Institutional Ownership and Short-Termist Pressures*

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Sept 2017

We investigate whether institutional investors ameliorate or exacerbate the short-termist pressures on public firms in this paper. Relying on index assignments that generate plausibly exogenous variations in institutional ownership, we find firms with higher institutional ownership are less likely to be affected by short-termist pressures. Firms with higher institutional ownership invest more in terms of research & development. They obtain more patents and receive more citations on their patents. The results are robust to a battery of robustness tests and are consistent with a view that institutional investors ameliorate the short-termist pressures on public firms.

Keywords: Corporate Investment; Innovation; Institutional Ownership; Short-Termism; Regression-Discontinuity Design.

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* This paper was previously circulated as "Institutional Investors and Corporate Investment". We would like to thank participants at the 5th AIEA-NBER conference, EFMA in Amsterdam, Hong Kong Polytechnic University, Yonsei University for their helpful comments. We also thank Jason Chao of Russell Investments for providing Russell 3000 index data and Brian Bushee for making institutional ownership type data available online.

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Abstract

We investigate whether institutional investors ameliorate or exacerbate the short-termist pressures on public firms in this paper. Relying on index assignments that generate plausibly exogenous variations in institutional ownership, we find firms with higher institutional ownership are less likely to be affected by short-termist pressures. Firms with higher institutional ownership invest more in terms of research & development. They obtain more patents and receive more citations on their patents. The results are robust to a battery of robustness tests and are consistent with a view that institutional investors ameliorate the short-termist pressures on public firms.

1. Introduction

Economists have long worried about the focus on quarterly earnings could adversely affect firms, leading to short-term oriented behaviors of firms. Using data on both private and public firms, Asker, Farre-Mensa and Ljungqvist (2014) confirm empirically that, from the perspective of corporate investment, public firms are indeed negatively influenced by short-termist pressures from the stock market. This paper asks whether the presence of institutional investors could ameliorate the problem addressed in their paper, or could they further exacerbate the issue?

Ownership of U.S. firms by institutional investors has been growing steadily in the past three decades (Panel A, Figure 1). With most corporate shares in the hands of institutional investors, it is important to figure out the impact of their presence towards the short-termist pressures on firms. On the one hand, the sophistication of institutional investors allows them to see through short-term earnings and focus on long term value creation. Institutional investors are therefore the natural candidates to ameliorate the negative impact of the short-termist pressures. Indeed, many papers have find evidences in support of the positive role of institutional investors played in changing corporate behaviors (e.g., Hartzell and Starks, 2003; Ferreira and Matos, 2008). On the other hand, institutional investors are also cited as the source of short-termist pressures of the stock market because they act as "traders" instead of "owners" (Bushee, 1998).

Since the role played by institutional investors could work in both directions, we need empirical data to answer the question raised.

[Insert Figure 1 Here]

To empirically answer this questions is not as easy as it may seem given the endogenous nature of institutional ownership. For example, if high institutional ownership is associated with corporate behaviors that correspond to long-term value maximization, it could be that institutional investors ameliorate short-termist pressures on firms, or it could well be that institutional investors possess information advantage and *select* firms that focus on long-term but not actually influence them. We tackle this problem by relying on an identification strategy which utilizes the annual reconstitutions of the Russell 1000/2000 indexes. The reconstitutions lead to plausibly exogenous variations in institutional ownership of certain firms in the indexes. Each year, Russell Investment would rank U.S. public firms by their market capitalization, with the first 1000 ranked firms placed into the Russell 1000 index while the next 2000 firms placed into the Russell 2000 index. The two indexes are value-weighted. This mechanism generates an interesting discontinuity in index weighting around the 1001st ranking. Firms with rankings just above 1001 will be put into the Russell 1000 index, in which they are the smallest firms and receive very low index weighting while firms with rankings equal or below 1001 will be put into the Russell 2000 index, in which they become the largest components and enjoy large index weighting. This discontinuity in index weighting generates discontinuity in institutional ownership that is plausibly exogenous (Chang, Hong, and Liskovich, 2015). This enables us to use regression discontinuity design to identify the impact of institutional investors on firms.

Using this identification strategy, we find evidences in support of institutional investors ameliorating the short-termist pressures on firms. While Asker, Farre-Mensa and Ljungqvist (2014) find public firms invest substantially less compared with otherwise similar private firms, we find firms with higher institutional ownership invest more. However, the increase in investment concentrates on research and development expenses (R&D). There is no evidence that institutional ownership is associated with changes in capital expenditures (CAPX). A group of firms with higher institutional ownership invests in R&D amounts to 4.43% of total assets on average while another group of firms with low institutional ownership only invests 2.49% on average. This is consistent with firms, when facing short-term earnings pressure, would cut R&D (Bushee, 1998). Asker, Farre-Mensa and Ljungqvist (2014) also documents the investment of public firms is substantially less responsive to changes in investment opportunities. We, however, find the R&D of firms with high institutional ownership is more responsive to changes in investment opportunities than those with low institutional ownership. All these results are consistent with institutional investors ameliorate the short-termist pressures on firms such that they exhibit less behaviors considered to be the results of short-termist pressures.

While it is plausible the increase of R&D spending of firms with high institutional ownership the result of less short-termist pressures, the increase in R&D, however, could also be an overinvestment problem as firms cater to institutional investors who might prefer firms with higher R&D. We thus look at the output of R&D, patents, to see if this increase in R&D is associated with more innovative outputs. If firms inefficiently increase R&D spending just to please institutional investors, we shall not observe significant differences in innovative outputs. We, however, find significant differences in innovative outputs. Firms with higher institutional ownership have more patents count. The log of patents count for an average firm with high institutional ownership is 0.71 while that for a firm with low institutional ownership is substantially lower at 0.47. To take the quality differences of patents into consideration, we also compare citations per patent for firms. We find the quality of patents is also higher for firms with higher institutional ownership. The log number of citations per patent is 0.84 on average for firms with high institutional ownership while for an average firm with low institutional ownership, the log number of citations decreases to 0.67.

Additionally, we find a stronger impact of institutional investors on explorative (riskier) innovations than on exploitative (safer) innovations. Chen et. al (2015) document that when faced with short-termist pressures, public firms are more likely to conduct exploitative (riskier) innovations compared with private firms (Chen et. al, 2015). Explorative innovations are innovations outside of the firms' expertise and are therefore riskier in nature. Thus, our result that higher institutional ownership is associated especially with more explorative innovations are again consistent with institutional investors ameliorates the short-termist pressures on public firms.

Given institutional investors that are mostly affected by index reconstitutions are passive type institutional investors, we classify institutional investors into sub-types: quasi-indexer, dedicated and transient type following Bushee (2001)[1]. Both quasi-indexer and transient type institutional investors are growing steadily in their ownership of corporate shares over the past three decades (Panel B, Figure 1). Index assignment has impact on ownership by these two types of institutional investors but not on that by the dedicated type. Index assignment attracts the trading of transient institutional investors probably due to their desire to profit from this event. However, those mostly affected by index reconstitution are quasi-indexers (Boone and White, 2015). Quasi-indexer institutional investors include index funds as well as actively managed funds that mimic a particular index. They have low turnover, high diversification and long-term investment horizon. Although they are passive in terms of investment, they are not passive owners. They can influence corporate policies through their large voting block (Appel, Gormley and Keim, 2015) and thus impact investment decisions. Our evidences suggest quasi-indexed type institutional investors could indeed shield firms from short-termist pressures from the stock market.

We employ various robustness tests for our findings. Firstly, we focus on firms which switch across indexes. We find firms switched from the bottom of Russell 1000 index (low institutional ownership) to the top of Russell 2000 index (high institutional ownership) are associated with an increase R&D and have more innovation. Those switched from Russell 2000 to Russell 1000 decrease their R&D and have less

[1] Quasi-indexer has low turnover, high diversification and long-term investment horizon. Transient has high turnover, high diversification and short-term investment horizon. Dedicated has low turnover, low diversification and long-term investment horizon.

innovation. Also, we perform several placebo tests by using pseudo cutoffs that determine index membership. Instead of using the 1001st ranking as the cutoff to determine index assignments, we use 951st and 1051st as placebos. We do not find any results if pseudo cutoffs are used. All these suggest our findings are not spurious relationship.

Finally, as short-termism models (Stein (1989)) predict firms whose stock prices are more sensitive to its current earnings per share are subject to more short-termist pressures, we use earnings response coefficient, or ERC (Ball and Brown (1968)), which measures the relationship between equity returns and the unexpected portion of a company's earnings announcements, as a proxy for the short-termist pressures on firms following Farre-Mensa and Ljungqvist (2014). Using ERC, we confirm that firms with higher institutional ownership face lower short-termist pressures as reflected by lower ERC.

We make several contributions to the literature. Firstly, we contribute to the literature on short-termist pressures. Asker, Farre-Mensa and Ljungqvist (2014) empirically document that public firms are subject to short-termist pressures such that their investment is substantially lower than otherwise similar firms; and that public firms have investment that is far less responsive to changes in investment opportunities. Chen et al. (2015) show public firms, under short-termist pressures, are more likely to engage in exploitative innovations than explorative innovations. We find institutional investors could ameliorates the problem raised in their papers. Firms with high institutional ownership have higher investment in R&D, generate more innovations; and the increases in innovations are more likely to be explorative innovations. In terms of institutional investors and short-termist pressures, Bushee (1998) finds institutional investors relive short-term pressure on firms in the perspective of R&D. Ours confirm his main result (in terms of R&D) but provide additional results on patents and innovative strategies. We also differ in that we utilize a better identification strategy, through which we find quasi-indexer type institutional investors could ameliorate the short-term focus of firms, while Bushee (1998) documents no impact.

We also contribute to the literature on corporate investment and innovation. In a study of monitoring by long-term institutional investors, Harford, Kecskes and Mansi (2015) shows ownership by long-term investors reduces various measures of corporate investment because of monitoring by long-term institutional investors reduces empire building. However, we show institutional investors increase investment of public firms who are likely to cut their investment when facing short-termist pressures. Aghion, Van Reneen and Zingales (2013) finds institutional investors influence innovation, in a positive way. However, the instrumental variable they used to identify their results offers a less clear test than ours, which might explain why in their paper, they find *no* impact from quasi-indexer type institutional investors on innovation while we show a strong relationship between institutional ownership by quasi-indexer type institutional investors and innovation. Plus, ours suggest institutional investors matter because they reduce short-termist pressures[2] and encourage innovative activities as a result while theirs support a career concern story in which institutional investors relieve the career concern of managers. We also contribute to the literature by showing institutional investors have no impacts on capital expenditures. This is in contrast to the finding of Ferreira and Matos (2008), who finds a negative relationship between institutional ownership and capital expenditures.

Lastly, we relates to the recent literature using natural experiments to study the impacts of institutional investors on firms. Boone and While (2015) finds higher ownership by passive institutional investors increases managerial disclosure, analyst following and liquidity which result in lower information asymmetry. Appel, Gormley and Keim (2015) documents passive type institutional investors can influence the governance mechanism of firms through their large voting blocs. Crane, Michenaud and Weston (2014) shows higher institutional ownership pay more dividends and repurchase more. They also show various other aspects of firms are affected, including R&D but their focus is not on corporate investment or

[2] As reflect in firms with higher institutional ownership exhibit less behaviors that are considered to be the results of short-termist pressures.

innovative activities or short-termism. We utilize the same methodology to shed lights on the implications of the increasing institutional ownership on short-termism through corporate investment and innovation.

The remainder of the paper is organized as follows. Section 2 describes the data sources, definitions of variables and descriptive statistics. Section 3 presents empirical methodology and main empirical results. We have several robustness tests in Section 4. Section 5 discusses the impact of institutional investors on short-termist pressures. Section 6 concludes.

2. Sample

2.1 Data

Russell Investments provides us with company names, ticker symbol, and the end-of-June index weight/ranking of the Russell 1000/2000 indexes constituents for a period from 1984 to 2006. After 2006 Russell introduces the banding rule[3] that reduces local continuity of firm assignment around the cutoff, making the index less useful for research purpose. We obtain market capitalization data of firms from CRSP and accounting data from COMPUSTAT. We drop entries with no match in CRSP or multiple matches where we cannot identify the validity of the match. Including these entries will not change the results. We obtain institutional ownership data from Thompson Reuters. Thompson Reuters collects equity ownership data of institutional investors from 13-F filings. Institutional investment manager with investment discretion over 100 million or more is required to file form 13-F with the SEC within 45 days at the end of a calendar quarter on the number of shares they hold of firms. It includes investment advisers, banks, insurance companies, broker-dealers, pension funds etc. The filing is quarterly. Classifications of institutional investors are obtained from Brian Bushee's personal website[4]. We obtain patents and citation data from the database provided by National Bureau of Economic Research (NBER). Utilities and financial firms with SIC code within 4900 to 4999 and 6000 to 6999 are excluded from the analysis due to the distinct

[3] See Appendix A for details
[4] http://acct.wharton.upenn.edu/faculty/bushee/IIclass.html. We would like to thank Brian Bushee who makes the data available online.

nature of investment for regulated industries and financial firms. Unbounded ratio variables have been winsorized at 1% level to eliminate the impact of outliers. Detailed definition of variable construction can be obtained from Appendix B.

2.2 Measures of Institutional Investors

Our measure of institutional investors is the percentage of institutional ownership. It is widely used in the literature, for example by Hartzell and Starks (2003) on the relationship between institutional investors and executive compensation, Aghion, van Reenen and Zingales (2013) on institutional investors and innovation. It is calculated as the ratio of total common stocks held by 13-F institutional investors and total shares outstanding. We use September's filing to calculate institutional ownership given Russell index reconstitutes on June.

Institutional investors differ in their investment styles. The classification we utilize is from Bushee (2001) where he classifies institutional investors into three types: transient institutional investors (INV_TRA), dedicated investors (INV_DED) as well as quasi-indexers (INV_QIX). Quasi-indexer type institutional investors are mostly buy-and-hold passive type institutional investors. Transient investors have high turnover and exhibit the use of momentum strategies while dedicated type institutional investors have low turnover and have little sensitivity to current earnings.

2.4 Measures of Corporate Investment

Our definition of investment follows from Edmans, Fang and Lewellen (2015) and Asker, Farre-Mensa and Ljunqvist (2014). We define capital expenditure (CAPX) as the changes in total fixed assets scaled by beginning-of-the-year total assets[5]. We define R&D investment as R&D expenses scaled by beginning-of-the-year total assets. We treat missing R&D as zero.

[5] This measure is more comprehensive than the capital expenditure from the cash flow statement as it can capture investment such as capitalized leases. Our results on CAPX do not hinge upon this specific definition though.

2.5 Measure of Investment Opportunities

We use sales growth (Sale_Q) as the measure for investment opportunities throughout this paper. Sales growth has been widely used as the proxy for investment opportunities (Lehn and Poulsen (1989), Shin and Stulz (1998), Bloom, Bond and van Reenen (2007), Michaely and Roberts (2012) and Asker, Farre-Mensa and Ljunqvist (2014)). We opt to not use market-to-book ratio as the proxy for investment opportunities due to the literature documents investment sensitivity to market-to-book ratio captures the amount of private information the managers of a firm learns from the trading of its shareholders (Chen, Goldstein and Jiang (2006)). As the information possessed by institutional investors is mostly known by managers, the manager learns more from the trading of individual investors. Therefore, from the information point of view, investment sensitivity to market-to-book ratio should be lower for firms with higher institutional ownership. For the purpose of this paper, we use sales growth as the measure of investment opportunities to separate us from the information literature.

2.6 Measure of Innovation

Following He and Tian (2013), we define innovation in each year as the patents filed in a given year that are eventually granted. To take into consideration the differences in patents quality, we also calculate future citations per patent applied each year for each firm. Due to the data on innovation ends on 2006, citation data are adjusted according to Hall, Jaffe, Trajtenberg (2001) to reflect the truncation of possible future citations.

2.6 Other Firm Characteristics

For regression analysis in the paper, our main control variables for investment regression include return on assets (ROA), cash flow (CF) and leverage (LEV). Although investment opportunity alone (Sale_Q) should fully explain investment in theory, prior researches have documented the impact of ROA, cash flow and leverage (Asker, Farre-Mensa and Ljunqvist (2014), Kaplan and Zingales (1997) and Ahn, Denis and Denis (2006)) on firm investment. We therefore include these as our control variables in regression analysis.

2.7 Descriptive Statistics

Table 1 shows the summary statistics of the main variables used in the paper. The average capital expenditure is 7% of lagged total assets. R&D expenses are 5% of lagged total assets on average. The log of patent counts is 0.76 while the log of citations per patent is 0.81. These two measures are high skewed. Total institutional ownership is 48% on average, with the majority comes from passive institutional investors (QIX type). Detailed definition of variables can be obtained from Appendix B.

[Insert Table 1 Here]

3. Empirical Methodology and Results

3.1 Empirical Methodology

3.1.1 Russell 1000/2000 Indexes

Russell Investments constructs the Russell 1000 and 2000 indexes based on transparent and deterministic rules. The indexes are constructed objectively using market capitalization of firms. Each year starting from 1984, Russell Investments calculates the total market capitalization of U.S. firms on the last trading date of May. Firms ranked within 1 to 1000 will be included in the Russell 1000 index; the next 2000 firms (1001 to 3000) constitute the Russell 2000 index. Except for certain corporate events[6], firms remain in the index for the whole year. The two indexes are value-weighted, making firms ranked just above the 1001st ranking (the cutoff) receive a much lower index weight than do firms ranked just below the cutoff because firms are larger in the Russell 1000 index. This difference in index weight (Figure 2) will generate differences in institutional ownership that are plausibly exogenous.

[Insert Figure 2 Here]

[6] See Appendix A for details

To assess the impact of institutional investors on firms, we can just compare firm behaviors around this cutoff as long as the assignment into which index is locally random, i.e., firms around the cutoff cannot manipulate their assignment into which indexes. This will empirically displayed as no discontinuity in market capitalization around the cutoff. Before we present the picture on market capitalization and ranking, one mechanism that Russell Investments adopts in constituting indexes needs to be mentioned is the float-adjustment. After selecting firms into the indexes using *end-of-May* market capitalization of firms, Russell Investments determines the weights (rankings) of firms in their respective indexes by their *end-of-June* float-adjusted market capitalizations. Float-adjusted market capitalization excludes the corporate shares that are not available for purchase and are not part of the investable opportunity set. The amount of float adjustment is the proprietary information of Russell Investments. As the rank/weight information we get (use) is after float-adjustment (end-of-June ranking), one may question the validity of the regression discontinuity design as firms around the cutoff using June's ranking might be not those firms around the cutoff using May's ranking. To remove those observations that are near the cutoff due to float-adjustment, we remove firm-year observations that receive large adjustment in rankings[7]. It is interesting to note that prior to removing firms that receive large ranking adjustment due to float-adjustment, there is indeed a discontinuity in end-of-May market capitalization (which determines index membership) if we use June's ranking as the rank of firms (Figure 3(a)), which seem to indicate firms could manipulate index membership. However, after removing those receiving large adjustment, there is no discontinuity in the assigning variable, end-of-May market capitalization, anymore (Figure 3(b)). The difference in market capitalization of the 1000th ranked and 1001st ranked firms is around 2%, making precise manipulation of stock prices at the end-of-May unlikely to succeed[8]. Thus, for firms around the cutoff, assigning into which index could be deemed as random. The approach we adopted here is the same as Boone and White (2015). The primary

[7] We calculate *the difference* between end-of-May market capitalization ranking calculated from CRSP and end-of-June float-adjusted ranking provided by Russell. Those receive large adjustment are deleted. Large adjustment is defined as those with *difference* value in the top decile of *the difference* distribution.

[8] We report results excluding firms receiving large adjustment in this paper. Thus, in our paper, the firms' end-of-May and end-of-June rankings are similar. But our results are robust to including firms receive large float-adjustment.

reason to use June's ranking by Russell instead of May's ranking calculated from CRSP is because the most important determinant of institutional ownership is index weighting, which is determined by end-of-June float-adjusted market capitalization.

[Insert Figure 3 Here]

3.1.2 Empirical Methodology

We utilize this randomness in index assignment that generates exogenous variations in institutional ownership to identify the impact of institutional investors on firms. Specifically, we rely on a sharp regression-discontinuity (RD) design that estimates the treatment effects of inclusion into the Russell 2000 index (higher institutional ownership). For each variable of interests, we match fiscal year t+1 data with Russell index in year t[9]. Our main RD design follows Calonico, Cattaneo, and Titiunik (CCT) (2014a) by estimating the bias-corrected treatment effects using data-driven (fully automatic) bandwidth[10]. We also use manually selected bandwidth as robustness tests. Essentially, two third-order local polynomials are fitted using data on each side of the cutoff following Boone and White (2015). The difference in value of the two polynomials at the cutoff point is the treatment effect estimation.

3.1.3 Pre-assignment Firm Characteristics

In RD design, it is important to ensure that there is no discontinuity in the forcing variable, in our case, end-of-May market capitalization. We have the visual inspection in the last section that there seems no discontinuity at the cutoff after removing firms receiving large adjustment in June because of free float. We formally test whether there is discontinuity in this section. We start by comparing the mean level of log market capitalization on fixed bandwidths. Panel A of Table 2 reports the result. For a narrow bandwidth of 50, there are no significant differences in the forcing variable. When we enlarge the bandwidth to 100 or

[9] For patent-related variables, application year is used. The results are similar if we take further lags for patent-related variables (i.e. use application year t+2 or t+3 variables to match with year t Russell index).
[10] The estimator enjoys demonstrably superior robustness properties compared with traditional RD estimator.

200, the differences become significant, which is expected as the Russell indexes are ranked by market capitalization. The further away from the cutoff, the larger the difference in market capitalization. Most importantly, we find no treatment effects for the forcing variable using by estimating RD treatment coefficients in Panel B of Table 2. Irrespective of the bandwidth we select, the coefficient estimates are insignificant, suggesting there is no discontinuity in the forcing variable and validating our RD design.

For RD design to be valid, we also have to ensure that there are no significant differences in covariates that determine investment in the cross section prior to index assignment. We compare the differences in investment opportunities, ROA, cash flow and leverage for firms around the cutoff for a fixed bandwidth of 50, 100 and 200. Specifically, for each reconstitution in year t, we compare characteristics calculated from financial statements with fiscal year end date in the same year. Table 2 presents the results. Within a bandwidth of 50, we do not find any significant differences in these characteristics. There are small differences in investment opportunities and ROA when the bandwidth gets large, which is expected for firms away from the cutoff. For RD treatment estimation coefficients, the results are similar, except for investment opportunities. We find there possibly is a positive treatment effects on investment opportunities when using manual bandwidth, but we reject any significant treatment effect when using the optimal bandwidth. Overall, we do not observe any significant differences in characteristics for firms around the cutoff, except for investment opportunities with fixed bandwidth.

[Insert Table 2 Here]

3.1.4 Discontinuity in Institutional Ownership

We next verify that there is discontinuity in institutional ownership around the cutoff. Figure 4 presents the visual inspection of the discontinuity in institutional ownership around the cutoff. The dot represents the mean of institutional ownership within 20 evenly spaced bins for a bandwidth of 200. Third-order polynomials are fitted for the control (Russell 1000 firms) and those treated (Russell 2000 firms) for a fixed bandwidth of 200. Sub-figure (a) is for total institutional ownership and (b) to (d) are for different types of institutional investors. The discontinuity of institutional investors is obvious and mostly the result of discontinuity in ownership by quasi-indexer type institutional investors.

[Insert Figure 4 Here]

Panel A of Table 3 presents the mean differences in institutional ownership for Russell 1000/2000 firms around the cutoff. Total institutional ownership are much higher for firms that are assigned to the top of Russell 2000 index than that of firms being assigned to the bottom of Russell 1000 index. With a bandwidth of 50, average total institutional ownership is 60.00% for top Russell 2000 firms, while it is only 38.90% for bottom Russell 1000 firms. The discrepancy in institutional ownership narrows when we enlarge the bandwidth. But even if we choose a bandwidth of 200, there is still 6.5% difference in total institutional ownership for the two groups of firms below and above the Russell 1000/2000 cutoff.

As for different types of institutional ownership, we find that out of the 21.1% total difference institutional ownership, most difference is due to quasi-indexer type. For dedicated type institutional investors, the difference is not significant. Transient institutional investors also exhibit some preferences towards Russell 2000 firms, but in a much lesser degree compared with quasi-indexer type institutional investors.

[Insert Table 3 Here]

Panel B of Table 3 presents the sharp RD design treatment effects of inclusion into the Russell 2000 index on total institutional ownership. The treatment effect of Russell 2000 inclusion is an increase of 29.9% in total institutional ownership using the data-driven bandwidth. Also, the results are not driven by specific bandwidth selection. The treatment effect is statistically significant for the data driven bandwidth as well as for the two manually chosen bandwidths. We follow Boone and White (2015) and choose a fixed bandwidth of 100 and 200. The treatment effect coefficient is the largest for quasi-indexer type institutional investors. The treatment effect for passive type institutional ownership is an increase of 20.8%. The treatment effect is insignificant for ownership by dedicated type institutional investors. For transient type institutional investors, the treatment effect is statistically significant as well, but the magnitude is less than half of that for passive type institutional investors.

Overall, through visual inspection, mean comparison and RD design estimation, we confirm the existence of discontinuity in institutional ownership around the 1001^{st} cutoff and the discontinuity is the largest for ownership of quasi-indexer type institutional investors.

3.2 Empirical Results

3.2.1 The Effect of Institutional Ownership on Corporate Investment

This section explores the investment behavior of firms around the Russell 1000/2000 indexes cutoff. If institutional investors do have impacts on corporate investment, we expect corporate investment should exhibit discontinuity around the cutoff due to the discontinuity in institutional ownership.

Firms with low and high institutional ownership could differ in many other unobserved factors. In our regression discontinuity setting, however, we can solve the endogeneity problem as assigning into Russell 1000/2000 indexes can be regarded as quasi-natural experiments that changes the level of institutional ownership, but not other unobserved factors that influence investment. By comparing the investment patters of firms around the cutoff, we can identify the link between institutional ownership and investment.

Figure 5 presents the RD plot for CAPX and R&D, respectively. There is a clear pattern in R&D that firms in the Russell 2000 (to the right of the cutoff) invest more in R&D. The difference in CAPX, however, is less clear from visual inspection. We next test the significance of the differences.

[Insert Figure 5 Here]

Panel A of Table 4 displays the mean differences of the investment for the two groups of firms. It confirms the discontinuity we observed in Figure 5. Firms that are assigned to the Russell 2000 index have higher R&D compared with that of firms which are assigned to the Russell 1000 index. Within a bandwidth of 50, firms in the top of Russell 2000 index have a R&D amounts to 4.43% of total assets while those in the bottom of the Russell 1000 index have only 2.49% on average. The differences in CAPX, however, are insignificant. These indicate firms with higher institutional ownership invest more in R&D.

[Insert Table 4 Here]

Panel B of Table 4 displays the RD design treatment coefficient estimate for investments. The results are similar to what we find in mean comparisons. The treatment effect of inclusion into Russell 2000 index is a 2.4% increase in R&D. The treatment effect of CAPX, however, is indistinguishable from 0 statistically. The results are generally robust to the two fixed bandwidth we used except for a narrow bandwidth of 100. This could due to fewer observations around this narrow bandwidth, making inferences less powerful.

Discontinuity in investment could be the result of discontinuity in investment opportunities. To formally test whether the differences in investment opportunities explain the difference in investment for the two groups of firms, we perform the following investment regression to control for the impact of investment opportunities:

$$I_{i,t} = \alpha + \beta Sale\_Q_{i,t} + +\epsilon_{i,t} \quad (1)$$

We take the residuals of this investment regression that are orthogonal to investment opportunities and compare the residuals of investments for firms around the Russell cutoff.

If differences in investment opportunities can explain the discontinuity in investment levels, we would expect the discontinuity disappears or narrows once we control for the impact of investment opportunities. However, visual inspection reveals the opposite. Figure 6 displays the regression discontinuity plot for the residual investments. We can observe the discontinuity in investments remains even if we control for investment opportunities.

[Insert Figure 6 Here]

Panel A of Table 4 compares the differences in mean of residual investments for firms around the Russell cutoff using fixed bandwidth of 50, 100 and 200. Irrespective of the bandwidth chosen, we find firms in the Russell 2000 (higher institutional ownership) invest more in terms of residual (res.) R&D. The differences are statistically significant and economically large. The difference in residual (res.) CAPX remains insignificant.

Panel B reveals the bias-corrected RD design treatment coefficient estimates. The results are similar to what we find by comparing the sample means. The treatment effect is a significant increase in res. R&D except for a fixed bandwidth of 100. The treatment effect for res. CAPX remains insignificant. All these results indicate differences in investment opportunities cannot account for the differences in investments induced by changes in institutional ownership.

3.2.2 The Effect of Institutional Ownership on Investment Sensitivities

This section explores the investment sensitivity of firms around the Russell 1000/2000 indexes cutoff. As the discontinuity in institutional ownership is most pronounced for a bandwidth of 50, we compare the investment sensitivity of firms around the cutoff using the 50 bandwidth. We also use a bandwidth of 100 as robustness check.

To compare the differences in investment sensitivity, we use the following specification within the bandwidth specified.

$$I_{i,t} = \alpha_t + \beta_1 Sale\_Q_{i,t} + \beta_2 Sale\_Q_{i,t} * R2000_{i,t-1} + \beta_3\ R2000_{i,t-1} + Controls_{i,t-1} + \epsilon_{i,t} \quad (2)$$

R2000 is a dummy variable that equals one if the firm is in the Russell 2000 index, equals zero otherwise. As index re-assignment happens annually and the firms are different each year. We perform Fama-Macbeth (1973) two-step procedure here. Namely, we first run cross-sectional regression each year and average the time-series coefficients. Table 5 presents the regression results. We find the investment sensitivity of firms included into the Russell 2000 index exhibit higher investment sensitivity to investment opportunities when investment is measured as R&D. The interaction term between the dummy variable (R2000) and investment opportunities (SALE_Q) are significant in Columns (5) to (8). The results are insensitive to the bandwidth chosen. We do not observe any differences when investment is measured as CAPX. Moreover, the loadings on R2000 is about 0.8% for R&D and insignificant in Column (6). Considering the difference in mean of R&D for a fixed bandwidth of 50 is 1.94% (4.43% vs. 2.49%), it seems most of the impacts from institutional investors are to increase investment sensitivity of firms.

[Insert Table 5 Here]

3.2.3 The Effect of Institutional Ownership on Innovation

This section explores whether the increase in R&D bears any implications for innovative output. The increase in R&D could be resulted from institutional investors inducing otherwise under-spend-on-R&D firms to invest more in R&D. It could also be an overinvestment problem. We measure innovation in two ways: patents count per year (quantity of innovation) and citations per patent (quality of innovation). A visual inspection (Figure 7) indicates that institutional ownership is associated with more innovation both in terms of quantity and of quality.

[Insert Figure 7 Here]

As with investment, we first compare the mean differences in innovation for firms around the cutoff. Panel A, Table 6 reports the results. For a fixed bandwidth of 50 and 100, we find significant differences in both patents counts and citations per patent for firms in the Russell 2000 index and those in the Russell 1000 index. For firms in the bottom of Russell 2000 (high institutional ownership), patents count and citations per patent are significantly larger. We do not find any significance when we use a bandwidth of 200, this could be due to the difference in institutional ownership is smaller when the bandwidth is 200. The decrease in the differences in institutional ownership results in a decrease in the significance of the results.

[Insert Table 6 Here]

We next cater to RD design to estimate the treatment effects of inclusion into the Russell 2000 index. The results are reported in Panel B, Table 6. We again find positive and significant treatment effects for innovation no matter we use CCT data-driven bandwidth or manually chosen fixed bandwidth of 100 and 200. The magnitude of the treatment effect is economically large.

3.2.4 The Effect of Institutional Ownership on Innovative Strategies

Patents can be decomposed into exploratory and exploitative types. Exploratory patents are those depart from the firm's existing expertise while exploitative ones are based on existing knowledge. Thus, exploratory innovation is riskier than exploitative innovation. Chen et. al (2015) finds public firms are more likely to do exploitative innovation that is less risky due to short-term pressure from the stock market. Thus, if institutional investors ameliorate short-termist pressures on firms, they are more likely to be associated with more explorative innovation. Following Chen et. al (2015), we define a patent to be exploratory if more than 60% of the patents it cites are out of the firm's existing expertise. A firm's existing expertise consists of its portfolio of patents and citations received by these patents. A patent is otherwise defined as exploitative type patent.

Figure 8 plots the log number of patents decomposed by innovation strategy. It is not hard to observe the discontinuity at the Russell cutoff for patents count of both types, although the impact is much clearer towards explorative innovations. To test the statistical significance of the discontinuity, we again cater to mean value comparison and RD treatment effect estimates. Table 7 reports the result. In Panel A, we see the firms in the bottom of Russell 2000 have more patents counts, be it exploratory or exploitative. The difference is significant with a bandwidth of 50 and 100. The difference losses significance when we expand the bandwidth to 200 when the difference in institutional ownership is smaller. In terms of magnitude, the log difference is 0.22 for explorative innovations, while that for exploitative innovations is only 0.07 when the bandwidth is 50. The results are similar for a bandwidth of 100. Panel B reports the RD treatment effect at the cutoff. We see that irrespective of the bandwidth we use, we find a positive treatment effects on patents count for both types of patents. However, the treatment effects on explorative patents are much stronger than that on exploitative patents. For the optimal bandwidth, the treatment effect is 0.280 for explorative innovations while it is only 0.109 for exploitative innovations. In sum, institutional ownership is positively associated with both types of innovations. The impact from institutional investors, however, is much stronger towards explorative innovations. These are again consistent with institutional investors reducing short-termist pressures.

[Insert Figure 8 & Table 7 Here]

3.2.5 Instrumental Variable Analysis

Institutional ownership is an endogenous variable in regressions. OLS coefficient estimates will be the combination of treatment effects and selection bias. For example, the literature has documented an inclination of institutional investors to hold better governed firms (Ferreira and Matos (2008); Chung and Zhang (2011)). If better governance influences investment behavior, OLS estimates will be biased. Moreover, there could be unobserved firm characteristics that correlate with both institutional ownership and corporate investment. That is why we opt for a RD design approach in this paper. For robustness, we also cater to instrumental variable (IV) based on Russell indexes assignments to address these endogenity problems of institutional ownership in this section. Using IV approach allows us to control for various characteristics of firms that determines the investment in the cross section. As Russell indexes assignments generate a discontinuity in institutional ownership only around the cutoff, our IV analysis is performed locally around the cutoff to ensure the validity of the IV. We choose a bandwidth of 100 as a trade-off between pre-assignment differences in firm characteristics and the number of observations we have. Our IV follows from Boone and White (2015) and includes a dummy variable, R2000, which equals one if the firm is in the Russell 2000 index. We also include the distance from the cutoff (DIST) and the interaction between DIST and R2000 as instrumental variables for institutional ownership to reflect the discontinuity in institutional ownership around the cutoff. The regressions are of the following specification:

$$IO_{i,t} = \alpha + \beta_1 R2000_{i,t} + \beta_2 DIST_{i,t} + \beta_3 R2000_{i,t} * DIST_{i,t} + Controls_{i,t} + \eta_t + \epsilon_{i,t}$$

$$I_{i,t} = \alpha + \beta_1 \widehat{IO\_P_{i,t-1}} + Controls + \eta_t + \epsilon_{i,t}$$

(3)

where $\widehat{IO\_P_{it}}$ is estimated institutional ownership in the first-stage of the regression. Our main control variables for investment regression include investment opportunities, ROA, cash flow and leverage.

Table 8 presents the regression results. Our results are again confirmed. First of all, the three instruments are significant in the first-stage. Using predicted value of institutional ownership ($\widehat{IO\_P_{it}}$), we find firms with higher institutional ownership invests more in R&D, have more patents count and citations per patents. There is no impact of institutional investors on CAPX.

[Insert Table 8 Here]

3.2.6 The Role of Quasi-Indexer Institutional Investors

Institutional investors are not a homogenous group. Firms in the top of the Russell index have significantly more ownership by quasi-indexer and transient type institutional investors. However, it is mostly quasi-indexers that respond to index reconstitutions (Boone and White, 2015). Althought these institutional investors are passive in terms of their investment styles, they are not passive owners. They affect corporate decisions through their large voting block (Appel, Gormley and Keim, 2015). Using instrumental variable analysis, we identify the impacts of them on R&D and innovation. Table 9 reports the results. First of all, the three instrumental variables are significant predictors of institutional ownership of quasi-indexers. Secondly, the presence of quasi-indexers can positively influence R&D and innovation. There are no impacts observed on CAPX. Thus, the results suggest our prior finding that institutional investors ameliorate short-termist pressures is likely due to quasi-indexers. The results are in line with Appel, Gormley and Keim (2015).

[Insert Table 9 Here]

4. Robustness Tests

We provide several robustness tests in this section, including focusing on firms that switch between indexes and use pseudo cutoff points for the Russell index as placebo tests.

4.1 Switching Analysis

In this section, we focus on firms that switch indexes within a bandwidth of 100. We select a bandwidth of 100 for this analysis due to a trade-off of the following: 1) institutional ownership of firms differs significantly for a bandwidth of 100, 2) number of observations is not too few, 3) firm characteristics are not significantly different.

We have a total of 167 observations moving from the bottom of the Russell 1000 to the top of Russell 2000, and 152 observations that move from the top of the Russell 2000 index to the bottom of the Russell 1000 index[11]. Table 10 reports the changes in investment and innovation for firms that switch indexes. We find that firms moving up to the Russell 1000 index from the Russell 2000 reduces CAPX, R&D and have less innovation. For firms moving down to the Russell 2000 index, we see the opposite except for CAPX. R&D and innovation both increased when a firm moves from the bottom of the Russell 1000 index to the top of the Russell 2000 index. The difference-in-difference analysis suggests institutional investors have a positive effects on R&D and innovation and negative effects on CAPX. Due to the number of observations are few, there is no statistically significance except for R&D. But overall, the pattern matches well with our

[11] The few observations make the test a less powerful one. But the patterns we observe are interesting nonetheless.

RD design results that an increase in institutional ownership (being assigned to the top of the Russell 2000 index) will result in more R&D and more innovation.

[Insert Table 10 Here]

4.2 Placebo Tests

As a further robustness test, we check whether there are any results when pseudo cutoffs are used. Instead of using 1001st as the cutoff rank to determine assignment into the Russell 1000 or the Russell 2000 index, we check the robustness of our results by using pseudo cutoff ranks in this section. Specifically, we estimate RD coefficients using 951st/1051st ranks as the cutoff rank for index assignment as opposed to using the real cutoff. If the increase in R&D and innovation is truly driven by the increase in institutional ownership generated by index assignment, we would expect our previous results to go away if we change the cutoff from 1001st to either 951st or 1051st.

Table 11 reports the RD design treatment effect estimates for investment and innovation using pseudo cutoffs. In Panel A, where the 951st rank is used as the cutoff, the treatment effects are gone. There is barely any significance in the treatment effects across all the variables of interests except for patents where we observe a negative treatment effects. This is due to firms in the bottom of the Russell 1000 index have low patents count. In Panel B, we do not find any significance.

[Insert Table 11 Here]

These results confirm the validity of our finding using the Russell 1000/2000 cutoff to identify the impact of institutional investors on corporate investment and innovation. The findings are not due to coincidence or pure luck.

5. Institutional Ownership and Short-Termist Pressures

Having established that firms with higher institutional ownership exhibit behaviors that are associated with less short-termist pressures, we directly test the impact of institutional ownership on short-termist pressures in this section.

As short-termism models (Stein (1989)) predict that firms whose stock prices are more sensitive to its current earnings per share are subject to more short-termist pressures, we use earnings response coefficient, or ERC (Ball and Brown (1968)), which measures the relationship between equity returns and the unexpected portion of a company's earnings announcements, as a proxy for the short-termist pressure on firms following Farre-Mensa and Ljungqvist (2014).

To estimate the impact of institutional ownership on ERC, we estimate the following model for Russell 1000 and Russell 2000 firms around the Russell index cutoff, respectively. As with the instrumental variable analysis, we choose a bandwidth of 100 as a trade-off between pre-assignment differences in firm characteristics and the number of observations we have. Thus, the Russell 1000 sample consists of earnings announcement of the bottom 100 Russell 1000 firms each year after reconstitution from July to June of next year. Similarly, the Russell 2000 sample consists of earnings announcement of the top 100 Russell 2000 firms.

$$CAR_{i,t} = \alpha + \beta_1 PRE\_ANN\_RET_{i,t} + \beta_2 UNEX_{i,t} + \beta_3 LOSS_{i,t} + \beta_4 LOSS * UNEX_{i,t} + \eta_t + \epsilon_{i,t}, \tag{4}$$

where CAR is the (-1, +1) three-day size-adjusted abnormal return around the earnings announcement date. PRE_ANN_RET is the pre-announcement return one day after the I/B/E/S forecast data up to two days prior to the announcement date in log terms. This is to control for information in between the forecast date and earnings announcement date. UNEX is the unexpected earnings. It is the difference between actual earnings and most recent quarterly consensus earnings forecast scaled by quarter-end stock price. Thus, β_2 is the ERC we are interested in. As Hayn (1995) points out, because investors have liquidation option, negative unexpected earnings are less informative, if at all, than positive unexpected earnings. We therefore define LOSS, a dummy variable that equals one for negative UNEX, and use an interaction term of LOSS and UNEX to take out the dampen effect of negative of negative UNEX.

We report the results in Table 12. Column (1) reports results for the bottom 100 Russell 1000 firms, whose institutional ownership is relatively lower. The ERC estimate is 1.052. In Column (2) where we use firms in the top 100 of the Russell 2000 index that have relatively higher institutional ownership, the ERC is much lower at 0.514. This confirms that institutional investors do relieve short-termist pressures on firms. Column (3) combines the two samples in the first two columns and introduces a dummy, R2000, for the Russell 2000 sample. This one serves to test the statistical difference of ERC between the two samples in the first two columns. The positive and significant coefficient on R2000*UNEX suggests the difference in ERC between the two samples in the first two columns is indeed statistically significant.

[Insert Table 12 Here]

Overall, the findings in Table 12 provide direct evidences that institutional investors are reducing short-termist pressures on firms.

6. Concluding Remarks

This paper uses index assignments as quasi-natural experiments to identify the impacts of institutional investors on public firms that face short-termist pressures from the perspective of corporate investment and innovation. We present evidences that are consistent with a view that institutional investors ameliorate short-termist pressures on firms. Previous literatures show public firms are likely to cut investment and do more exploitative (safer) innovations than explorative (riskier) ones when facing short-termist pressures. We find firms with higher institutional ownership invest more on average, but only in R&D. The increases in R&D bear positive implications for innovation. And the positive impact on innovation is stronger towards explorative innovations. All these suggest institutional investors are reducing short-termist pressures on firms. Our results are in contrast to prior literature showing no impact of quasi-indexer type institutional investors on innovation. Institutional ownership is endogenously determined, making it difficult to assess their impacts on firms. We highlight the importance of using exogenous variations in institutional ownership in this strand of research.

Appendix A **Russell 1000/2000 Index Assignment**

Russell 1000 and 2000 indexes are market capitalization-weighted indexes constructed by Russell Investments from the year of 1984. The two indexes are objectively constructed and based on transparent rules. The two indexes contain the 3000 largest U.S. firms. Russell Investments ranks all exchange-traded U.S. firms based on their market capitalization on the last trading day of May each year. Firms ranked within the first 1000 consist of the Russell 1000 index and the rest 2000 firms the Russell 2000 index. Total market capitalization is determined by multiplying total outstanding shares by the market price as the last trading day in May. Common stock, non-restricted exchangeable shares and partnership units/membership interests are used to calculate a company’s total market capitalization.

After membership is determined, securities shares are adjusted to include those shares available to the public. This is called “free float”. The purpose of float-adjustment is to exclude portions of the firm that are not available for purchase. The price to calculate float-adjusted market capitalization is from the last trading day of June. The weight of the index is determined by the float-adjusted market capitalization.

Except for certain corporate actions, firms remain in the index until the next reconstitution. These actions include merges and acquisitions, and other activities influencing shares outstanding.

Since 2007, Russell investments introduces the banding rule that a firm in the Russell has to have a market capitalization larger/smaller than 2.5% than that of the new 1001st cutoff firm to merit a change in index. This weakens local continuity condition for regression discontinuity studies and we therefore end the sample on 2006 following the literature using the Russell data.

Appendix B **Variable Definitions**

CAPX is changes in total property, plant and equipment (PPEGT) scaled by beginning-of-year total assets (AT).

R&D is research and development (XRD, replace by 0 if missing) scaled by beginning-of-year total assets (AT).

Patents Count is the natural log of the number of patents applications that are eventually granted.

Exploratory Patent is a patent that more than 60% of patents it cites are out of the firm's existing expertise. A firm's existing expertise is defined as its portfolio of prior patents and citations received. A patent is defined **Exploitative** if otherwise is true.

Citations per Patent are the average citations received for patents applied that are eventually granted. Citation data has been adjusted for the truncation bias according to Hall, Jaffe, Trajtenberg (2001).

MKT_CAP is the natural log of the product of end-of May share price (PRC) and shares outstanding (SHROUT) from CRSP.

Sale_Q is sales growth. It is the change in sales (SALE) scaled by beginning-of-year sales (SALE).

ROA is operating income before depreciation (OIBDP) scaled by beginning-of-year total assets (AT).

CF is cash flow (IB+DP) scaled by beginning-of-year total assets (AT).

LEV is the sum of long-term (DLTT) and short-term debt (DLC) scaled by beginning-of-year total assets (AT).

IOR is the percentage of common shares held by institutional investors. It is calculated as the ratio of quarterly common shares held by institutions that file form 13-F and common shares outstanding. The quarterly data is then averaged to obtain yearly institutional ownership.

IOR_QIX is the percentage of common shares held by passive quasi-indexer (Type QIX) institutional investors in Bushee (2001).

IOR_DED is the percentage of common shares held by dedicated (Type DED) institutional investors in Bushee (2001).

IOR_TRA is the percentage of common shares held by transient (Type TRA) institutional investors in Bushee (2001).

CAR is the (-1, +1) three-day cumulative abnormal return around earnings announcement date in log. The stock return is adjusted for the same time period return of a NYSE/AMEX/NASDAQ portfolio with similar size.

PRE_ANN_RET is the pre-announcement return one day after the I/B/E/S forecast data up to two days prior to the announcement date in log.

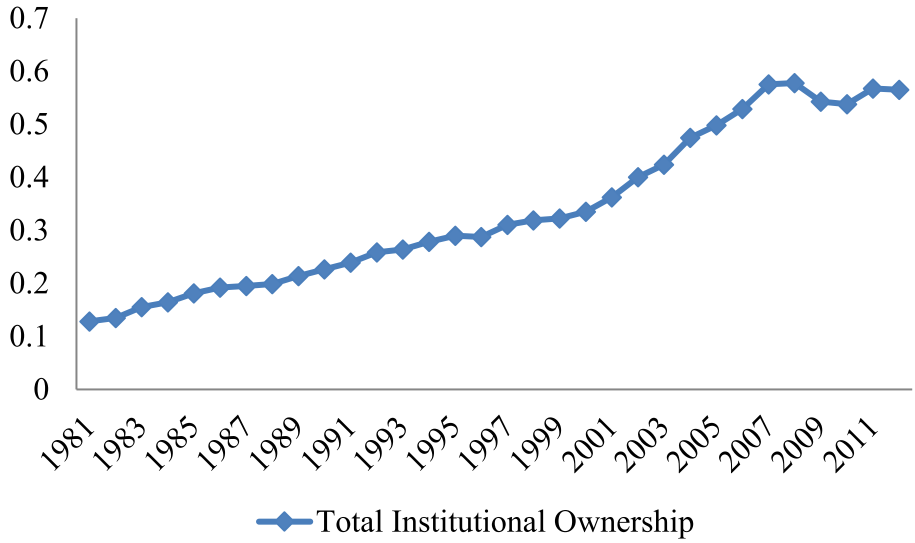
UNEX is the unexpected earnings. It is the difference between actual earnings and most recent quarterly consensus earnings forecast scaled by quarter-end stock price.

LOSS is a dummy variable that equals one for negative UNEX.

Figure 1 **Institutional Ownership across the Years**

Panel A **Total Institutional Ownership**

The figure shows the annual average institutional ownership of firms from 1981 to 2012. It is calculated from 13-F files data obtained from Thompson Reuters. For each firm, institutional ownership is the ratio of common shares held by institutional investors that files form 13-F to total common shares outstanding.



Panel B **Institutional Ownership by Type**

The figure shows the annual average institutional ownership of firms from 1981 to 2012. It is calculated from 13-F files data obtained from Thompson Reuters. For each firm, institutional ownership is the ratio of common shares held by institutional investors that files form 13-F to total common shares outstanding. Types of institutional investors are from Bushee (2001). Quasi-indexer has low turnover, high diversification and long-term investment horizon. Transient has high turnover, high diversification and short-term investment horizon. Dedicated has low turnover, low diversification and long-term investment horizon.

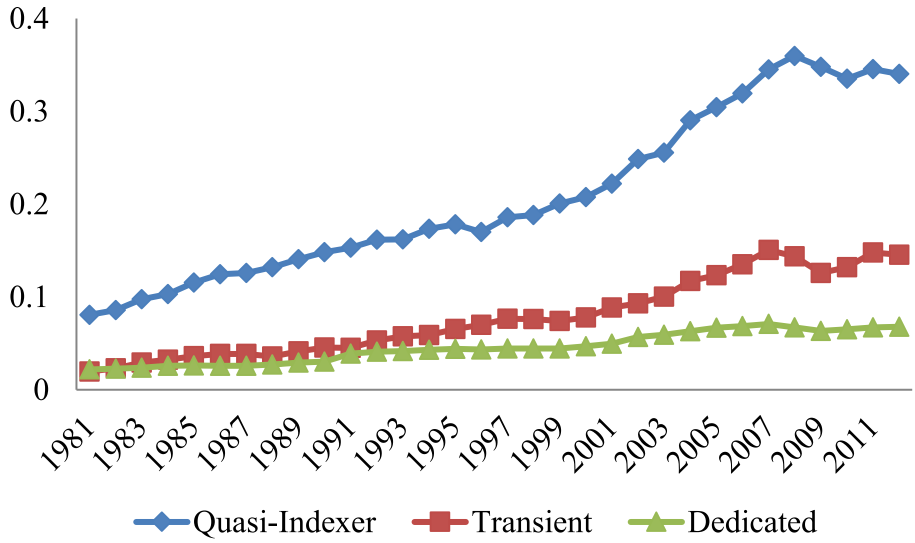


Figure 2 **Index Weight of Firms around the Russell 1000/2000 Cutoff**

This figure displays the index weights of firms around Russell 1000/2000 index cutoff. The data spans from 1984 to 2006. The index weight data is provided by Russell Investment. Distance is the relative position to the 1001st firm in the Russell 1000/2000 index. Firms in the Russell 1000 have negative distance while firms in the Russell 2000 have non-negative distance. The dots in the figure represents sample mean of 20 non-overlapping bins on each side of the cutoff. The curves represent a third-order polynomial fit.

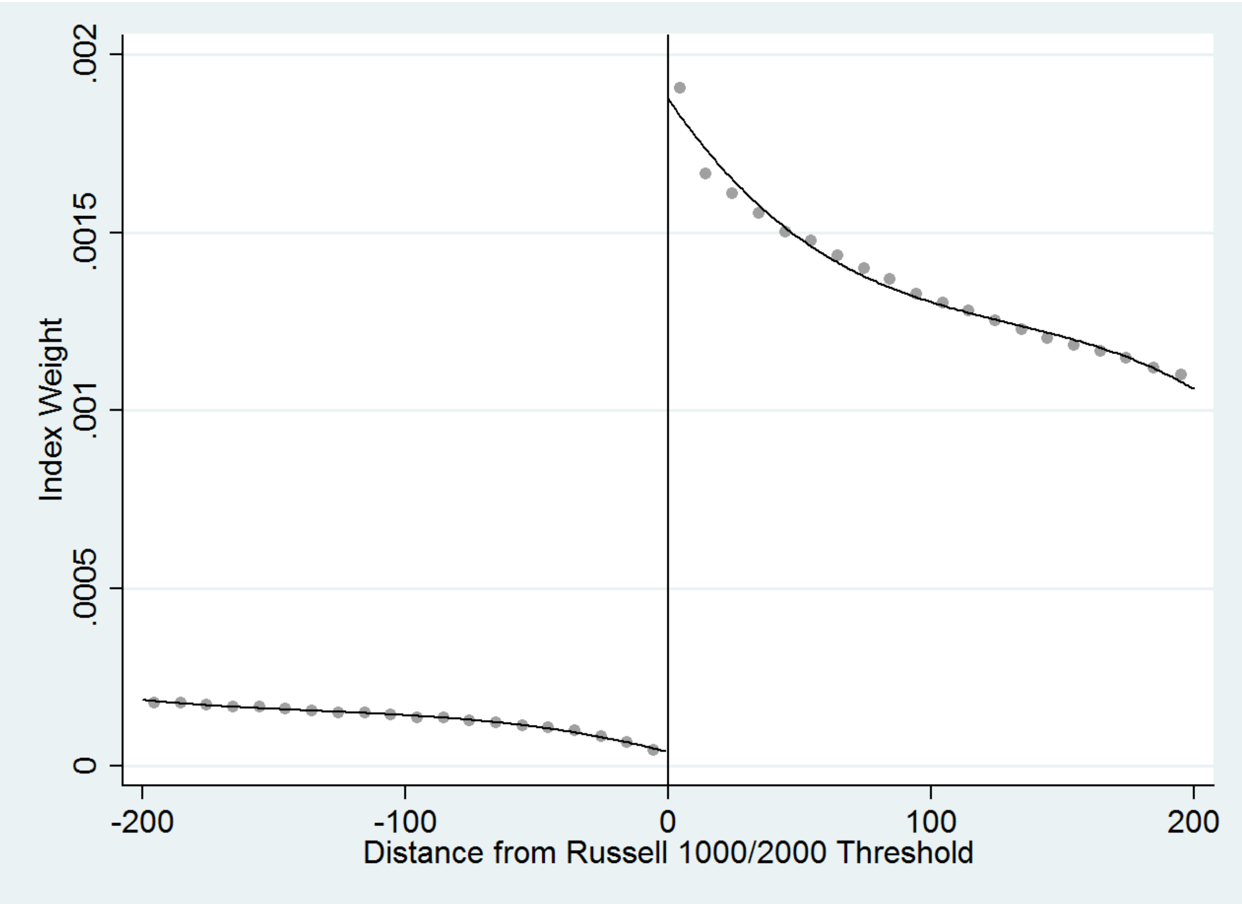
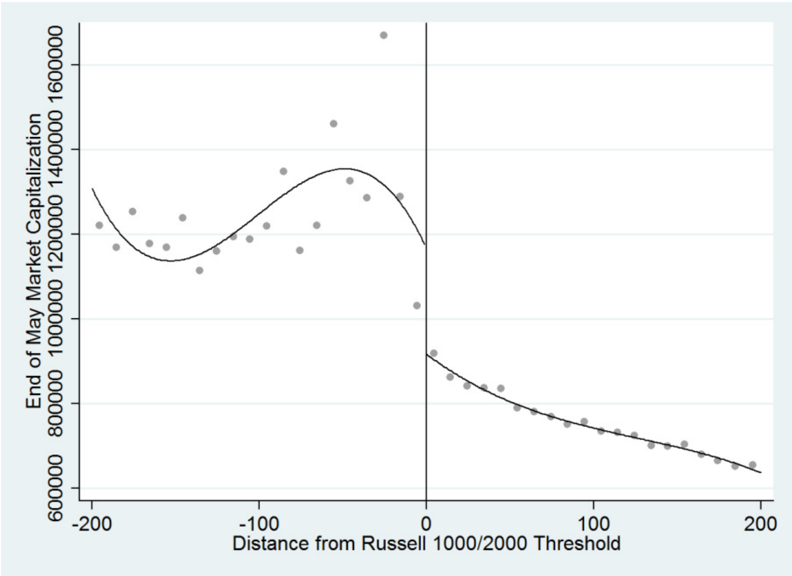


Figure 3 **End-of-May Market Capitalization of Firms around the Russell 1000/2000 Cutoff**

These figures display the end-of-May market capitalization of firms around Russell 1000/2000 index cutoff using distance calculated from end-of-June index weight ranking. The data spans from 1984 to 2006. Market capitalization is calculated using data from CRSP. Distance is the relative position to the 1001st firm in the Russell 1000/2000 index. Firms in the Russell 1000 have negative distance while firms in the Russell 2000 have non-negative distance. Figure (a) uses all firms around the cutoff while figure (b) excludes firms that receive large float adjustment (remove top decile). The dots in the figure represents sample mean of 20 non-overlapping bins on each side of the cutoff. The curves represent a third-order polynomial fit.

(a) All Firms



(b) Excluding Firms Receiving Large Adjustment

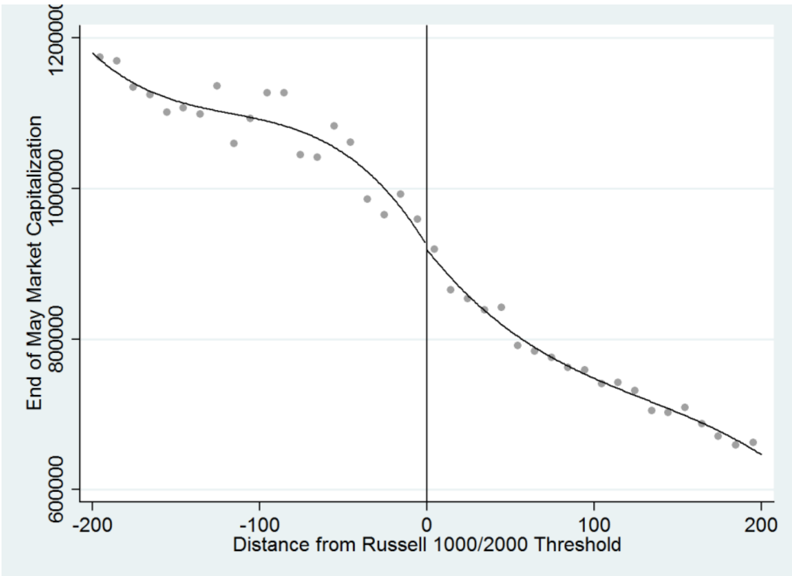
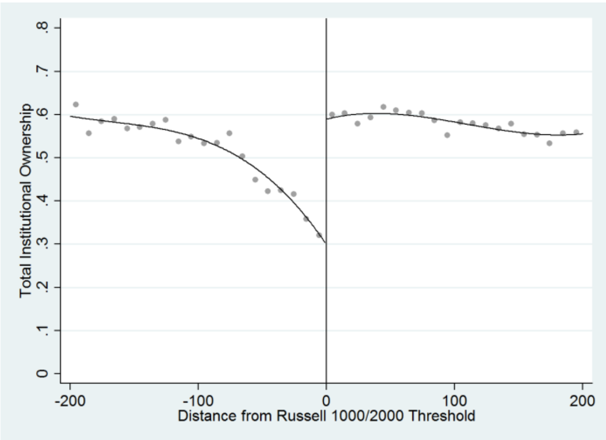


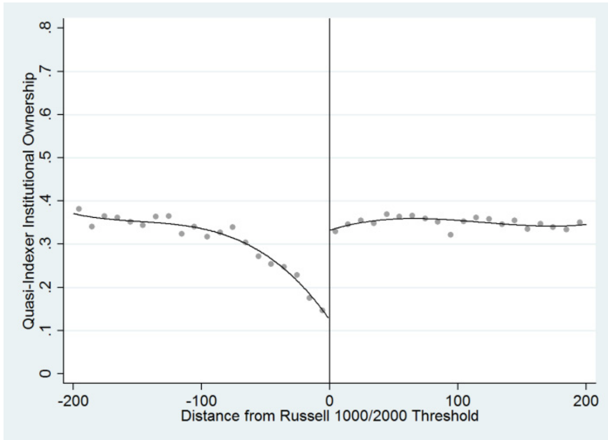
Figure 4 **Institutional Ownership of Firms around the Russell 1000/2000 Cutoff**

These figures display institutional ownership of firms around Russell 1000/2000 index cutoff. The data spans from 1984 to 2006. Russell index data is provided by Russell Investment. Institutional ownership is calculated from 13-F filings data from Thompson Reuters. Institutional investors are classified in to Quasi-Indexer, Dedicated and Transient type according to Bushee (2001). Distance is the relative position to the 1001st firm in the Russell 1000/2000 index. Firms in the Russell 1000 have negative distance while firms in the Russell 2000 have non-negative distance. The dots in the figure represents sample mean of 20 non-pverlapping bins on each side of the cutoff. The curves represent a third-order polynomial fit.

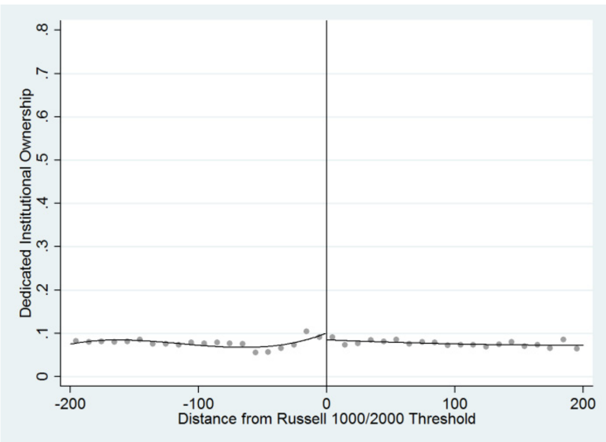
(a) Total Institutional Ownership



(b) Quasi-Indexer



(c) Dedicated



(d) Transient

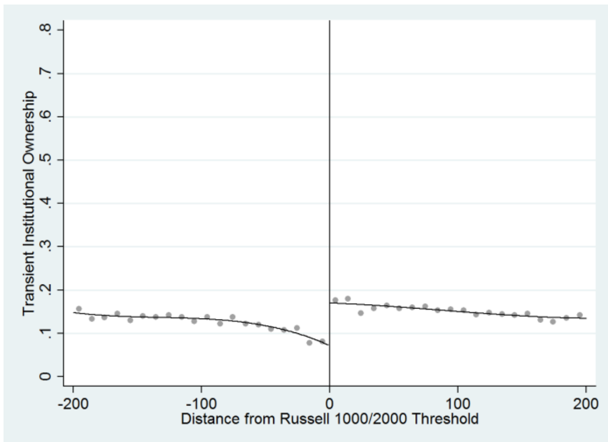
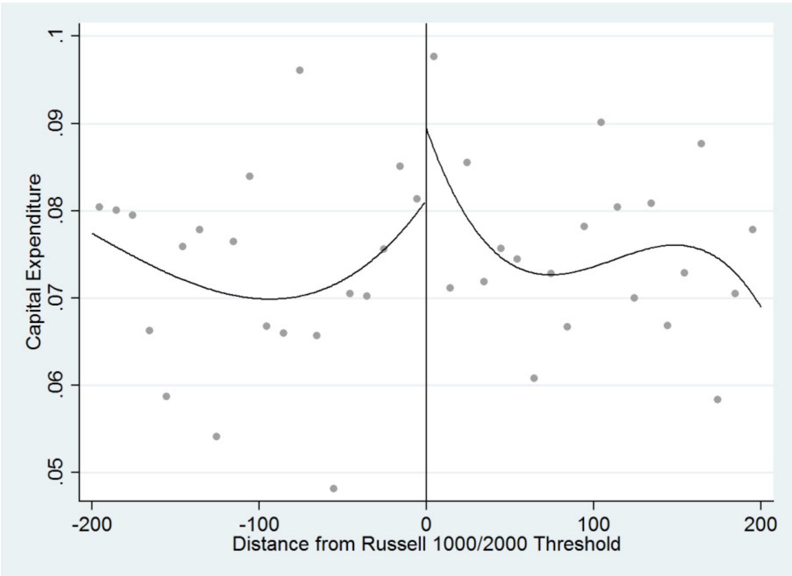


Figure 5 **Investment of Firms around the Russell 1000/2000 Cutoff**

These figures display investment of firms around Russell 1000/2000 index cutoff. The data spans from 1984 to 2006. Russell index data is provided by Russell Investment. Investment is calculated from COMPUSTAT. Capital expenditure is the change in gross property, plant and equipment (PPEGT) scaled by begin of the year total assets (AT). R&D expenses (XRD) are scaled by begin of the year total assets (AT). Distance is the relative position to the 1001st firm in the Russell 1000/2000 index. Firms in the Russell 1000 have negative distance while firms in the Russell 2000 have non-negative distance. The dots in the figure represents sample mean of 20 non-overlapping bins on each side of the cutoff. The curves represent a third-order polynomial fit.

(a) Capital Expenditures



(b) R&D Expenses

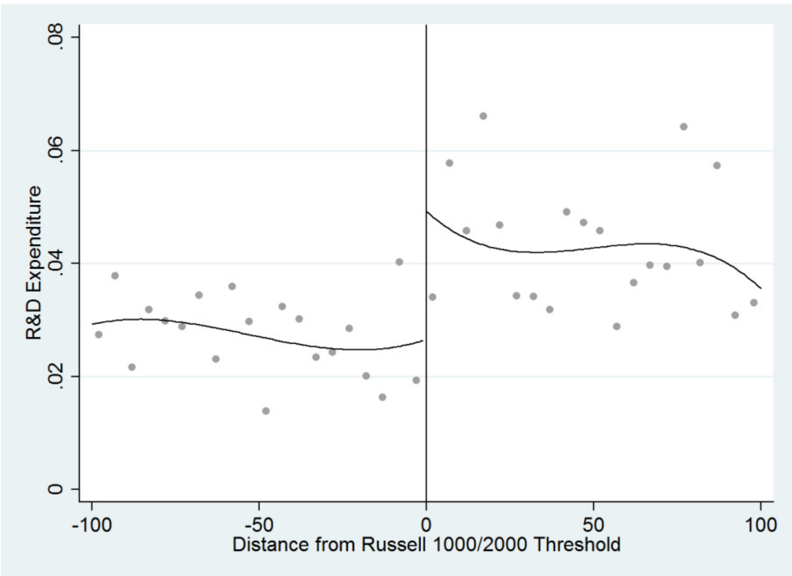
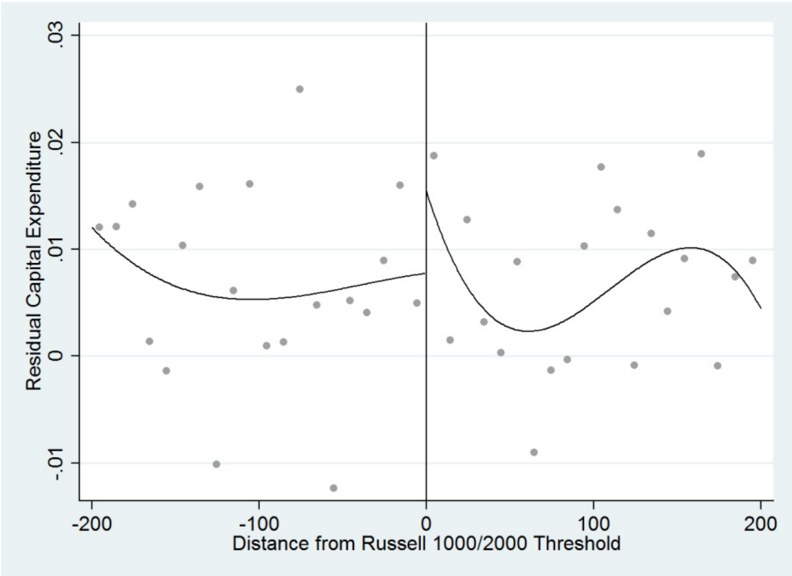


Figure 6 **Residual Investment of Firms around the Russell 1000/2000 Cutoff**

These figures display residual investment of firms around Russell 1000/2000 index cutoff. The data spans from 1984 to 2006. Russell index data is provided by Russell Investment. Residual Investment is calculated from COMPUSTAT. Capital expenditure is the change in gross property, plant and equipment (PPEGT) scaled by begin of the year total assets (AT). R&D expenses (XRD) are scaled by begin of the year total assets (AT). Residual values are obtained from regression residuals by regressing investment variables on investment opportunities. Distance is the relative position to the 1001st firm in the Russell 1000/2000 index. Firms in the Russell 1000 have negative distance while firms in the Russell 2000 have non-negative distance. The dots in the figure represents sample mean of 20 non-overlapping bins on each side of the cutoff. The curves represent a third-order polynomial fit.

(a) Residual Capital Expenditures



(b) Residual R&D Expenses

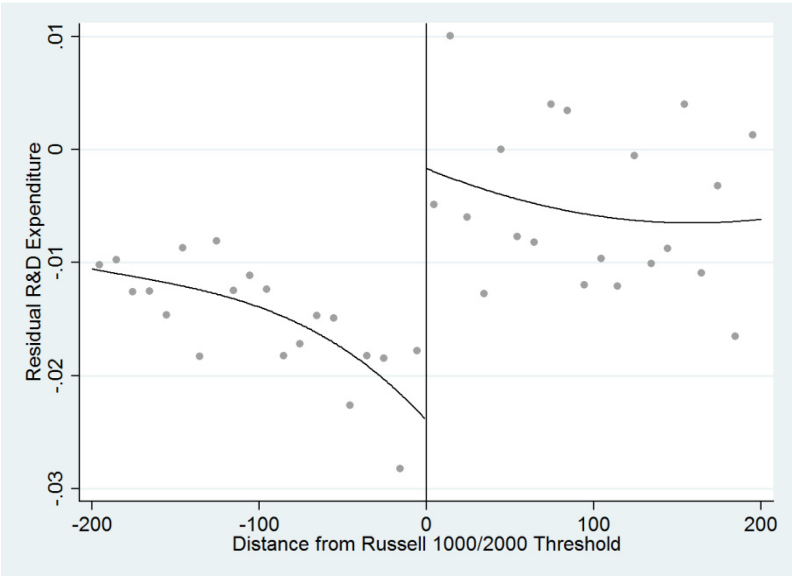
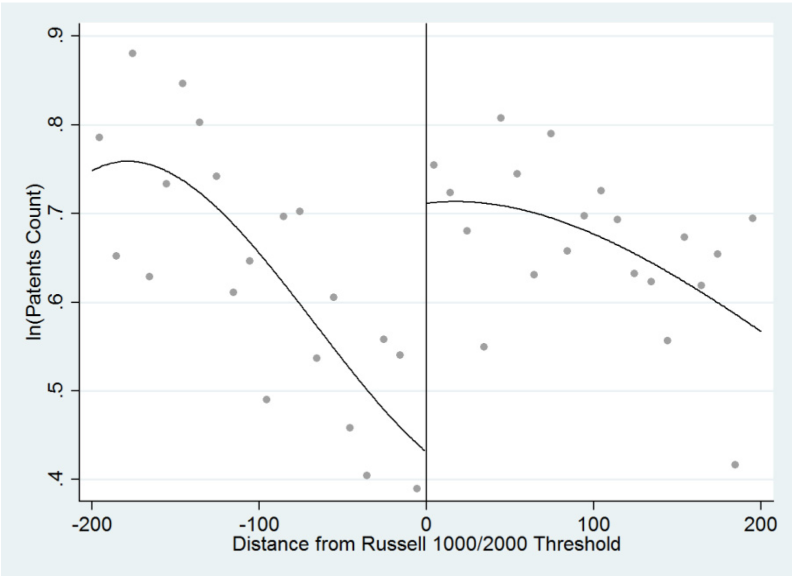


Figure 7 **Innovation of Firms around the Russell 1000/2000 Cutoff**

These figures display innovation of firms around Russell 1000/2000 index cutoff. The data spans from 1984 to 2006. Russell index data is provided by Russell Investment. Innovation data is obtained from NBER. Patents count is the natural log of total patents applied that are eventually granted. Citation per patent is the natural log of average citations received per patent applied and eventually granted. Distance is the relative position to the 1001st firm in the Russell 1000/2000 index. Firms in the Russell 1000 have negative distance while firms in the Russell 2000 have non-negative distance. The dots in the figure represents sample mean of 20 non-overlapping bins on each side of the cutoff. The curves represent a third-order polynomial fit.

(a) Patents Count



(b) Citation per Patent

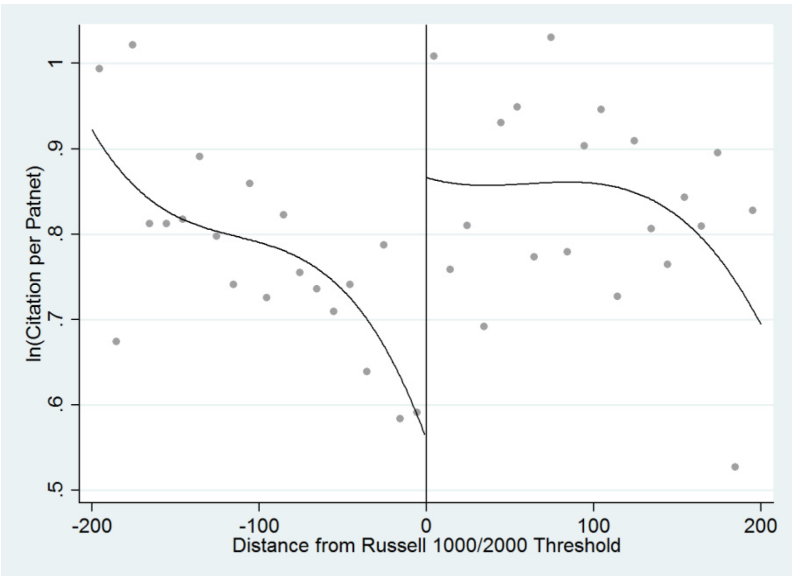
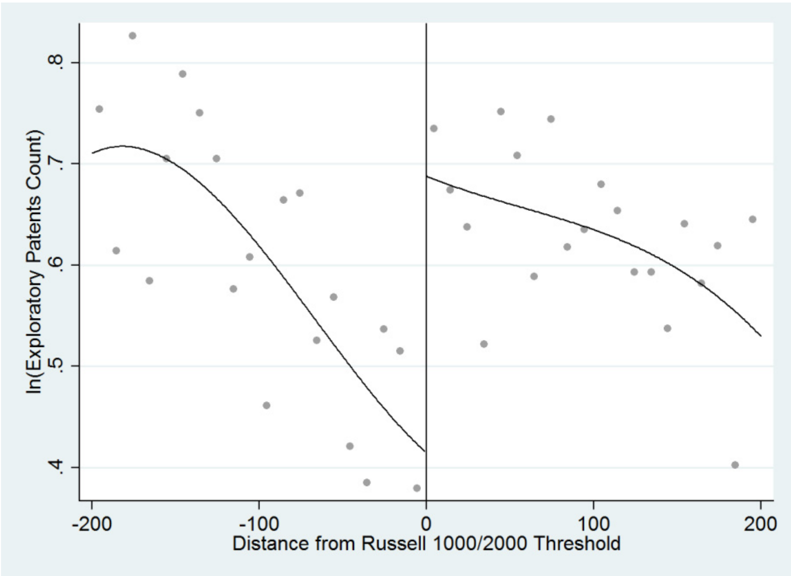


Figure 8 **Innovation Strategies of Firms around the Russell 1000/2000 Cutoff: Exploratory or Exploitative**

These figures display patents count of firms around Russell 1000/2000 index cutoff decomposed by the type of innovative strategy. The data spans from 1984 to 2006. Russell index data is provided by Russell Investment. Innovation data is obtained from NBER. Patents count is the natural log of total patents applied in year t that are eventually granted. Exploratory patents are those cites less than 60% from firm's own expertise while exploitative ones are those cite no less than 60% from the firm's own expertise. Detailed definitions can be found in Appendix B. Distance is the relative position to the 1001st firm in the Russell 1000/2000 index. Firms in the Russell 1000 have negative distance while firms in the Russell 2000 have non-negative distance. The dots in the figure represents sample mean of 20 non-pverlapping bins on each side of the cutoff. The curves represent a third-order polynomial fit.

(a) Exploratory Patents Count



(b) Exploitative Patents Count

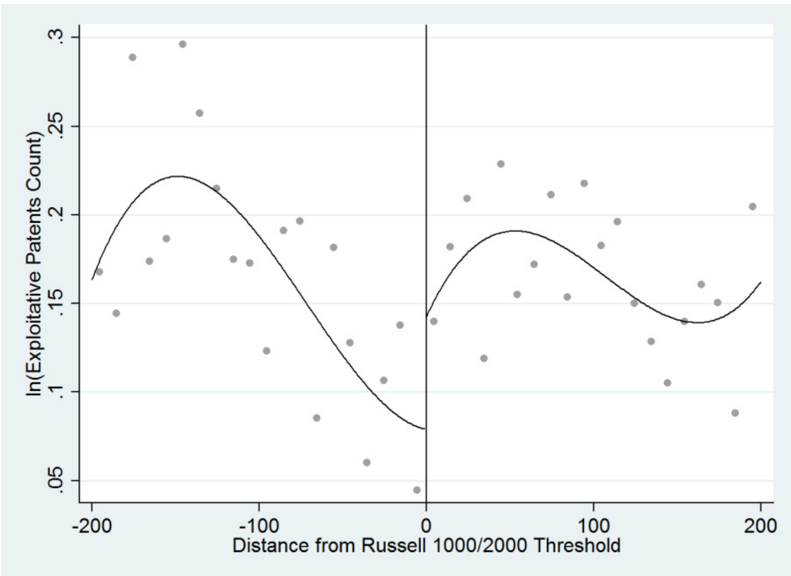


Table 1 **Descriptive Statistics**

This table presents descriptive statistics for firms in the Russell 1000/2000 indexes. The data spans from 1984 to 2006. Institutional ownership data is obtained from Thompson Reuters. We merge institutional ownership data with corporate data from COMPUSTAT. Patents data is from NBER Patents database. Unbounded ratio variables have been winsorized at 1% level to minimize the impact of outliers. CAPX and R&D are capital expenditures and research and development expenses scaled by beginning-of-the-year total assets. Patents count and citations per patent are the log number of patents and citations per patents, respectively. Sales_Q is the growth in sales that measures investment opportunities. ROA is return on assets. CF is cash flow. LEV is leverage. IOR is institutional ownership that can be further decomposed into three sub-types: quasi-indexer (IOR_QIX), dedicated (IOR_DED), and transient (IOR_TRA). Types of institutional investors are from Bushee (2001). Quasi-indexer has low turnover, high diversification and long-term investment horizon. Transient has high turnover, high diversification and short-term investment horizon. Dedicated has low turnover, low diversification and long-term investment horizon. A detailed definition of variables can be obtained from Appendix B.

Variable	**N**	**Mean**	**S.D.**	**Min**	**0.25**	**Mdn**	**0.75**	**Max**
Investment								
CAPX	40251	0.07	0.12	-0.26	0.01	0.04	0.09	0.63
RD	40531	0.05	0.08	0.00	0.00	0.00	0.06	0.47
Innovation								
Patents Count	38971	0.76	1.34	0.00	0.00	0.00	1.10	8.38
Citations per Patent	38971	0.81	1.29	0.00	0.00	0.00	1.93	5.69
Firm Characteristics								
Sale_Q	40073	0.15	0.34	-0.57	0.00	0.09	0.22	1.93
ROA	40073	0.14	0.16	-0.54	0.08	0.15	0.22	0.56
CF	40073	0.08	0.15	-0.64	0.05	0.10	0.15	0.40
LEV	40073	0.27	0.25	0.00	0.06	0.23	0.38	1.29
Institutional Ownership								
IOR	40073	0.48	0.25	0.00	0.29	0.49	0.67	1.00
IOR_QIX	40073	0.30	0.16	0.00	0.17	0.30	0.42	0.86
IOR_DED	40073	0.07	0.07	0.00	0.01	0.04	0.10	0.87
IO_TRA	40073	0.11	0.10	0.00	0.04	0.09	0.16	0.73

Table 2 **Pre-Assignment Differences in Firm Characteristics**

This table presents pre-assignment characteristics of firms that are assigned to the Russell 1000/2000 indexes. The data spans from 1984 to 2006. For each firm in an index in year t, the corresponding firm characteristics (except for MKT_CAP) are calculated from financial statements with fiscal year ending in year t. MKT_CAP is calculated each May of year t. MKT_CAP is market capitalization. Sales_Q is the growth in sales that measures investment opportunities. ROA is return on assets. CF is cash flow. LEV is leverage. Definitions of variables can be find in Appendix B. Panel A compares the mean of characteristics for a fixed bandwidth of 50, 100 and 200. Panel B reports the bias-corrected treatment effect coefficient estimates using RD design. ***, ** and * denote the difference is significance at 1%, 5% and 10% respectively.

Panel A *Univariate Analysis of Pre-Assignment Characteristics*

	Bandwidth ±50		Bandwidth ±100			Bandwidth ±200		
	Russell 1000	Russell 2000	Russell 1000		Russell 2000	Russell 1000		Russell 2000
MKT_CAP	13.47	13.41	13.56	***	13.33	13.65	***	13.25
Sale_Q	0.23	0.27	0.22	*	0.25	0.21	**	0.23
ROA	0.19	0.19	0.19		0.19	0.19	*	0.18
CF	0.12	0.12	0.12		0.12	0.12		0.12
LEV	0.29	0.29	0.28		0.28	0.28		0.28

Panel B *Regression-Discontinuity Coefficients of Pre-Assignment Characteristics*

	(1)		(2)	(3)
BW Type	CCT	Bandwidth	Manual 100	Manual 200
Bias-corrected Treatment Coefficients				
MKT_CAP	0.097	341	0.126	0.015
Sale_Q	0.043	635	0.169	0.152**
ROA	0.010	574	0.031	0.038
CF	0.001	480	0.011	0.009
LEV	0.003	516	0.025	0.017

Table 3 **Institutional Ownership of Firms around the Russell 1000/2000 Cutoff**

This table presents institutional ownership of firms around the Russell 1000/2000 indexes. The data spans from 1984 to 2006. Institutional ownership is calculated as the ratio of total shares held by institutional investors that file 13-F filings to total shares outstanding as of September after index reconstitution in June. Total is institutional ownership that can be further decomposed into three sub-types: quasi-indexer (QIX), dedicated (DED), and transient (TRA). Types of institutional investors are from Bushee (2001). Quasi-indexer has low turnover, high diversification and long-term investment horizon. Transient has high turnover, high diversification and short-term investment horizon. Dedicated has low turnover, low diversification and long-term investment horizon. Panel A compares the mean of institutional ownership for a fixed bandwidth of 50, 100 and 200. Panel B reports the bias-corrected treatment effect coefficient estimates using RD design for institutional ownership. We use the code/methodology of Calonico, Cattaneo and Titiunik (2014b) to perform the RD analysis. We use CCT data-driven bandwidth as well as two fixed bandwidth of 100 and 200 manually for robustness. We choose 3rd order polynomial in the analysis. ***, ** and * denote significance at 1%, 5% and 10% respectively.

Panel A *Univariate Analysis of Institutional Ownership*

	Bandwidth ±50			Bandwidth ±100			Bandwidth ±200		
	Russell 1000		Russell 2000	Russell 1000		Russell 2000	Russell 1000		Russell 2000
Institutional Ownership, September									
Total	38.90%	***	60.00%	45.30%	***	59.50%	51.40%	***	57.90%
Quasi-Indexer	21.10%	***	34.95%	26.18%	***	35.12%	30.83%	***	34.93%
Dedicated	7.80%		8.28%	7.53%		7.97%	7.74%		7.62%
Transient	9.81%	***	16.46%	11.32%	***	16.09%	12.61%	***	15.05%

Panel B *Regression-Discontinuity Coefficients of Institutional Ownership*

	(1)	(2)	(3)	(4)	(5)	(6)
BW Type	CCT	Manual	Manual	CCT	Manual	Manual
Variable	Total	Total	Total	QIX	QIX	QIX
Bias-corrected Treatment Coefficients	0.299***	0.313***	0.276***	0.208***	0.203***	0.195***
Robust p-value	0.000	0.000	0.000	0.000	0.000	0.000
BW Loc. Poly.	350	100	200	310	100	200
	(7)	(8)	(9)	(10)	(11)	(12)
Variable	DED	DED	DED	TRA	TRA	TRA
Bias-corrected Treatment Coefficients	0.000	0.013	-0.028	0.095***	0.097***	0.107***
Robust p-value	0.981	0.672	0.214	0.000	0.000	0.000
BW Loc. Poly.	574	100	200	385	100	200

Table 4 **Corporate Investment of Firms around the Russell 1000/2000 Cutoff**

This table presents (residual) investment of firms around the Russell 1000/2000 indexes. The data spans from 1984 to 2006. CAPX is the changes in property, plant and equipment scaled by beginning-of-the-year total assets. R&D is research and development expenses scaled by beginning-of-the-year total assets. Residual investment is the residual taken from regressing investment on investment opportunities. Investment variables are measured from financial statements with fiscal year end date one year after index reconstitution. Panel A compares the mean of (residual) corporate investment for a fixed bandwidth of 50, 100 and 200. Panel B reports the bias-corrected treatment effect coefficient estimates using RD design for (residual) corporate investment. We use the code/methodology of Calonico, Cattaneo and Titiunik (2014b) to perform the RD analysis. We use CCT data-driven bandwidth as well as two fixed bandwidth of 100 and 200 manually for robustness. We choose 3rd order polynomial in the analysis. ***, ** and * denote significance at 1%, 5% and 10% respectively.

Panel A *Univariate Analysis of (Residual) Corporate Investment*

	Bandwidth ±50			Bandwidth ±100			Bandwidth ±200		
	Russell 1000		Russell 2000	Russell 1000		Russell 2000	Russell 1000		Russell 2000
CAPX	7.63%		8.17%	7.26%		7.55%	7.30%		7.54%
R&D	2.49%	***	4.43%	2.74%	***	4.26%	3.03%	***	4.06%
Res. CAPX	0.77%		0.86%	0.60%		0.45%	0.68%		0.68%
Res. R&D	-2.10%	***	-0.29%	-1.82%	***	-0.40%	-1.49%	***	-0.52%

Panel B *Regression-Discontinuity Coefficients of (Residual) Corporate Investment*

	(1)	(2)	(3)	(4)	(5)	(6)
BW Type	CCT	Manual	Manual	CCT	Manual	Manual
Variable	CAPX	CAPX	CAPX	R&D	R&D	R&D
Bias-corrected Treatment Coefficients	0.006	0.030	0.005	0.024***	0.011	0.019**
Robust p-value	0.607	0.338	0.818	0.000	0.325	0.035
BW Loc. Poly.	521	100	200	548	100	200
	(7)	(8)	(9)	(10)	(11)	(12)
Variable	Res. CAPX	Res. CAPX	Res. CAPX	Res. R&D	Res. R&D	Res. R&D
Bias-corrected Treatment Coefficients	0.001	0.024	0.007	0.022***	0.009	0.019**
Robust p-value	0.938	0.381	0.720	0.000	0.390	0.028
BW Loc. Poly.	532	100	200	523	100	200

Table 5 **Investment Sensitivity of Firms around the Russell 1000/2000 Cutoff**

This table reports the results of comparing investment sensitivity to investment opportunities for firms that are assigned into Russell 1000/2000 indexes for a fixed bandwidth of 50 and 100. Fama-Macbeth (1973) two-step procedures are used. Coefficients are time-series average of annual cross-sectional regressions of the following model:

$$I_{i,t} = \alpha_t + \beta_1 Sale\_Q_{i,t} + \beta_2 Sale\_Q_{i,t} * R2000_{i,t-1} + \beta_3\ R2000_{i,t-1} + Controls_{i,t-1} + \epsilon_{i,t}$$

R2000 is a dummy variable that equals one if a firm is assigned to the Russell 2000 index. Investment (I) is measured either by CAPX or R&D. CAPX is the changes in property, plant and equipment scaled by beginning-of-the-year total assets. R&D is research and development expenses scaled by beginning-of-the-year total assets. Sales_Q is the growth in sales that measures investment opportunities. ROA is return on assets. CF is cash flow. LEV is leverage. Detailed definitions of variables can be found in Appendix B. p-values are reported in the parenthesis. ***, ** and * denote significance at 1%, 5% and 10% respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Bandwidth	±50		±100		±50		±100	
Variable	CAPX	CAPX	CAPX	CAPX	R&D	R&D	R&D	R&D
SALE_Q	0.198***	0.193***	0.179***	0.174***	0.044***	0.040***	0.037***	0.037***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.005)	(0.001)	(0.000)
SALE_Q*R2000	0.012	-0.000	-0.006	0.001	0.035*	0.047**	0.029**	0.032**
	(0.762)	(0.993)	(0.800)	(0.954)	(0.069)	(0.032)	(0.042)	(0.042)
R2000	-0.000	0.006	-0.002	0.001	0.010**	0.009	0.008***	0.008**
	(0.974)	(0.513)	(0.753)	(0.843)	(0.034)	(0.128)	(0.009)	(0.017)
ROA		-0.123		-0.023		0.094**		0.047
		(0.135)		(0.629)		(0.039)		(0.158)
CF		0.432***		0.261***		-0.171***		-0.103*
		(0.001)		(0.000)		(0.006)		(0.053)
LEV		0.036**		0.012		-0.054***		-0.054***
		(0.033)		(0.270)		(0.000)		(0.000)
Constant	0.042***	0.000	0.045***	0.013**	0.017***	0.032***	0.021***	0.037***
	(0.000)	(0.993)	(0.000)	(0.034)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	1,304	1,227	2,597	2,486	1,319	1,241	2,626	2,512
R-squared	0.286	0.411	0.237	0.321	0.167	0.329	0.135	0.261

Table 6 **Innovation of Firms around the Russell 1000/2000 Cutoff**

This table presents innovation of firms around the Russell 1000/2000 indexes. The data spans from 1984 to 2006. Innovation is either defined as total patents count or citations per patent in log with application year one year after Russell index reconstitution. Detailed definitions can be found in Appendix B. Panel A compares the mean of innovation for a fixed bandwidth of 50, 100 and 200. Panel B reports the bias-corrected treatment effect coefficient estimates using RD design for innovation. We use the code/methodology of Calonico, Cattaneo and Titiunik (2014b) to perform the RD analysis. We use CCT data-driven bandwidth as well as two fixed bandwidth of 100 and 200 manually for robustness. We choose 3rd order polynomial in the analysis. ***, ** and * denote significance at 1%, 5% and 10% respectively.

Panel A *Univariate Analysis of Innovation*

	Bandwidth ±50			Bandwidth ±100			Bandwidth ±200	
	Russell 1000		Russell 2000	Russell 1000		Russell 2000	Russell 1000	Russell 2000
Patents Count	0.47	***	0.71	0.54	***	0.70	0.64	0.66
Citations per Patent	0.67	**	0.84	0.71	***	0.86	0.78	0.83

Panel B *Regression-Discontinuity Coefficients of Innovation*

	(1)	(2)	(3)	(4)	(5)	(6)
BW Type	CCT	Manual	Manual	CCT	Manual	Manual
Variable	Patents Count	Patents Count	Patents Count	Citations per Patent	Citations per Patent	Citations per Patent
Bias-corrected Treatment Coefficients	0.301***	0.639***	0.428***	0.226**	0.599**	0.458**
Robust p-value	0.003	0.002	0.004	0.037	0.015	0.012
BW Loc. Poly.	454	100	200	598	100	200

Table 7 **Innovation Strategies of Firms around the Russell 1000/2000 Cutoff: Exploratory or Exploitative**

This table presents patents count of firms around the Russell 1000/2000 indexes. The data spans from 1984 to 2006. Patents counts with application year one year after index reconstitution are decomposed into two types: exploratory and exploitative. Exploratory patents are those cites less than 60% from firm's own expertise while exploitative ones are those cite no less than 60% from the firm's own expertise. Panel A compares the mean of patents count for a fixed bandwidth of 50, 100 and 200. Panel B reports the bias-corrected treatment effect coefficient estimates using RD design for patents count. We use the code/methodology of Calonico, Cattaneo and Titiunik (2014b) to perform the RD analysis. We use CCT data-driven bandwidth as well as two fixed bandwidth of 100 and 200 manually for robustness. We choose 3^{rd} order polynomial in the analysis. ***, ** and * denote significance at 1%, 5% and 10% respectively.

Panel A *Univariate Analysis of Patent Counts*

	Bandwidth ±50			Bandwidth ±100			Bandwidth ±200	
	Russell 1000		Russell 2000	Russell 1000		Russell 2000	Russell 1000	Russell 2000
Exploratory	0.45	***	0.67	0.51	***	0.66	0.60	0.62
Exploitative	0.10	***	0.17	0.12	***	0.18	0.17	0.16

Panel B *Regression-Discontinuity Coefficients of Patent Counts*

Variable	(1) CCT Exploratory	(2) Manual Exploratory	(3) Manual Exploratory	(4) CCT Exploitative	(5) Manual Exploitative	(6) Manual Exploitative
Bias-corrected	0.280***	0.627***	0.403***	0.109**	0.164**	0.137**
Robust p-value	0.004	0.002	0.005	0.013	0.035	0.017
BW Loc. Poly.	370	100	200	310	100	200

Table 8 **Institutional Ownership, Investment and Innovation: Instrumental Variable Analysis**

This table reports the results of estimating the impacts of institutional investors on investment and innovation using two-stage least square instrumental variable regression.

First Stage: $IO_{i,t} = \alpha + \beta_1 R2000_{i,t} + \beta_2 DIST_{i,t} + \beta_3 R2000_{i,t} * DIST_{i,t} + Controls_{i,t} + \eta_t + \epsilon_{i,t}$

Second Stage: $I_{i,t} = \alpha + \beta_1 \widehat{IO\_P_{i,t-1}} + Controls_{i,t} + \eta_t + \epsilon_{i,t}$

Instrumental variables consist of a dummy variable that equals one if the firm is in the Russell 2000 index (R2000), the distance (DIST) of the firms' index ranking relative to 1001 and the interaction of these two. IO_P is the fitted institutional ownership from first-stage regression. CAPX and R&D are capital expenditures and research and development expenses scaled by beginning-of-the-year total assets. Patents count and citations per patent are the log number of patents and citations per patent, respectively. Definitions of other variables can be found in Appendix B. p-values are reported in the parenthesis. Standard-errors are heteroscedasticity-consistent and are clustered at firm level. ***, ** and * denote significance at 1%, 5% and 10% respectively.

Variable	(1) IOR	(2) CAPX	(3) R&D	(4) Patents Count	(5) Citations per Patent
	First Stage	Second Stage			
R2000	0.270***				
	(0.000)				
R2000*DIST	0.002***				
	(0.000)				
DIST	-0.002***				
	(0.000)				
IO_P		-0.004	0.090***	1.083***	0.980***
		(0.874)	(0.000)	(0.001)	(0.010)
SALE_Q	0.041***	0.174***	0.047***	0.083	0.236**
	(0.003)	(0.000)	(0.000)	(0.297)	(0.014)
ROA	0.152**	0.092**	0.069**	-0.159	-0.103
	(0.024)	(0.010)	(0.010)	(0.636)	(0.794)
CF	-0.074	0.106**	-0.158***	-0.581	-0.467
	(0.314)	(0.011)	(0.000)	(0.146)	(0.247)
LEV	-0.003	0.010	-0.061***	-0.476***	-0.696***
	(0.883)	(0.303)	(0.000)	(0.000)	(0.000)
Constant	0.094***	0.036***	0.013*	0.407***	0.836***
	(0.004)	(0.008)	(0.056)	(0.002)	(0.000)
Year Fixed Effects	Y	Y	Y	Y	Y
Observations	2,512	2,486	2,512	2,422	2,422
Adjusted R2	0.405	0.260	0.156	0.052	0.092

Table 9 **Institutional Ownership, Investment and Innovation: Quasi-Indexer**

This table reports the results of estimating the impacts of institutional investors on investment and innovation using two-stage least square instrumental variable regression for quasi-indexer type institutional investors.

$$\text{First Stage: } IO\_QIX_{i,t} = \alpha + \beta_1 R2000_{i,t} + \beta_2 DIST_{i,t} + \beta_3 R2000_{i,t} * DIST_{i,t} + Controls_{i,t} + \eta_t + \epsilon_{i,t}$$

$$\text{Second Stage: } I_{i,t} = \alpha + \beta_1 \widehat{IO\_QIX\_P}_{i,t-1} + Controls_{i,t} + \eta_t + \epsilon_{i,t}$$

Instrumental variables consist of a dummy variable that equals one if the firm is in the Russell 2000 index (R2000), the distance (DIST) of the firms' index ranking relative to 1001 and the interaction of these two. IO_QIX_P is the fitted quasi-indexer type institutional ownership from first-stage regressions. CAPX and R&D are capital expenditures and research and development expenses scaled by beginning-of-the-year total assets. Patents count and citations per patent are the log number of patents and citations per patent, respectively. Definitions of variables can be found in Appendix B. p-values are reported in the parenthesis. Standard-errors are heteroscedasticity-consistent and are clustered at firm level. ***, ** and * denote significance at 1%, 5% and 10% respectively.

Variable	(1) IOR_QIX	(2) CAPX	(3) R&D	(4) Patents Count	(5) Citations per Patent
	First Stage	Second Stage			
R2000	0.182***				
	(0.000)				
R2000*DIST	0.002***				
	(0.000)				
DIST	-0.002***				
	(0.000)				
IO_QIX_P		-0.007	0.127***	1.599***	1.471***
		(0.868)	(0.000)	(0.001)	(0.009)
SALE_Q	-0.038***	0.174***	0.056***	0.191**	0.334***
	(0.000)	(0.000)	(0.000)	(0.023)	(0.001)
ROA	0.095**	0.092**	0.071***	-0.152	-0.100
	(0.027)	(0.010)	(0.009)	(0.651)	(0.802)
CF	-0.029	0.106**	-0.160***	-0.609	-0.492
	(0.526)	(0.011)	(0.000)	(0.128)	(0.223)
LEV	-0.015	0.010	-0.060***	-0.455***	-0.676***
	(0.260)	(0.308)	(0.000)	(0.000)	(0.000)
Constant	0.051***	0.036***	0.014**	0.411***	0.834***
	(0.006)	(0.008)	(0.034)	(0.002)	(0.000)
Year Fixed Effects	Y	Y	Y	Y	Y
Observations	2,512	2,486	2,512	2,422	2,422
Adjusted R2	0.327	0.260	0.155	0.052	0.092

Table 10 **Investment and Innovation: Firms that Switch Indexes**

This table presents compare changes in investment and innovation of firms that are assigned to a different index compared with its index membership prior year within a 100 bandwidth around the Russell cutoff for index assignment. The data spans from 1984 to 2006. CAPX and R&D are capital expenditures and research and development expenses scaled by beginning-of-the-year total assets. Patents and citations are the log number of patents and citations per patents, respectively. Definitions of variables can be find in Appendix B. ***, ** and * denote the difference is significance at 1%, 5% and 10% respectively.

	Current Year Index					
	Russell 1000		Russell 2000		DID	
		t-stat		t-stat		t-stat
Changes in CAPX	-0.90%	-1.00	-1.35%	-0.69	0.46%	0.24
Changes in R&D	-0.49%	-2.61	0.22%	1.04	-0.71%	-2.49
Changes in Patents	-0.65%	-0.27	2.42%	1.01	-3.08%	-0.90
Changes in Citations	-0.54%	-0.18	3.04%	0.83	-3.58%	-0.75

Table 11 **Institutional Ownership, Investment and Innovation: Placebo Tests**

This table reports the bias-corrected treatment effect coefficient estimates using RD design for corporate investment and innovation around the Russell 1000/2000 indexes using pseudo cutoff. The data spans from 1984 to 2006. CAPX and R&D are capital expenditures and research and development expenses scaled by beginning-of-the-year total assets. Patents and citations are the log number of patents and citations per patent, respectively. Panel A reports results using 951st rank as the pseudo cutoff. Panel B reports results using 1051st rank as the pseudo cutoff. We use the code/methodology of Calonico, Cattaneo and Titiunik (2014b) to perform the RD analysis. We use CCT data-driven bandwidth and 3rd order polynomial fit in the analysis. ***, ** and * denote significance at 1%, 5% and 10% respectively.

Panel A *951st Rank as the Pseudo Cutoff*

	(1)	(2)	(3)	(4)
BW Type	CCT	CCT	CCT	CCT
Variable	CAPX	R&D	Patents	Citation
Bias-corrected Treatment Coefficients	0.012	-0.008	-0.194*	-0.072
Robust p-value	0.162	0.120	0.051	0.519
BW Loc. Poly.	561	506	342	441

Panel B *1051st Rank as the Pseudo Cutoff*

	(1)	(2)	(3)	(4)
BW Type	CCT	CCT	CCT	CCT
Variable	CAPX	R&D	Patents	Citation
Bias-corrected Treatment Coefficients	-0.008	-0.006	-0.065	0.066
Robust p-value	0.362	0.310	0.565	0.529
BW Loc. Poly.	593	402	326	529

Table 12 **Institutional Ownership and Short-Term Pressures**

This table reports the results of estimating the impacts of institutional investors on short-term pressures as measured by earnings response coefficient (ERC).

$$CAR_{i,t} = \alpha + \beta_1 PRE\_ANN\_RET_{i,t} + \beta_2 UNEX_{i,t} + \beta_3 LOSS_{i,t} + \beta_4 LOSS * UNEX_{i,t} + \eta_t + \epsilon_{i,t}$$

The regression is performed on a bandwidth of 100 around the Russell cutoff. Column (1) and (2) report results of Russell 1000 and Russell 2000 firms, respectively. Column (3) combines the two samples in (1) and (2). R2000 is a dummy variable that equals one if the firm belongs to the Russell 2000 index. CAR is the (-1,+1) three-day cumulative abnormal return. PRE_ANN_RET is pre announcement return. UNEX is unexpected earnings. LOSS is a dummy for negative unexpected earnings. Definitions of variables can be found in Appendix B. p-values are reported in the parenthesis. Standard-errors are heteroscedasticity-consistent and are clustered at firm level. ***, ** and * denote significance at 1%, 5% and 10% respectively.

	(1)	(2)	(3)
VARIABLES	CAR	CAR	CAR
	R1000	R2000	Combined
PRE_ANN_RET	-0.035***	-0.074***	-0.054***
	(0.004)	(0.000)	(0.000)
UNEX	1.052***	0.514**	1.070***
	(0.000)	(0.040)	(0.000)
R2000*UNEX			-0.557*
			(0.087)
LOSS	-0.025***	-0.026***	-0.026***
	(0.000)	(0.000)	(0.000)
LOSS*UNEX	-1.139***	-0.547**	-1.166***
	(0.000)	(0.048)	(0.000)
R2000*LOSS*UNEX			0.626*
			(0.081)
R2000			0.002
			(0.137)
Constant	0.008**	0.013***	0.009***
	(0.023)	(0.000)	(0.000)
Year Fixed Effects	Y	Y	Y
Observations	6,979	7,375	14,354
Adjusted R2	0.040	0.045	0.042

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