that regardless of the polynomial's order or the bandwidth used, the coefficient of α_1 is positively significant at the 1% level. This rejects the null hypothesis that there is no jump in the probability of Russell 2000 membership at the threshold. The magnitude of α_1 suggests that the probability of Russell 2000 membership jumps by between 91 and 94 percentage points at the threshold where the firm's rank equals the cutoff rank. Specifically, using the optimal bandwidth combined with the linear (third-order) polynomial, α_0 shows that the probability of being in the Russell 2000 at the threshold is 3.5% (4.1%) if $TREATED_{it}$ equals 0 and summing α_0 and α_1 shows that this probability increases to 97.6% (97.4%) if $TREATED_{it}$ equals 1. Panels B and C show that the strength of this instrument is similar surrounding Russell 2000 additions and deletions.

Figure 1. First Stage of Fuzzy RDD



Notes. The x axis plots size rankings relative to the cutoff rank for inclusion in the Russell 2000 Index, based on our market capitalization ranking. Firms to the right of zero are expected to be the largest firms outside the Russell 2000 and firms to the left of zero are expected to be the smallest firms inside the index. The y axis indicates the percentage of firms within a given size bin that are actually included in the Russell 2000 Index. Specifically, each dot represents the average percentage of firms within a given 10 rank size bin that are in the Russell 2000, using our sample from 2000–2012. The dashed lines reflect the predicted probability that a firm of a given size rank is in the Russell 2000. The estimates are based on the main first stage of the fuzzy RDD:

$$R2000_{it} = \alpha_0 + TREATED_{it}(\alpha_1 + \alpha_2(RANK_{it} - C_t)) + \alpha_3(RANK_{it} - C_t) + \eta_{it},$$

where $R2000_{it}$ equals 1 if Russell indicates that firm i is included in the Russell 2000 as of the end of June of year t and 0 otherwise, $TREATED_{it}$ is an indicator that is equal to 1 when firm i's Russell Micro rank is smaller than the annual cutoff rank in year t, $RANK_{it}$ is the rank of firm i at time t, and C_t is the rank of the smallest firm in the Russell 2000 Index at time t. The regression is run using a bandwidth of the 200 firms to the left and the right of the Russell 2000's lower cutoff.

This evidence in Figure 1 and Table 2 is important because a common criticism of fuzzy RDD at the upper Russell 2000 cutoff is that the estimated market capitalization is not a strong enough predictor of index membership, leading to a weak instrument problem. Our use of Russell's stated lower market capitalization cutoff for the Russell 2000 alleviates this problem because it makes it so that the number of estimated index constituents is not fixed. This directly addresses the concern raised in Crane et al. (2016) whereby fuzzy RDD estimates are biased toward zero when the number of index constituents is fixed.

3.4.2. The Local Continuity Assumption. A second important assumption in fuzzy RDD is that the sorting variable and other pretreatment outcomes are locally continuous across the threshold. Our size rankings relative to the cutoff are always symmetric and thus mechanically satisfy this requirement. Table 3 presents estimates of Equation (4) for various outcomes in the period prior to index assignment to provide further evidence on the validity of the local continuity assumption. Flow and market quality variables are defined from July–May prior to reconstitution and accounting stock variables are defined at the fiscal quarter end that occurs during the first calendar quarter in the year of reconstitution. Our focus is on the estimate of β_1, which measures the increase in a variable caused by inclusion in the Russell 2000. Given that the outcomes occur prior to index assignment, significant estimates of β_1 would cast doubt on the validity of the local continuity assumption. Across 19 firm-level outcomes and three RDD specifications, we find no statistically significant discontinuous differences during the period prior to index assignment between the firms ultimately ending up in the Russell 2000 and those ending up just outside the index. For example, the firms ending up on either side of the threshold are equally likely to have been in the Russell 2000 during the previous year.

3.4.3. Internal and External Validity. Under the above assumptions, fuzzy RDD will yield an internally valid estimate of the causal effect of being in the Russell 2000 Index. Lee and Lemieux (2010) argue that, in terms of

Table 2. Fuzzy RDD First-Stage Regressions

	BW = 200, Order = 1		BW = IK, Order = 1		BW = IK, Order = 3	
Dependent variable	α_0	Treatment effect (α_1)	α_0	Treatment effect (α_1)	α_0	Treatment effect (α_1)
		Panel A: All firms				
Russell 2000 *Index membership*	0.057	0.906***	0.035	0.941***	0.041	0.933***
		(0.016)		(0.010)		(0.011)
		Panel B: Additions, firms not in the Russell 2000 or Russell 1000 last year				
Russell 2000 *Index membership*	0.048	0.899***	0.028	0.936***	0.033	0.925***
		(0.023)		(0.014)		(0.017)
		Panel C: Deletions, firms in the Russell 2000 or Russell 1000 last year				
Russell 2000 *Index membership*	0.068	0.911***	0.047	0.940***	0.057	0.929***
		(0.023)		(0.015)		(0.018)

Notes. Panel A shows the regression estimates of the main first stage of the fuzzy RDD, run at the lower Russell 2000 cutoff on a sample consisting of all (nonfinancial and nonutility) Russell Micro Index constituents between 2000 and 2012:

$$R2000_{it} = \alpha_0 + TREATED_{it}(\alpha_1 + \alpha_2(RANK_{it} - C_t)) + \alpha_3(RANK_{it} - C_t) + \eta_{it}.$$

Russell 2000 membership at the end of June (postreconstitution) is regressed on each firm's rank position relative to the cutoff rank with separate functional forms on both sides of the cutoff. The results presented employ a triangular kernel using the optimal bandwidth method proposed by Imbens and Kalvanaraman (2012) or a fixed bandwidth of 200 firm ranks per year, and they are estimated using bank loan proceeds as a percentage of market capitalization as the dependent variable in the second-stage regression. The coefficient α_1 equals the estimated discontinuity in the probability of Russell 2000 membership when our treated variable becomes one, which occurs when our estimated market capitalization is greater than the size of the firm at the annual Russell 2000 lower cutoff. The table shows local-linear (order = 1) and third-order local-polynomial (order = 3) regression discontinuity estimates. Panel A presents the full sample results. In panel B the sample is restricted to (nonfinancial and nonutility) Russell Micro Index constituents that were not in the Russell 2000 or Russell 1000 Index during the previous year (i.e., our additions sample). Thus, we compare Russell 2000 additions to firms remaining just outside the index. Conversely, panel C restricts the sample to (nonfinancial and nonutility) Russell Micro Index constituents that were in the Russell 2000 or Russell 1000 Index during the previous year (i.e., our deletions sample). Standard errors are shown in parentheses.

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

internal validity RDD approximates a random experiment. One limitation to interpreting RDD estimates is the extent to which the inferences are externally valid. Put differently, although there is no reason to expect that the effects we observe will not extend to the average small public firm, it is possible that our estimates of the effect to index membership are unique to firms just around the lower Russell 2000 cutoff.

4. Index Membership and Small Firm Financing

In this section we empirically investigate whether index membership affects the financing behavior of small public firms. To do so, we merge Thomson's DealScan and Securities Data Corporation (SDC) databases along with Sagient Research's PlacementTracker with CRSP, Compustat, and Russell's Index constituent list.[14] We create two measures of bank borrowing and equity issuance activity. One captures the frequency of each financing event and the other the proceeds raised. Our four primary measures are as follows:

$$\textit{Bank Debt Count} = \text{Total number of bank loan facilities}, \tag{5}$$

$$\textit{Bank Debt to Market Cap} = \frac{\text{Proceeds from all bank loans}}{\text{End of May marketcap (pre-Russell reconstitution)}}, \tag{6}$$

$$\textit{Public Equity Count} = \text{Total number of SEOs containing primary shares}, \tag{7}$$

$$\textit{Public Equity to Market Cap} = \frac{\text{Proceeds from SEOs containing primary shares}}{\text{End of May marketcap (pre-Russell reconstitution)}}. \tag{8}$$

We define postreconstitution measures from July, the first month since Russell reconstitution, through the following June. We avoid longer-term issuance measures (including leverage, which Lemmon et al. 2008 show adjusts slowly) because of the difficulty in controlling for future index switchers. The majority of bank loans in our sample are revolving lines of credit, for which we measure proceeds using the maximum credit line size. Given the evidence in table 1 of Sufi (2009) that the average credit line is only 36% drawn, this data limitation reduces the comparability between bank loan and SEO proceeds.

Table 3. Regression Discontinuity Estimates of Firm Characteristics Measured Prereconstitution

	(1) BW = 200, Order = 1		(2) BW = IK, Order = 1		(3) BW = IK, Order = 3	
Dependent variable	β_1	s.e.	β_1	s.e.	β_1	s.e.
Log Market Cap	0.01	(0.02)	0.02	(0.02)	0.01	(0.03)
Log Total Assets	−0.09	(0.08)	−0.07	(0.06)	−0.10	(0.08)
Market to Book Equity	19.28	(34.65)	4.19	(19.30)	−0.45	(34.39)
Capital Expenditures / Total Assets	−0.99	(0.97)	−0.67	(0.56)	−0.94	(0.89)
Cash / Total Assets	1.30	(2.29)	0.77	(1.45)	1.59	(2.47)
Leverage	0.22	(1.64)	0.81	(0.82)	0.17	(1.77)
Bid-Ask Spread	−9.56	(10.00)	−8.22	(6.12)	−10.33	(10.36)
Inelasticity	−0.15	(0.10)	−0.04	(0.06)	−0.20	(0.13)
Credit Rating Indicator	−0.13	(2.48)	−0.98	(1.60)	−1.57	(2.49)
Annual Standard Deviation of Returns	1.40	(10.90)	3.00	(6.59)	4.12	(9.84)
Number of Institutional Owners	0.68	(1.66)	0.44	(1.27)	−0.01	(1.73)
Percentage Institutional Ownership	0.31	(1.87)	1.11	(1.27)	0.41	(1.90)
Russell 2000 member, next year	5.58	(4.04)	4.89	(3.18)	3.20	(3.36)
Russell 2000 member, prior year	1.59	(4.08)	2.42	(3.04)	1.63	(4.55)
Log Analysts	0.01	(0.05)	−0.02	(0.03)	0.00	(0.05)
Log Forecasts	−0.01	(0.08)	−0.03	(0.05)	−0.01	(0.09)
Forecast Indicator	1.68	(4.07)	0.85	(2.49)	0.18	(3.52)
Log Forecast Frequency	0.00	(0.06)	0.01	(0.03)	−0.01	(0.05)

Notes. This table investigates whether there are discontinuities in firm characteristics in the year prior to index assignment. The leftmost column of the table is a list of dependent variables, all of which are measured prereconstitution, unless indicated otherwise. Thus, all flow or market-based measures are computed from July through May prior to reconstitution and all level measures are presented as of the fiscal quarter end during the first calendar quarter in the year of reconstitution. Detailed variable definitions are provided in the appendix. Subsequent columns present β_1 estimates and standard errors from the second stage of our fuzzy RDD procedure:

$$Y_{it} = \beta_0 + \beta_1 \widehat{R2000_{it}} + \beta_2 R2000_{it}\widehat{(RANK_{it}} - C_t) + \beta_3(RANK_{it} - C_t) + \varepsilon_{it}.$$

The sample contains (nonfinancial and nonutility) Russell Micro Index constituents between 2000 and 2012. Specification 1 uses a fixed bandwidth of 200 firm ranks per year, while specifications 2 and 3 use optimal bandwidths computed as proposed by Imbens and Kalvanaraman (2012). Specification 3 expands the set of controls in the above equation to include a third-order (instead of linear) polynomial control for a firm's distance from the Russell 2000 lower cutoff.

Table 4 reports results of discontinuity tests of bank borrowing and equity issuance activity in the year following index assignment. For brevity, we focus our discussion on the results in specification 1, which uses a fixed 200 firm bandwidth and a first-order polynomial local-linear regression. The RDD estimates in panel A of Table 4 (rows 1 and 2) indicate that the smallest firms inside the Russell 2000 take out an average of 0.13 fewer bank loans per year. To put this decline in percentage terms, we divide the estimated decline of 0.13 by β_0 (i.e., 0.36, the estimated frequency of bank loan initiations for firms just outside the index). Doing so suggests that index membership results in 35% fewer bank loan originations. The effect is similar when looking at bank loan proceeds. Firms just outside the index originate bank loans with proceeds equal to 18% of their market capitalization compared to 10% for a similar firm inside the Russell 2000.

Panel A of Table 4 also shows a corresponding increase in public equity issuance activity for firms inside the Russell 2000 compared to firms just outside the index (see rows 3 and 4). Firms just inside the Russell 2000 are approximately 9 percentage points more likely to conduct SEOs compared to firms outside the index, which amounts to a doubling in the probability of SEO issuance. In specifications 2 and 3 of Table 4, we reestimate Equation (4) using the optimal bandwidth suggested by Imbens and Kalvanaraman (2012), with specification 3 further introducing third-order polynomial controls for a firm's distance from the Russell 2000 cutoff. In either case, the results are very similar to those presented in specification 1.[15] In unreported tests, we find no significant effect of index membership on the likelihood of PIPEs, convertible debt offerings, or public bond offerings. However, these null results may be due to a lack of power as Table 1 indicates that firms in our sample use these alternate financing methods infrequently.

Figure 2 visually confirms the reduction in bank financing and increase in public equity issuance that

Table 4. Discontinuity Tests of Bank Borrowing Activity and Equity Issuance

	(1) BW = 200, Order = 1		(2) BW = IK, Order = 1		(3) BW = IK, Order = 3	
Dependent variable:	β_1	β_0	β_1	β_0	β_1	β_0
	Panel A: Postreconstitution (July–June), main specification					
Bank Debt Count	−0.13**	0.36***	−0.11***	0.34***	−0.12**	0.35***
	(0.06)	(0.04)	(0.04)	(0.03)	(0.06)	(0.04)
Bank Debt to Market Cap.	−7.69**	17.96***	−7.43***	16.71***	−8.04***	16.83***
	(3.50)	(2.69)	(2.52)	(1.95)	(2.89)	(2.23)
Public Equity Count	0.09**	0.09***	0.06**	0.11***	0.10**	0.09***
	(0.04)	(0.02)	(0.02)	(0.01)	(0.04)	(0.02)
Public Equity to Market Cap.	2.84***	1.34***	0.96**	2.46***	3.72***	0.81*
	(0.83)	(0.39)	(0.48)	(0.30)	(1.06)	(0.48)
	Panel B: Prereconstitution (July–May)					
Bank Debt Count	−0.04	0.20***	−0.06*	0.23***	−0.05	0.19***
	(0.04)	(0.03)	(0.03)	(0.02)	(0.05)	(0.04)
Bank Debt to Market Cap.	−3.11	9.99***	−3.79*	10.95***	−4.24	9.97***
	(2.73)	(2.02)	(2.06)	(1.55)	(2.95)	(2.18)
Public Equity Count	0.02	0.07***	0.02	0.09***	0.03	0.08***
	(0.03)	(0.02)	(0.02)	(0.01)	(0.03)	(0.02)
Public Equity to Market Cap.	0.81	1.61***	0.82	1.73***	0.90	1.60***
	(0.74)	(0.45)	(0.54)	(0.34)	(0.84)	(0.52)

Notes. This table investigates bank borrowing or equity issuance in the year following (panel A) and year prior to (panel B) index assignment. The leftmost column of the table is a list of dependent variables, which are measured from July–June following reconstitution in panel A and from July–May prior to reconstitution in panel B. The appendix contains detailed variable definitions. Subsequent columns present β_1 and β_0 estimates from the second-stage fuzzy RDD procedure:

$$Y_{it} = \beta_0 + \beta_1 \widehat{R2000_{it}} + \beta_2 R2000_{it}\widehat{(RANK_{it}} - C_t) + \beta_3 (RANK_{it} - C_t) + \varepsilon_{it}.$$

The sample contains Russell Micro Index constituents between 2000 and 2012. Specification 1 uses a fixed bandwidth of 200 firm ranks per year, while specifications 2 and 3 use optimal bandwidths as in Imbens and Kalvanaraman (2012). Specification 3 includes a third-order polynomial control for a firm's distance from the Russell 2000 lower cutoff. In panel A, the number of observations in specification 1 is 3,686, and the center of mass of the triangular kernel is at rank 59. The number of observations in specification 2 ranges between 6,268 and 10,058, and the center of mass of the triangular kernel ranges between 99 and 160. The number of observations in specification 3 ranges between 9,260 and 17,182, and the center of mass of the triangular kernel ranges between 147 and 289. In panel B, the number of observations in specification 1 is 3,469, and the center of mass of the triangular kernel is at rank 59. The number of observations in specification 2 ranges between 5,821 and 7,238, and the center of mass of the triangular kernel ranges between 100 and 121. The number of observations in specification 3 ranges between 9,945 and 12,644, and the center of mass of the triangular kernel ranges between 172 and 220. The standard error estimates for β_1 are presented below the coefficient.

*, **, and *** indicate significance at the 10%, 5%, or 1% levels, respectively.

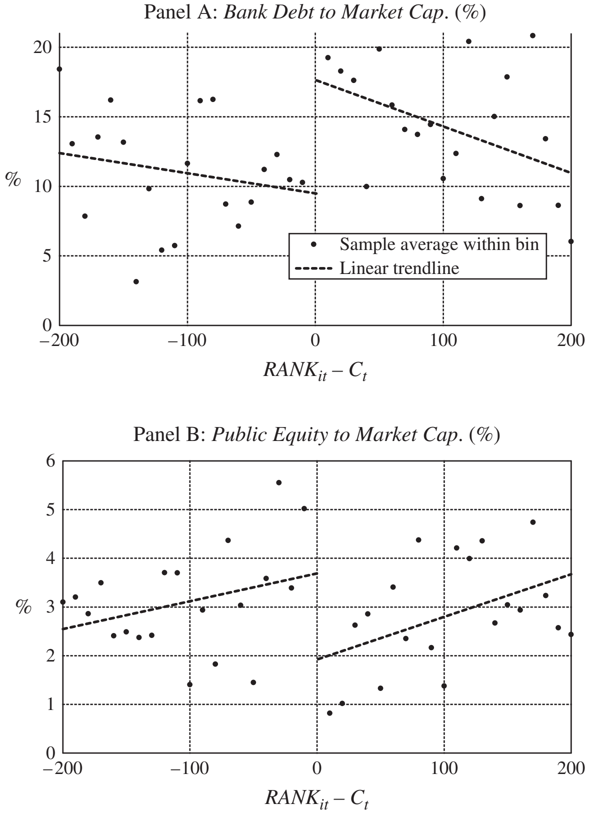
accompanies Russell 2000 membership. Each dot indicates a 10 rank average across the 13 years of our sample, and thus represents approximately 100 firm years after the exclusion of financial and regulated firms. In panel A, all five of the dots just inside the Russell 2000 raise between 9% and 13% of their market capitalization in bank loan proceeds each year. In contrast, four of the five groups just outside the index raise between 18% and 20% of their market capitalization in bank loan proceeds each year. Panel B indicates the opposite with respect to equity issuance—four of the five groups just inside the Russell 2000 raise over 3% of their market capitalization in equity proceeds each year, while none of the five groups just outside the Russell 2000 do.

In contrast to these significant differences in financing behavior following index assignment, panel B of Table 4 shows that the firms ultimately ending up on either side of the Russell 2000 threshold raise capital similarly in the year before index assignment. This further supports RDD's local continuity assumption (see Section 3.4.2), and suggests that index membership causes the changes in financing that we document following index assignment.

5. Evidence on Why Index Membership Affects Small Firm Financing

Our empirical framework, which exploits exogenous variation in Russell 2000 Index assignment, is well

Figure 2. Discontinuity Tests of Bank Borrowing Activity and Public Equity Issuance



Notes. The x axis plots size rankings relative to the cutoff rank for inclusion in the Russell 2000 Index, based on our market capitalization ranking. Firms to the right of zero are expected to be the largest firms outside the Russell 2000 and firms to the left of zero are expected to be the smallest firms inside the index. The y axis indicates the average *Bank Debt to Market Cap.* (%) (panel A) and *Public Equity to Market Cap.* (%) (panel B) for firms within a given size bin between July and June following Russell reconstitution. Specifically, each dot represents the average for a given 10 rank size bin, using our sample from 2000–2012. The lines reflect the predicted issuance activity for a firm of a given size rank. Estimates are based on the fuzzy RDD specification described in Equations (2)–(4) using a uniform kernel. The sample consists of (nonfinancial and nonutility) Russell Micro Index constituents with size ranks within 200 of the Russell 2000 lower cutoff between 2000 and 2012.

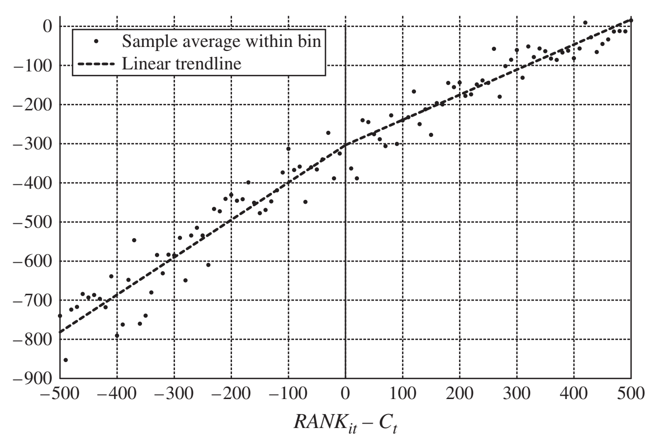
suited to identify the aggregate consequences to Russell 2000 membership. In this section, we conduct several analyses to provide circumstantial evidence on why index membership affects small firm financing. These subsequent tests are less direct because although we have exogenous variation in index assignment, we do not have exogenous variation in the specific economic mechanisms through which index membership affects small firm financing.

5.1. Tests for Symmetry Following Russell 2000 Additions and Deletions

Chen et al. (2004) argue that if consequences to index membership are concentrated following additions then they may be because of the fact that being added to an index increases visibility, but being deleted does not immediately remove this visibility. To separately investigate the effect of Russell 2000 additions and deletions on financing behavior, we employ an empirical design identical to the method used by Chang et al. (2015) to identify the effect of Russell 2000 additions and deletions on stock returns. This method is similar to the RDD procedure discussed in Sections 3.1 and 3.2, except that the additions sample includes only firms outside the Russell 2000 in the previous year, while the deletions sample contains only firms inside the Russell 2000 in the previous year.

Here, RDD identifies the effect of Russell 2000 membership by comparing outcomes for firms that are barely added to (deleted from) the Russell 2000 to similar firms that remain just outside (inside) the index. In the case of the additions sample, the firms added to the Russell 2000 will be on average different (i.e., better performing) from the firms remaining outside the index, but this does not compromise RDD identification because the firms ending up on either side of the Russell 2000 cutoff are not discontinuously different. Figure 3 illustrates this idea by showing that firms added to the Russell 2000 reduced their market capitalization ranking more over the previous year than firms remaining outside the index, but the firms on

Figure 3. Discontinuity Plot of Change in Rank—Additions



Notes. The sample runs from 2000 to 2012 and consists of (nonfinancial and nonutility) Russell Micro Index constituents that are within 500 size ranks of the Russell 2000 lower cutoff. The sample is restricted to firms that were not in the Russell 2000 in the previous year (i.e., our additions sample). The x axis plots size rankings relative to the cutoff rank for inclusion in the Russell 2000 Index, based on our market capitalization ranking. Firms to the right of zero are expected to be the largest firms outside the Russell 2000 and firms to the left of zero are expected to be the smallest firms inside the index. The y axis indicates the average year over year change in size ranking, defined as this year's size rank (based on May 31 1 month before Russell reconstitution) minus last year's size rank (based on May 31 13 months before Russell reconstitution). Specifically, each dot represents the average for a given 10 rank size bin, using our sample from 2000–2012. The trend lines reflect the predicted change in rank for a firm of a given size rank. Estimates are based on the fuzzy RDD specification described in Equations (2)–(4) using a uniform kernel.

either side of the cutoff do not exhibit discontinuously different changes in their ranking.

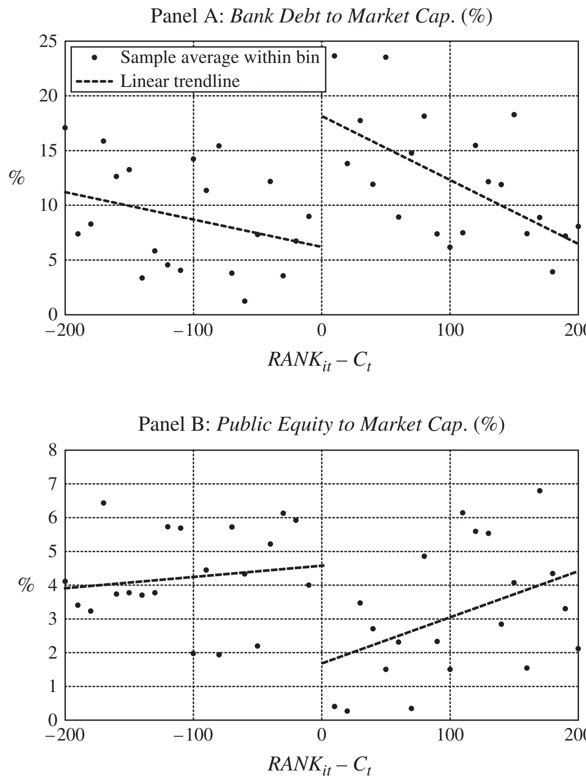
The results in Table 5 show that the transition away from bank financing and toward SEOs is concentrated in the additions sample. Compared to firms staying outside the index, firms newly added to the Russell 2000 initiate 0.17 or 49% fewer bank loans and 68% less proceeds in bank loans. These firms substitute toward SEOs. On average, firms added to the Russell 2000 raise over 3.9% more of their market capitalization in SEO proceeds compared to similar firms not added to the index. In panel B, β_1 measures the increase in the dependent variable for firms that stay in the Russell 2000 Index compared to firms that are deleted from the Russell 2000 Index. In contrast to the additions analysis, panel B indicates no significant change in financing behavior following deletion from the Russell 2000.

Moving across the columns in panel A of Table 5 shows that the estimates of β_1 are robust to using a fixed 200 bandwidth or an optimal bandwidth with either linear or cubic controls for the distance a firm is away from the Russell 2000 threshold. The bottom half of each panel shows that the firms on either side of the Russell 2000 cutoff raise capital similarly before index assignment. In the case of our additions sample, this means that in the year prior to reconstitution, during which all firms in the sample are outside the Russell 2000, there is no discontinuity in financing behavior between firms that ultimately are added to the Russell 2000 and those that ultimately remain outside of the index.

Figure 4 illustrates the magnitude of the discontinuity in financing behavior between firms added to the Russell 2000 and those remaining outside the index. Panel A shows that the threshold firm remaining just outside the Russell 2000 is estimated to initiate banks loans with total proceeds of 20% of their market capitalization each year, while a similar firm inside the index raises only a quarter of that amount. Panel B shows the opposite for annual SEO proceeds as firms added to the Russell 2000 raise approximately five times more SEO proceeds than similar firms outside the index.

An important consideration when interpreting the effect of Russell 2000 additions and deletions is the possibility that some firms are being readded to the index. Any effect of Russell 2000 additions on visibility or the information environment implicitly assumes that the average firm being added to the index has been outside the index long enough that any effects from previous stints in the Russell 2000 have dissipated. Within our additions sample, we find that 80% of firms have not been in the Russell 2000 within two years and 60% of firms have not been in the index within five years. Moreover, unreported analyses indicate that the transition away from bank borrowing in favor of SEO issuance remains significant in the sample of firms that have been outside the index for an extended period of time.

Figure 4. Discontinuity Plots of Bank Borrowing Activity and Public Equity Issuance—Additions



Notes. The sample runs from 2000 to 2012 and consists of (nonfinancial and nonutility) Russell Micro Index constituents that are within 200 size ranks of the Russell 2000 lower cutoff. The sample is restricted to firms that were not in the Russell 2000 in the previous year (i.e., our additions sample). The x axis plots size rankings relative to the cutoff rank for inclusion in the Russell 2000 Index, based on our market capitalization ranking. Firms to the right of zero are expected to be the largest firms outside the Russell 2000 and firms to the left of zero are expected to be the smallest firms inside the index. The y axis indicates the average *Bank Debt to Market Cap.* (%) (panel A) and *Public Equity to Market Cap.* (%) (panel B) for firms within a given size bin between July and June following Russell reconstitution. Specifically, each dot represents the average for a given 10 rank size bin, using our sample from 2000–2012. The lines reflect the predicted issuance activity for a firm of a given size rank. Estimates are based on the fuzzy RDD specification described in Equations (2)–(4) using a uniform kernel.

5.2. Postaddition Improvement in Visibility and the Information Environment

The evidence in Section 5.1 is consistent with Russell 2000 membership affecting small firms financing via increased visibility. The significant media attention paid to Russell reconstitutions is consistent with this channel. In the first part of this section we examine whether Russell 2000 additions also lead to changes in two common measures of visibility: institutional ownership and analyst coverage.

Table 5. Discontinuity Tests of Bank Borrowing Activity and Public Equity Issuance—Additions/Deletions

	(1) BW = 200, Order = 1		(2) BW = IK, Order = 1		(3) BW = IK, Order = 3	
Dependent variable	β_1	β_0	β_1	β_0	β_1	β_0
Panel A: Russell 2000 additions compared to firms remaining just outside the index						
Postreconstitution						
Bank Debt Count	−0.17**	0.36***	−0.12***	0.31***	−0.18**	0.35***
	(0.07)	(0.06)	(0.04)	(0.03)	(0.08)	(0.06)
Bank Debt to Market Cap.	−13.09***	19.33***	−9.18***	15.40***	−14.33**	21.16***
	(4.66)	(3.67)	(2.79)	(2.15)	(6.04)	(4.56)
Public Equity Count	0.11**	0.08***	0.08**	0.11***	0.11**	0.08***
	(0.05)	(0.02)	(0.03)	(0.02)	(0.05)	(0.03)
Public Equity to Market Cap.	3.93***	0.90*	2.11**	2.40***	2.99***	1.79***
	(1.21)	(0.49)	(0.84)	(0.42)	(1.14)	(0.51)
Prereconstitution						
Bank Debt Count	−0.05	0.19***	−0.05	0.21***	−0.04	0.18***
	(0.06)	(0.04)	(0.05)	(0.03)	(0.08)	(0.05)
Bank Debt to Market Cap.	−2.30	10.47***	−2.84	12.50***	−1.42	9.63***
	(4.48)	(2.91)	(3.09)	(1.98)	(5.23)	(3.26)
Public Equity Count	0.03	0.08***	0.02	0.10***	0.02	0.09***
	(0.04)	(0.03)	(0.02)	(0.01)	(0.05)	(0.03)
Public Equity to Market Cap.	1.25	2.49***	0.86	2.46***	1.31	2.60***
	(1.44)	(0.80)	(0.75)	(0.38)	(1.60)	(0.86)
Panel B: Russell 2000 deletions compared to firms remaining just inside the index						
Postreconstitution						
Bank Debt Count	−0.07	0.36***	−0.10*	0.36***	−0.08	0.37***
	(0.09)	(0.07)	(0.06)	(0.05)	(0.11)	(0.09)
Bank Debt to Market Cap.	−1.35	15.54***	−4.47	17.42***	−1.74	15.75***
	(5.21)	(3.94)	(3.21)	(2.62)	(6.70)	(5.06)
Public Equity Count	0.06	0.12***	0.01	0.12***	0.10	0.09**
	(0.06)	(0.04)	(0.03)	(0.02)	(0.07)	(0.04)
Public Equity to Market Cap.	1.46	2.01***	−0.05	2.39***	0.28	2.36***
	(1.17)	(0.64)	(0.69)	(0.50)	(1.02)	(0.68)
Prereconstitution						
Bank Debt Count	−0.03	0.20***	−0.07	0.24***	0.00	0.17***
	(0.06)	(0.05)	(0.05)	(0.04)	(0.08)	(0.06)
Bank Debt to Market Cap.	−4.29	9.78***	−2.45	9.34***	−5.44	9.99***
	(3.34)	(2.76)	(1.90)	(1.65)	(3.99)	(3.27)
Public Equity Count	0.01	0.06***	−0.01	0.09***	0.03	0.04*
	(0.03)	(0.02)	(0.03)	(0.02)	(0.04)	(0.03)
Public Equity to Market Cap.	0.55	0.71**	−0.02	1.15***	0.76	0.41
	(0.53)	(0.28)	(0.35)	(0.23)	(0.62)	(0.31)

Notes. This table investigates whether there are discontinuities in bank borrowing or equity issuance activity following Russell 2000 additions (panel A) and deletions (panel B). In panel A (B) the sample is restricted to (nonfinancial and nonutility) Russell Micro Index constituents that were not (were) in the Russell 2000 or Russell 1000 Index during the previous year. The leftmost column of the table is a list of dependent variables. Postreconstitution variables are measured from July–June following reconstitution, while prereconstitution variables are measured from July–May prior to reconstitution. Detailed variable definitions are provided in the appendix. Subsequent columns present β_1 and β_0 estimates from the second stage of our fuzzy RDD procedure:

$$Y_{it} = \beta_0 + \beta_1 \widehat{R2000_{it}} + \beta_2 R2000_{it}\widehat{(RANK_{it} - C_t)} + \beta_3(RANK_{it} - C_t) + \varepsilon_{it}.$$

The sample contains (nonfinancial and nonutility) Russell Micro Index constituents between 2000 and 2012. Specification 1 uses a fixed bandwidth of 200 firm ranks per year, while specifications 2 and 3 use optimal bandwidths computed as proposed by Imbens and Kalvanaraman (2012). Specification 3 expands the set of controls in the above equation to include a third-order (instead of linear) polynomial control for a firm's distance from the Russell 2000 lower cutoff. In panel A, the number of observations in specification 1 is 2,045, and the center of mass of the triangular kernel is at rank 59. The number of observations in specification 2 ranges between 4,121 and 5,266, and the center of mass of the triangular kernel ranges between 118 and 152. The number of observations in specification 3 ranges between 5,142 and 8,000, and the center of mass of the triangular kernel ranges between 148 and 257. In panel B, the number of observations in specification 1 is 1,641, and the center of mass of the triangular kernel is at rank 59. The number of observations in specification 2 (panel B) ranges between 4,155 and 4,727, and the center of mass of the triangular kernel ranges between 147 and 167. The number of observations in specification 3 (panel B) ranges between 4,113 and 7,733, and the center of mass of the triangular kernel ranges between 145 and 269. The standard error estimates for β_1 are presented below the coefficient.

*, **, and *** indicate significance at the 10%, 5%, or 1% levels, respectively.

Table 6. Differences in the Information Environment

	(1) BW = 200, Order = 1		(2) BW = IK, Order = 1		(3) BW = IK, Order = 3	
Dependent variable	β_1	β_0	β_1	β_0	β_1	β_0
Panel A: Russell 2000 additions compared to firms remaining just outside the index						
Institutional shareholders						
Number of Institutional Owners	10.46***	36.23***	11.01***	35.55***	9.81***	36.75***
	(1.94)	(1.34)	(1.46)	(0.97)	(2.38)	(1.60)
Percentage Institutional Ownership	2.01	40.37***	4.83***	38.27***	1.02	41.16***
	(2.53)	(1.68)	(1.43)	(0.92)	(3.10)	(2.00)
Analyst Coverage						
Log Analysts	0.11*	1.42***	0.05	1.45***	0.17**	1.39***
	(0.06)	(0.04)	(0.04)	(0.02)	(0.08)	(0.05)
Log Forecasts	0.18*	2.81***	0.09*	2.86***	0.24*	2.77***
	(0.10)	(0.06)	(0.05)	(0.03)	(0.13)	(0.08)
Market quality measures						
Bid-ask Spread	−51.04***	133.68***	−44.54***	132.56***	−51.04***	131.44***
	(11.48)	(8.26)	(5.89)	(4.19)	(13.93)	(9.78)
Inelasticity	−0.59***	2.82***	−0.54***	2.85***	−0.59***	2.80***
	(0.14)	(0.11)	(0.08)	(0.06)	(0.17)	(0.13)
Panel B: Russell 2000 deletions compared to firms remaining just inside the index						
Institutional shareholders						
Number of Institutional Owners	11.88***	40.21***	10.99***	41.03***	12.88***	39.58***
	(2.06)	(1.49)	(1.47)	(1.09)	(2.67)	(1.91)
Percentage Institutional Ownership	5.67**	42.30***	5.00***	43.19***	6.17*	41.66***
	(2.60)	(1.85)	(1.85)	(1.38)	(3.19)	(2.27)
Analyst coverage						
Log Analysts	0.00	1.55***	−0.03	1.57***	0.02	1.53***
	(0.06)	(0.05)	(0.05)	(0.03)	(0.07)	(0.05)
Log Forecasts	−0.04	3.09***	−0.07	3.11***	−0.02	3.05***
	(0.10)	(0.07)	(0.07)	(0.05)	(0.11)	(0.08)
Market quality measures						
Bid-ask Spread	−9.72	112.06***	−14.54*	111.29***	−12.33	111.88***
	(13.55)	(9.83)	(7.74)	(6.27)	(15.77)	(11.55)
Inelasticity	−0.18	2.50***	−0.12*	2.44***	−0.22	2.51***
	(0.12)	(0.09)	(0.07)	(0.06)	(0.14)	(0.11)

Notes. This table investigates whether there are discontinuities in measures of market quality and information acquisition costs following Russell 2000 additions (panel A) and deletions (panel B). In panel A the sample is restricted to (nonfinancial and nonutility) Russell Micro Index constituents that were not in the Russell 2000 or Russell 1000 Index during the previous year. Thus, we compare Russell 2000 additions to firms remaining just outside the index. Conversely, panel B restricts the sample to (nonfinancial and nonutility) Russell Micro Index constituents that were in the Russell 2000 or Russell 1000 Index during the previous year. The leftmost column of the table is a list of dependent variables, which are measured from July–June following reconstitution. Detailed variable definitions are provided in the appendix. Subsequent columns present β_1 and β_0 estimates from the second stage of our fuzzy RDD procedure:

$$Y_{it} = \beta_0 + \beta_1 \widehat{R2000_{it}} + \beta_2 R2000_{it}\widehat{(RANK_{it}} - C_t) + \beta_3(RANK_{it} - C_t) + \varepsilon_{it}.$$

The sample contains (nonfinancial and nonutility) Russell Micro Index constituents between 2000 and 2012. Specification 1 uses a fixed bandwidth of 200 firm-ranks per year, while specifications 2 and 3 use optimal bandwidths computed as proposed by Imbens and Kalvanaraman (2012). Specification 3 expands the set of controls in the above equation to include a third-order (instead of linear) polynomial control for a firm's distance from the Russell 2000 lower cutoff. The standard error estimates for β_1 are presented below the coefficient.

*, **, and *** indicate significance at the 10%, 5%, or 1% levels, respectively.

We begin our investigation of how Russell 2000 membership affects firm visibility by examining the effect of Russell 2000 additions and deletions on institutional ownership. Although the number of institutions owning a stock captures many things, it is a useful measure of firm visibility because it directly reflects the number of investors that are informed about the firm. The positive β_1 coefficients in panels A and B of Table 6 suggest that Russell 2000 firms have more institutional shareholders and that the effect of Russell 2000 membership on institutional ownership is symmetric surrounding additions and deletions. Despite this symmetric effect, the discussion in Chen et al. (2004) suggest that the change in visibility is likely to be asymmetric surrounding additions and deletions because institutions are likely to become aware of a firm when they purchase it, but will not necessarily become immediately unaware the instant they sell the stock.

The symmetry of this change in institutional shareholders, coupled with the concentration of the change in financing behavior following Russell 2000 additions, makes it unlikely that increased institutional shareholders is a first-order explanation for our main results. It remains possible, however, that institutional shareholders induce changes, which affect the financing decision, and persist after the institutional shareholders sell their shares. Although we believe this is unlikely to be the primary driver of our findings, Johnson et al. (2015) do find evidence that institutions have persistent effects on firms' governance structures.

In the next two rows of Table 6, panel A, we turn to our second measure of visibility, which is analyst coverage. Among the approximately 85% of firms with some analyst coverage, being added to the Russell 2000 increases analyst coverage, both in terms of the number of analysts covering a firm and the total number of analyst forecasts issued. Across the six specifications, the magnitude of the increase is typically between 5% and 10%, with five of the six coefficient estimates being statistically significant at the 10% level or better. In unreported tests, we find no evidence that Russell 2000 additions significantly affect the probability that analysts will begin following the 15% of firms with no analyst coverage. In addition, panel B of Table 6 indicates no significant change in analyst coverage or forecast frequency following deletions. These findings suggest that there is an increase in firm visibility following index additions that does not immediately reverse upon deletion.

In the last two rows of Table 6 we examine whether this increased visibility is accompanied by an enhanced information environment, which we measure using bid-ask spreads and the Gao and Ritter (2010) demand inelasticity measure. We find that both measures improve following additions to the Russell 2000. Scaling each β_1 coefficient by β_0, indicates that index addition causes bid-ask spreads to drop by over 30% and demand inelasticity to drop by approximately 20%. Moreover, these findings are robust to bandwidth and polynomial choice as all six β_1 coefficients across the various specifications in Table 6, panel A, are significant at the 1% level or better. In contrast, panel B shows that deletion is not associated with significant changes in market quality.

Overall, the evidence in Table 6 suggests that Russell 2000 additions materially affect the firm's visibility and information environment. In contrast, deletions appear to have little effect. Given that the transition away from bank borrowing toward SEO issuance is also concentrated after additions, this evidence is consistent with Russell 2000 membership affecting small firm financing through its effect on visibility and the information environment.

5.3. Stock Returns Surrounding Russell 2000 Additions and Deletions

Another potential reason that Russell 2000 membership increases the frequency of SEOs relative to bank loan initiations is that Russell 2000 additions (deletions) result in positive (negative) stock returns. Figure 5 presents the differential cumulative abnormal returns for firms that are in the Russell 2000 as of the end of June versus firms just outside the index. We obtain these estimates from our baseline RDD specification, which we describe in Equations (2)–(4), using monthly returns as the dependent variable. Specifically, we cumulate the compounded monthly abnormal returns (i.e., the monthly β_1 estimates), with the returns being set to zero as of the end of May prior to Russell reconstitution. Panels A and B use Fama–French three-factor abnormal returns and raw returns, respectively.[16]

The solid line presents returns for the full sample, while the dashed lines partition the sample into the additions and deletions subsamples. Firms inside the Russell 2000 experience approximately 6% more positive returns in the June month of reconstitution compared to firms just outside the index. However, these positive returns completely reverse by August, becoming negative over the remainder of the year of reconstitution. These returns patterns are similar in our additions and deletions subsamples.

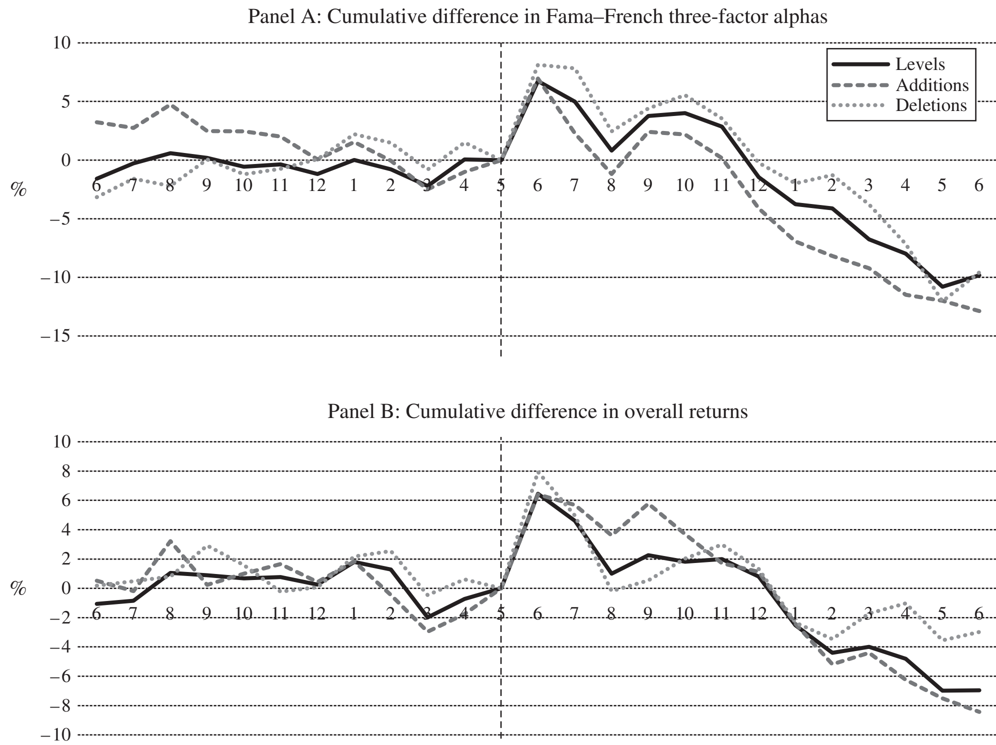
The symmetry of the returns following Russell 2000 additions and deletions makes equity overvaluation an unlikely driver of our results. Moreover, the returns reversal we document in August suggests that July and August are the only months between the first month since reconstitution and the following June that recently added firms appear to have higher equity valuations. The evidence in Table 7 shows firms continue to be less likely to initiate bank loans and more likely to conduct SEOs even after excluding July and August from the test sample, makes it unlikely that addition and deletion period returns as a driver of our findings.

6. Index Membership and Financing Terms

In this section, we examine whether the changes in financing behavior following Russell 2000 additions are accompanied by changes in financing terms. Unlike our analysis with respect to the quantity of financing, we cannot cleanly identify the causal effect of index membership on financing terms, because financing terms are observed only when a firm obtains a given source of financing and the type of financing firms seek depends on index membership. Therefore, the goal of this section is to use RDD to provide descriptive statistics on how Russell 2000 inclusion relates to financing terms.

We first examine whether bank loan terms are related to Russell 2000 membership. Since DealScan

Figure 5. Cumulative Return Difference



Notes. The x axis plots months surrounding Russell reconstitution, where 6 equals June, the month of reconstitution. The y axis plots cumulative abnormal returns (panel A) and cumulative abnormal returns (panel B), where the May before Russell reconstitution is set to 0. The solid, long-dash, and short-dash lines represent monthly compounded cumulative abnormal returns for the full, additions, and deletions subsamples. Each month the excess returns attributable to Russell 2000 membership are estimated as β in the following fuzzy RDD second-stage equation:

$$Y_{it} = \beta_0 + \beta_1 \widehat{R2000_{it}} + \beta_2 R2000_{it}\widehat{(RANK_{it} - C_t)} + \beta_3 (RANK_{it} - C_t) + \varepsilon_{it},$$

where the dependent variable is Fama–French three-factor alphas (panel A) and overall returns (panel B) in a given month. Panel A presents risk-adjusted return differences, by estimating the Fama–French three-factor model on a rolling basis for each month using data from the preceding year. Panel B presents cumulative return differences between firms in and outside of the Russell 2000 Index based on unadjusted returns. All estimates from RDD specifications at the lower Russell 2000 cutoff using a sample consisting of all (nonfinancial and nonutility) Russell Micro Index constituents between 2000 and 2012 with a triangular kernel using the optimal bandwidth method proposed by Imbens and Kalvanaraman (2012). The additions sample is restricted to (nonfinancial and nonutility) Russell Micro Index constituents that were not in the Russell 2000 or Russell 1000 Index during the previous year. Conversely, the deletions sample restricts the sample to (nonfinancial and nonutility) Russell Micro Index constituents that were in the Russell 2000 or Russell 1000 Index during the previous year.

misses covenants for many loan packages, we supplement DealScan's covenant information with our own hand-collected covenant measure for firms within 200 ranks of the Russell 2000 cutoff.[17] Panel A of Table 8 presents RDD results, where the outcomes of interest are the average financing terms for all bank loans or equity offerings initiated in a given year. Russell 2000 members take out smaller loans. This extends the evidence in Table 4 by suggesting that not only does index membership result in less frequent bank loan initiations, but it also reduces average loan size, conditional on taking out a loan. Russell 2000 members also get more favorable financing terms as they have lower spreads and fewer covenants. Panel B shows that these findings become more significant after restricting the analysis to our additions sample and are largely statistically insignificant in the deletions sample. Results are qualitatively similar using a count variable for the number of covenants reported in DealScan.

We find little evidence that index membership affects other loan characteristics, such as whether the borrower switches their lead arranger, whether the borrower has an outstanding loan at the time of loan initiation, or the time since the borrower's last bank loan. These latter two findings are consistent with Russell 2000 membership not affecting the relative frequency of bank loan renegotiations and new bank loan originations. Finally, there is no significant difference in the percentage of loans financed by a single lead arranger; both groups use a single lead over 85% of the time. Moreover, over half of borrowers working with a single lead have not worked with another lead arranger within five years, which is consistent with borrowers

Table 7. Discontinuity Tests of Bank Borrowing Activity and Equity Issuance—Excluding July and August

	(1) BW = 200, Order = 1		(2) BW = IK, Order = 1		(3) BW = IK, Order = 3	
Dependent variable	β_1	β_0	β_1	β_0	β_1	β_0
Bank Debt Count	−0.11*	0.31***	−0.09**	0.29***	−0.11**	0.30***
	(0.06)	(0.04)	(0.04)	(0.03)	(0.05)	(0.04)
Bank Debt to Market Cap.	−5.99*	15.73***	−5.70***	14.38***	−6.45**	14.68***
	(3.33)	(2.51)	(2.18)	(1.66)	(2.64)	(2.01)
Public Equity Count	0.08**	0.08***	0.05**	0.09***	0.09**	0.07***
	(0.04)	(0.02)	(0.02)	(0.01)	(0.04)	(0.02)
Public Equity to Market Cap.	2.53***	1.22***	0.80*	2.22***	3.27***	0.77*
	(0.80)	(0.37)	(0.44)	(0.28)	(1.00)	(0.45)

Notes. This table investigates whether Russell 2000 membership creates discontinuities in bank borrowing or equity issuance activity. To avoid the effect of abnormal returns following changes in index membership the sample used in this table excludes the months of July and August from the computation of postreconstitution financing activity. Thus, the dependent variables in the leftmost column are measured from September–June following reconstitution. Detailed variable definitions are provided in the appendix. Subsequent columns present β_1 and β_0 estimates from the second stage of our fuzzy RDD procedure:

$$Y_{it} = \beta_0 + \beta_1 \widehat{R2000_{it}} + \beta_2 R2000_{it} \widehat{(RANK_{it} - C_t)} + \beta_3 (RANK_{it} - C_t) + \varepsilon_{it}.$$

The sample contains (nonfinancial and nonutility) Russell Micro Index constituents between 2000 and 2012. Specification 1 uses a fixed bandwidth of 200 firm-ranks per year, while specifications 2 and 3 use optimal bandwidths computed as proposed by Imbens and Kalvanaraman (2012). Specification 3 expands the set of controls in the above equation to include a third-order (instead of linear) polynomial control for a firm's distance from the Russell 2000 lower cutoff. The standard error estimates for β_1 are presented below the coefficient.

*, **, and *** indicate significance at the 10%, 5%, or 1% levels, respectively.

Table 8. Russell 2000 Membership and Bank Loan Characteristics

	(1) BW = 200, Order = 1		(2) BW = IK, Order = 1		(3) BW = IK, Order = 3	
Dependent variable	β_1	β_0	β_1	β_0	β_1	β_0
			Panel A: Postreconstitution, full sample			
Bank debt characteristics						
Bank Debt to Market Cap.	−30.30	100.92***	−25.46**	97.82***	−40.65*	106.99***
	(20.01)	(13.91)	(11.82)	(9.07)	(21.92)	(15.38)
All-in-drawn Spread	−48.24	296.94***	−59.38***	307.84***	−45.60	300.01***
	(30.02)	(20.15)	(18.23)	(13.13)	(29.96)	(20.37)
Covenants	−0.64**	3.66***				
	(0.31)	(0.20)				
Maturity	−0.25	43.54***	−0.73	43.49***	−0.47	43.04***
	(3.46)	(2.10)	(1.98)	(1.26)	(3.13)	(1.94)
Lead Switches	5.84	66.27***	−0.82	70.07***	5.39	66.23***
	(8.68)	(5.52)	(4.02)	(2.77)	(9.23)	(5.97)
One Lead	7.94	78.46***	4.12	83.06***	7.33	79.04***
	(7.10)	(4.78)	(3.72)	(2.61)	(6.69)	(4.55)
Equity characteristics						
Gross Spread	0.36	5.57***	0.32	5.53***	0.45	5.47***
	(0.39)	(0.24)	(0.24)	(0.14)	(0.41)	(0.26)
Underpricing	0.24	5.96***	−0.10	6.02***	0.37	5.88***
	(2.95)	(1.50)	(1.87)	(0.98)	(2.69)	(1.42)
SEO Announcement Ret.	−0.57	−6.18***				
	(2.23)	(1.78)				
Public Equity to Market Cap.	13.92**	22.92***	1.82	30.70***	15.77**	22.35***
	(6.24)	(5.02)	(4.45)	(3.60)	(6.75)	(5.76)

Table 8. (Continued)

	(1) BW = 200, Order = 1		(2) BW = IK, Order = 1		(3) BW = IK, Order = 3	
Dependent variable	β_1	β_0	β_1	β_0	β_1	β_0
Panel B: Russell 2000 additions compared to firms remaining just outside the index						
Bank debt characteristics						
Bank Debt to Market Cap.	−66.35***	108.46***	−64.09***	106.84***	−78.50***	117.42***
	(25.10)	(17.26)	(22.34)	(15.60)	(28.70)	(19.13)
All-in-drawn Spread	−76.50*	300.77***	−64.07**	305.88***	−73.48	299.48***
	(46.13)	(28.04)	(28.46)	(18.00)	(50.36)	(29.37)
Covenants	−1.12**	3.83***				
	(0.51)	(0.29)				
Panel C: Russell 2000 deletions compared to firms remaining just inside the index						
Bank debt characteristics						
Bank Debt to Market Cap.	−0.33	88.88***	−18.41	105.52***	−2.32	89.35***
	(29.69)	(22.64)	(19.99)	(16.92)	(36.63)	(22.13)
All-in-drawn Spread	−28.59	291.60***	−55.29**	305.02***	−10.00	286.25***
	(39.50)	(28.50)	(24.19)	(19.94)	(46.40)	(28.08)
Covenants	−0.22	3.45***				
	(0.36)	(0.25)				

Notes. This table investigates whether Russell 2000 membership affects financing terms. Thus, the dependent variables in the leftmost column are the average over all financing events that occur between July and June following reconstitution. Firm years with no appropriate financing events are excluded from the analysis. Panel A contains the full sample, panel B is restricted to firms that were not in the Russell 2000 or Russell 1000 Index during the previous year, while panel C restricts the sample to firms were in the Russell 2000 or Russell 1000 Index during the previous year. Detailed variable definitions are provided in the appendix. Subsequent columns present β_1 and β_0 estimates from the second stage of our fuzzy RDD procedure:

$$Y_{it} = \beta_0 + \beta_1 \widehat{R2000_{it}} + \beta_2 R2000_{it}\widehat{(RANK_{it} - C_t)} + \beta_3(RANK_{it} - C_t) + \varepsilon_{it}.$$

For our third-order equity issuance analyses in specification 3 of panel A we run a sharp RDD instead of the fuzzy RDD because conditional on raising equity, there are fewer than four firms in which our treated indicator does not equal actual Russell 2000 membership. This precludes us from identifying the fuzzy RDD system of equations, but makes sharp and fuzzy RDD virtually equivalent. We use a similar simplification in panel C. The sample contains (nonfinancial and nonutility) Russell Micro Index constituents between 2000 and 2012. Specification 1 uses a fixed bandwidth of 200 firm ranks per year. Specifications 2 and 3 use optimal bandwidths as in Imbens and Kalvanaraman (2012). Specification 3 expands the set of controls in the above equation to include a third-order (instead of linear) polynomial control for a firm's distance from the Russell 2000 lower cutoff. The standard error estimates for β_1 are presented below the coefficient.

*, **, and *** indicate significance at the 10%, 5%, or 1% levels, respectively.

near the Russell 2000 cutoff being locked into a lending relationship.

Finally, we examine whether Russell 2000 membership results in more favorable equity issuance terms, as one would expect in an improved information environment. We begin by using underwriter fees and SEO underpricing as dependent variables in our fuzzy RDD specification, which have both been shown to be decreasing in the quality of the information environment (Corwin 2003, Lee and Masulis 2009). In panel A of Table 8 we do not find significant relations between Russell 2000 membership and these dimensions of SEO issuance costs. To construct an additional measure of the information costs associated with SEO issuance, we conduct Factiva searches to identify the earliest announcement date for the 454 SEOs conducted by firms within 200 ranks of the Russell 2000 lower cutoff. Consistent with the existing literature, there is a significant negative market reaction surrounding SEO announcement. In our sample, this negative reaction is approximately 5% and is concentrated in the days before and following the announcement. However, we do not find a significant relation between Russell 2000 membership and the returns during the two days surrounding SEO announcement.

This lack of a significant relation between Russell 2000 membership and SEO issuance costs could be due to a lack of statistical power or the limitations discussed at the beginning of this section. The last row of panel A of Table 8, which shows that firms in the Russell 2000 Index conduct larger SEOs, offers another possibility. Since SEO size and other offer characteristics are simultaneously determined, we cannot identify the direct effect of Russell 2000 membership on any single SEO characteristic—it could be that index membership directly reduces SEO issuance costs, but firms adjust other SEO characteristics in a manner that effectively undoes this cost reduction. Thus, the evidence in this section should be interpreted descriptively.

7. Conclusion

We exploit quasirandom variation in Russell 2000 Index assignment to show that index membership is an important determinant of the financing process for small public firms. Our results suggest that Russell 2000 members initiate significantly fewer bank loans and conduct significantly more SEOs compared to similar firms outside the index.

We also provide circumstantial evidence regarding why Russell 2000 membership has these effects on financing policy. Our evidence is most consistent with an information channel whereby Russell 2000 membership reduces financing frictions because it increases investor awareness, thus improving the information environment. For example, Russell 2000 members change their financing behavior following index additions, but not following deletions, and we observe the same pattern with respect to changes in the information environment—liquidity and analyst coverage increase following index addition but do not change following deletions. Overall, our findings indicate that small public firms face significant financing frictions and suggest that the recent increase in small-cap index investing has resulted in new consequences to index membership.

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Appendix. Variable Definitions

Variable	Definition (source)
Firm characteristics	
Russell Index membership	Russell Index membership as indicated by the first updated monthly constituent list after every reconstitution. Typically, the list is updated by the end of June, however in some years July is the first updated list. (Russell Indexes)
Market Cap ($Mln)	In millions of dollars as of the last trading day in May. Computed as the sum of $r * shrout * prc$ over all share classes, where r is the best most recent ratio of Compustat's shares outstanding *cshoq* to CRSP's shares outstanding *shrout*. The best ratio r is the lowest ratio greater than 1 as measured as of the latest report date or the latest earnings release date (rdq). When the earnings release date is not available, we follow Chang et al. (2015) and use varying rules regarding filing delays over the years. Share classes are identified based on permno identifiers, while firms are identified based on gvkeys. Gvkeys are merged using the CRSP/Compustat Merged Database (CCM),[a] and are forward- and back-filled to ensure a continuous match. (CRSP, Compustat)
Total Assets ($Mln)	Total assets (atq) in millions of dollars, as of December. (Compustat)
Market to Book Equity (%)	Market capitalization (prccq * cshoq) divided by book value of common equity (ceqq), expressed as a percentage. This variable is winsorized at 1% and observations with negative book equity are ignored. (Compustat)
Leverage (%)	Long-term liabilities (dlttq) over total assets (atq), expressed as a percentage and winsorized at 1%. (Compustat)
Capital Expenditures/ Total Assets (%)	Sum of quarterly changes in capital expenditures (capxy) over the past four quarters scaled by beginning of period total assets (atq), expressed as a percentage and winsorized at 1%. Missing values are set to zero. (Compustat)
Cash (%)	Cash and equivalents (cheq) divided by total assets (atq) to reconstitution, expressed as a percentage and winsorized at 1%. (Compustat)
Credit Rating Indicator	Equals 1 for firms with credit ratings and 0 otherwise. (Compustat)
Market quality measures	
Returns (%)	Compounded monthly returns expressed as a percentage, including delisting returns when available. (CRSP)
Abnormal Returns (%)	Fama–French three-factor model adjusted returns, expressed as a percentage. The factor model exposures are obtained on a rolling basis using daily data during the year prior to each month. (Kenneth French's website,[b] CRSP)

Appendix. (Continued)

Variable	Definition (source)
Standard Deviation of Returns (%)	Standard deviation of daily returns, computed using daily returns data and expressed as a percentage. (CRSP)
Bid-ask Spread (%)	Average bid-ask spread as a percentage of price using daily data, expressed as a percentage and winsorized at 1%. (CRSP)
Inelasticity	The Gao and Ritter (2010) demand inelasticity measure, which is computed as the logarithm of the sum of absolute daily returns divided by share turnover, where NASDAQ volume is corrected pre-2004. (CRSP)
Financing variables	
Bank Debt Count	Total number of bank loan facilities initiated. Missing values are set to zero. (Dealscan, Roberts' linking table,[c] CCM)
Bank Debt to Market Cap. (%)	Proceeds from bank loans facilities initiated scaled by market cap in May prior to the beginning of the period, expressed as a percentage and winsorized at 1%. Missing values are set to zero. (Dealscan, CSRP, Roberts' linking table, CCM)
Public Equity Count	The number of public SEOs conducted. We consider stock offerings of registered shares public (SDC DealType "C" and registered direct shelf sales or confidentially marketed public offering in PlacementTracker). Missing values are set to zero. (SDC, PlacementTracker, Roberts' linking table, CCM)
Public Equity to Market Cap. (%)	Proceeds from public SEOs scaled by market cap in May prior to the beginning of the period, expressed as a percentage and winsorized at 1%. Missing values are set to zero. We consider stock offerings of registered shares public (SDC DealType "C" and registered direct shelf sales or confidentially marketed public offering in PlacementTracker). (SDC, PlacementTracker, CRSP).[d] (Dealscan, CSRP, Roberts' linking table, CCM)
Nonbank Debt Count	The number of public, Rule 144-A, or private debt placements conducted. Missing values are set to zero. (Dealscan, Roberts' linking table, CCM)
Nonbank Debt to Market Cap. (%)	Proceeds from public, Rule 144-A, or private debt placements, expressed as a percentage and winsorized at 1%. Missing values are set to zero. (Dealscan, CSRP, Roberts' linking table, CCM)
PIPE Count	The number of PIPEs initiated. Missing values are set to zero. (SDC, PlacementTracker, Roberts' linking table, CCM)
PIPE to Market Cap. (%)	Proceeds from PIPEs, expressed as a percentage and winsorized at 1%. Missing values are set to zero. (SDC, PlacementTracker, CRSP)
Other Equity/Conv. Debt Count	The number of other equity/convertible debt offerings conducted. (SDC, PlacementTracker, Roberts' linking table, CCM)
Other Equity/Conv. Debt to Market Cap. (%)	Proceeds from other equity/convertible debt offerings conducted, expressed as a percentage and winsorized at 1%. Missing values are set to zero. (SDC, PlacementTracker, CRSP, Roberts' linking table, CCM)
Ownership variables	
Percentage Institutional Ownership (%)	Percentage of shares held by institutions, computed as the sum of shares held by 13F filers over shares outstanding and expressed as a percentage. (Thomson Reuters, CRSP)
Number of Institutional Owners	Number of unique management companies holding the stock. (Thomson Reuters)
Analyst coverage variables	
Log Analysts	Log of one plus the number of unique analysts that issued a forecast regarding a firm's annual/semiannual/quarterly earnings estimate. Firms with no analyst coverage and forecasts provided after the fiscal period end date or before the fiscal period under consideration are ignored. (I/B/E/S Detailed EPS U.S. file)
Log Forecasts	Log of one plus the number of earnings forecasts that are issued by analysts regarding a firm's annual/semiannual/quarterly earnings. Firms with no analyst coverage and forecasts provided after the fiscal period end date or before the fiscal period under consideration are ignored. (I/B/E/S Detailed EPS U.S. file)

Appendix. (Continued)

Variable	Definition (source)
Financing terms variables	
All-in-drawn Spread (bp)	Annual average spread over LIBOR on all loans taken out. When multiple loans are initiated by a firm during the time period, a weighted average is computed using the loan proceeds as weights. (Dealscan, Roberts' linking table, CCM)
Covenants	When reported by DealScan, the number of financial, capital expenditure, and net worth covenants. If DealScan covenants is missing, which occurs approximately 32% of the time, equals the number of financial, capital expenditure, and net worth covenants according to our hand collection from the loan agreement. The 45 loans with missing Dealscan covenant data for which we cannot find reliable contracts are dropped (although results are similar assigning zero covenants). When multiple loans are initiated by a firm during the time period, a weighted average is computed using the loan proceeds as weights. (Hand collection, Dealscan, Roberts' linking table, CCM)
Maturity (months)	The average duration in months of loans initiated. When multiple loans are initiated by a firm during the time period, a weighted average is computed using the loan proceeds as weights. (Dealscan, Roberts' linking table, CCM)
Lead Switches (%)	Indicator that is one for firms with lead arrangers that are all different from the firm's most recent loan, expressed as a percentage. When multiple loans are initiated by a firm during the time period, a weighted average is computed using the loan proceeds as weights. (Dealscan, Roberts' linking table, CCM)
One Lead (%)	Indicator that is one for firms that have loans with one lead arranger. , expressed as a percentage. When multiple loans are initiated by a firm during the time period, a weighted average is computed using the loan proceeds as weights. (Dealscan, Roberts' linking table, CCM)
Underpricing (%)	Percentage increase from the offer price to the closing price on the offer day, expressed as a percentage. (Dealscan, CRSP)
Gross Spread (%)	Underwriting discount as a percentage of the offer price. (Dealscan, CRSP)
SEO Announcement Ret.	The two-day compounded market adjusted returns ending one day after SEO announcement, which we obtain from a combination of Factiva, SDC, and EDGAR, expressed as a percentage and winsorized at 1%. (SDC, hand collection, CRSP)

[a]http://www.crsp.com/products/research-products/crspcompustat-merged-database (last accessed May 21, 2018).

[b]http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html (last accessed May 21, 2018).

[c]Roberts' linking table refers to the Dealscan/Compustat linking file used in Chava and Roberts (2008), which has been updated through 2012 in the Wharton Research Data Services (WRDS) Thomson Reuters database.

[d]We remove duplicate observations between the PlacementTracker and SDC databases by excluding multiple equity (or convertible bond) offerings by the same issuer that are within four days and $1 million in proceeds.

Endnotes

[1] Chen et al. (2004) find that S&P 500 membership has no effect on equity issuance behavior.

[2] See Shleifer (1986), Harris and Gurel (1986), Chen et al. (2004), Biktimirov et al. (2004), and Chang et al. (2015) for examples of how stock prices increase following changes in index status.

[3] See, for example, Houston and James (1996), Pagano et al. (1998), Santos and Winton (2008), Hale and Santos (2009), Schenone (2010), and Gopalan et al. (2011).

[4] Passive institutions monitor because they are long-term shareholders that care about the absolute return on their portfolio. Several pieces of anecdotal evidence support this argument. Glenn Booraem, the controller of Vanguard, released a Vanguard commentary entitled "Passive Investors, Not Passive Owners" (https://personal.vanguard.com/us/insights/article/proxy-commentary-042013). Rakhi Kumar, head of corporate governance at State Street Global Advisors, expressed similar views in the *Financial Times* on April 6, 2014, in an article titled "Passive Investment, Active Ownership" (https://www.ft.com/content/7c5f8d60-ba91-11e3-b391-00144feabdc0), as did David Booth, chairman and cofounder of Dimensional Fund Advisors, in a March 16, 2013, *New York Times* article entitled "Challenging Management (but Not the Market)" (https://www.nytimes.com/2013/03/17/your-money/david-booth-of-dfa-using-the-chicago-schools-theory.html).

[5] See "FTSE Russell Posts Preliminary U.S. Index Additions and Deletions as Part of Annual Russell Reconstitution" posted by *Business Wire* on June 12, 2015 (http://www.businesswire.com/news/home/20150612005950/en/FTSE-Russell-Posts-Preliminary-U.S.-Index-Additions).

[6] See "Russell Rebalancing: The Day Every Investor 'Needs to Think Like a Trader'," published by the *Wall Street Journal* online on June 26, 2015 (https://blogs.wsj.com/moneybeat/2015/06/26/russell-rebalancing-the-day-every-investor-needs-to-think-like-a-trader/).

[7] This assumption has also been shown to be violated in other ways for samples of large firms, such as (1) Standard & Poor's choosing stocks based on factors such as market representativeness and liquidity, (2) S&P 500 inclusion being associated with higher earnings (Denis et al. 2003), and (3) Chen et al. (2016) and Kasch and Sarkar (2014) showing that loadings on asset pricing factors change surrounding S&P 500 additions.

[8] To compute total market capitalization, Russell combines all shares outstanding, including common stock, nonrestricted exchangeable shares, and partnership units. The price is determined by the firm's

primary trading vehicle, which is selected based on a liquidity measure. Certain exclusion criteria apply, such as a stock price below $1, stocks traded over the counter, closed-end mutual funds, ADRs, REITs, and stocks with a market cap under $30 million.

[9] The reason for this is that a firm at the cutoff has a rank of 3,000, so β_2 and β_3 have no effect on the predicted outcome. Thus, the estimated outcome for a hypothetical 3,000th ranked firm just outside the Russell 2000 is β_0 and the estimated outcome for the 3,000th ranked firm that is just inside the index is $\beta_0 + \beta_1$.

[10] We approximate Russell's May 31 market capitalization measure using CRSP and Compustat data. We use shares outstanding and prices from CRSP to compute firms' total market cap in May and multiply this by the ratio of shares outstanding from Compustat (cshoq) to the total shares outstanding from CRSP, which we compute as the lower of (1) the shares ratio as of the report date, or (2) the shares ratio as of the earnings release date, where ratios smaller than one are set equal to 1. Stock splits between the report date and the earnings release date are appropriately adjusted for. This method attempts to incorporate both the higher reporting frequency by CRSP and the inclusion of nonexchange-traded share classes by Compustat as well as accommodate delays in public knowledge of firms' accounting data due to publication lags.

[11] https://www.ftserussell.com/research-insights/russell-reconstitution/market-capitalization-ranges (accessed October 2014).

[12] We employ a more recent sample than studies at the upper Russell 2000 cutoff because Russell does not introduce a banding procedure in 2007 that invalidates RDD at the lower cutoff. See section 6.10.3 on p. 23 of the following document: http://www.ftse.com/products/downloads/Russell-US-indexes.pdf?42 (last accessed May 21, 2018).

[13] Results are similar using the data-driven nonparametric optimal bandwidth procedure proposed by Calonico et al. (2014), or the cross-validation technique discussed in Ludwig and Miller (2007).

[14] We use an updated version of the linking file in Chava and Roberts (2008) to merge Dealscan with Compustat.

[15] Unreported tests further show that the significant transition away from bank financing toward SEO issuance is not sensitive to the number of firms included in the sample. Specifically, the estimated reduction in bank borrowing is similar in magnitude and statistically significant at the 10% level or better for all bandwidths between 90 and 300, while the increase in SEO issuance is statistically significant for all bandwidths between 40 and 300.

[16] We use data over the previous year and estimate the Fama–French three factor on a rolling basis.

[17] There are 715 loan packages initiated by firms within 200 ranks of the Russell 2000 lower cutoff during our sample period. According to DealScan, 231 or 32% of these packages have no financial, capital expenditure, or net worth covenants. We locate loan agreements for all but 45 of these loan contracts with missing covenant data to determine the total number of financial, capital expenditure, and net worth covenants. We find that 145 of the 186 loan contracts with zero reported DealScan covenants actually have covenants.

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