Volume 22, Number 3 – September 2020
China Accounting and Finance Review
中 国 会 计 与 财 务 研 究
2020 年 9 月 第 22 卷 第 3 期

Do Passive Investors Demand High Earnings Quality? Evidence from a Quasi-Natural Experiment*

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Received 23rd of January 2020 Accepted 12th of June 2020
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Abstract

In this paper, we examine the effect of passive institutional holdings on firms' earnings quality by exploiting the variation in passive ownership around the Russell 1000/2000 index cut-off. Using three sets of earnings quality proxies (properties of earnings, investor responsiveness to earnings, and external indicators of earnings misstatements), we find that passive ownership improves earnings quality. Furthermore, this effect is more pronounced in firms with low active institutional ownership. Finally, we find that firms with higher passive ownership undertake more long-term investments. The last two results provide consistent evidence that passive investors improve earnings quality because they have a long-term investment horizon and only have the option to monitor (as opposed to threaten exit) for good portfolio performance due to their buy-and-hold strategy.

***Keywords*:** Passive Investors, Earnings Quality, Earnings Management

JEL classification: G23, M41

* We thank seminar participants at Rensselaer Polytechnic Institute for their helpful comments. All remaining errors are our own.
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"On many issues, such as governance, we are top-down and we are philosophically trying to find the ways in the governance system and in ***the way companies report*** *to ensure that … the world has* ***the best information*** *to the long-term value."*[4]

- Rodney Comegys, Principal and Head of the Risk Management Group, Vanguard

I. Introduction

Passive institutional ownership has substantially increased over the past decade. For instance, just over a decade ago, funds managed by Vanguard had an ownership stake in just over 20 per cent of firms in the Standard and Poor's (S&P) 500 index. Now, it has a significant ownership stake in almost every company in the S&P 500 index.[5] Today, the big three passive investment firms (BlackRock, Vanguard, and State Street) constitute the largest shareholders in more than 88 per cent of S&P 500 firms (Fichtner *et al.*, 2017). Moreover, over the period 2008 to 2015, investors sold holdings of actively managed funds worth approximately $600 billion while investing roughly $1 trillion in passively managed funds (Bogle, 2016).[6] The substantial rise in passively managed fund assets over the past decade has put the spotlight on passive investors and their influence in portfolio firms. In this spirit, several recent studies have examined the impact of passive ownership on firms' policies and corporate governance (e.g. Boone and White, 2015; Appel *et al.*, 2016; Bird and Karolyi, 2016; Crane *et al.*, 2016; Schmidt and Fahlenbrach, 2017). In this paper, we build on and extend this line of research by examining the impact of passive ownership on corporate earnings quality.

Earnings quality is an essential part of financial accounting information. According to the Statement of Financial Accounting Concepts No. 1 (SFAC No. 1), "financial reporting should provide information about an enterprise's financial performance during a period." This information should be "useful to existing and potential investors, lenders, and other creditors in making decisions about providing resources to the entity" (SFAC No. 8). The demand for such high-quality earnings information has long existed in the capital market as it enables investors to identify good projects, discipline managers, and reduce information asymmetry (Bushman and Smith, 2001). A survey on fund managers, institutional investors, and financial analysts by Gassen and Schwedler (2010) shows that fund managers and financial analysts often rely on firms' accounting data. Additionally, accounting numbers have been extensively

[4] This is the reply that Rodney Comegys gave when Lisa Fairfax, a law professor at George Washington University, asked about the governance view of passive institutional investors at the SEC's Dodd-Frank Investor Advisory Committee meeting. Accessed at https://global.factiva.com/ha/default.aspx#./!?&_suid =154229355504703789136243402693 on 15 November 2018.

[5] Vanguard owns at least 5 per cent of 491 companies in the S&P 500, up from just three firms in 2005 and 116 firms in 2010.

[6] In 2016 alone, passive funds attracted inflows of $429 billion, while actively managed funds saw outflows of $285 billion (Morningstar, 2017).

and explicitly used in executive compensation contracts to mitigate agency conflict.[7] Furthermore, financial accounting information affects firm-level (Bird *et al.*, 2018) as well as economy-level resource allocations (Bushman and Smith, 2001), such as takeovers (Raman *et al.*, 2013), cost of capital (Dechow *et al.*, 1996; Lambert *et al.*, 2007), and auditor choice (DeFond and Subramanyam, 1998). Despite its importance and the call for higher earnings quality from both investors and regulators, evidence exists that managers opportunistically manipulate earnings (due to the separation of ownership and control) to window dress financial statements prior to equity offerings (Teoh *et al.*, 1998a, 1998b), increase their own compensation and job security (Healy, 1985; Baker *et al.*, 2003), and avoid violating lending contracts (DeFond and Jiambalvo, 1994). To this end, investors who can play a role in monitoring the management or exert pressure through the threat of exit can deter managers from providing poor earnings quality.

However, not all investors are equally willing or have the capability to monitor or exert pressure through the threat of exit. Passive institutional investors are one such class of investors who are traditionally viewed to have little or no incentive to intervene and hold management accountable for any wrongdoing. This outlook stems from their buy-and-hold investment strategy that restricts them from buying and selling assets to profit from short-term stock price swings. In support of this view, extant literature has found that passive investors do not have much discretion to voice their viewpoint or to effectively utilise the threat of exit. Consistent with this notion, Schmidt and Fahlenbrach (2017) document an increase in CEO power following an increase in passive institutional ownership. Furthermore, because passive investors hold a widely diversified portfolio, they may have insufficient resources to monitor each firm in their portfolio.[8] To the extent that an increase in passive ownership reduces the degree of monitoring and to the extent that CEO power increases the likelihood of earnings management (Cornett *et al.*, 2008), an increase in passive ownership could reduce earnings quality.

In contrast, as highlighted by the opening quote, passive institutional investors may care about earnings quality and could, therefore, pressure firms to provide high-quality earnings for the following reasons.[9] First, as passive funds replicate or benchmark the performance of a specific index and are not trying to beat the market by profiting from short-term price swings, they are less likely to divest their positions unless the company is excluded from the index. This is because their decision to trade stocks is often directed by broader fund flows and larger rebalances and not typically by firm-specific fundamentals. This means that passive investors

[7] For instance, 161 of the 177 publicly traded companies surveyed in Murphy (1999) explicitly use at least one measure of accounting profits in their annual executive bonus plan.

[8] For example, BlackRock only has about two dozen people overseeing its 14,000 invested companies, Vanguard has 15 people for its 13,000 firms, and State Street has fewer than 10 people for about 9,000 companies (Krouse *et al.*, 2016).

[9] BlackRock (2017) confirms that company reporting helps shareholders assess whether their economic interests have been protected.

are likely to hold stocks long term and thus have less incentive to pressure managers to have a short-term focus (Bushee, 2001), such as managing earnings (Koh, 2007).[10] Second, unlike a typical investor who often faces the choice of either exerting effort to monitor for shared gain or simply trading the stock for private gain,[11] passive investors are only left with the choice to monitor for profit due to their buy-and-hold strategy (Fisch *et al.*, 2020). Furthermore, unlike a typical institutional investor who has sufficient resources to procure the private information of a few invested firms, passive investors rely on public information to monitor firms (Bushee and Noe, 2000).[12]

Although passive investors cannot vote with their feet and/or sell underperforming stocks, shareholders who invest in these funds can. This is accomplished by selling their shares in underperforming funds and pocketing the net asset value of their ownership interest. This exit option implies that passive funds compete for investors not only with other passive funds that track the same index but also with actively managed funds. For example, The Philadelphia Inquirer has reported that Vanguard is winning the competition for shareholders partly because of its index fund performance.[13] On its company website, Vanguard compares its index funds' performance to its peer group, stating that "84% of our index mutual funds and ETFs have performed better than their peer-group averages over the last 10 years."[14] Money.com has also reported that passive funds compete for shareholders with active funds. It states that "during the past 10 years, investors yanked about $1.4 trillion from active U.S. stock funds, with most of the money - $1.3 trillion - going to passive funds, according to Morningstar."[15] Thus, failure to outperform other passive funds tracking the same index and to actively manage funds on a cost-adjusted basis could lead to an investor exodus and thus a reduction in assets under management (Fisch *et al.*, 2020; Cremers *et al.*, 2016).

Furthermore, unlike passive managers, active fund managers can generate substantial alpha on a cost-adjusted basis by picking stocks to beat the market from short-term price swings. The inability of passive fund managers to pick stocks and the possibility of a fund investors' exodus in favour of actively managed alternatives imply that passive managers have the incentive to reduce the relative advantage of actively managed funds by monitoring the portfolio firms to reduce the incidence of mispricing (Fisch *et al.*, 2020). One such way is to improve the financial reporting quality of their portfolio companies.

Extant literature has examined the role of passive ownership on earnings quality but offers mixed results. The literature has documented no relation (Bushee, 1998), a positive

[10] For example, the California Public Employees' Retirement System (CalPERS), a passive institutional investor, held 98 per cent of its portfolio companies for at least 2 years in 2001 (Bushee, 2004).
[11] See Shleifer and Vishny (1986), Maug (1998), Kahn and Winton (1998), and Chen *et al.* (2007).
[12] For example, Smith (1996) reports that CalPERS uses "screens" based on public data to choose which of its portfolio firms to target for governance improvement.
[13] https://www.inquirer.com/business/vanguard-jack-bogle-passive-active-mutual-fund-etf-20190527.html
[14] https://investor.vanguard.com/index-funds/
[15] https://money.com/index-funds-assets-top-active/

relation (Baig *et al.*, 2018), and a negative relation (DeLisle *et al.*, 2017) between passive ownership and earnings quality.[16] These conflicting findings in prior studies could be due to the omission of key variables and/or passive ownership being correlated with confounding factors, such as active ownership, that directly affect earnings quality (Appel *et al.*, 2016). To circumvent these issues and shed light on the important relationship between passive ownership and earnings quality, we explore the quasi-natural experiment resulting from the annual reconstitution of the Russell 1000 and 2000 indices. For the reasons mentioned below, we are cautiously confident that this setting alleviates the endogeneity concern and helps establish causality.

The Russell 1000 and 2000 indices constitute the largest set of publicly listed US companies and serve as an important benchmark for passive institutional investments in firms. The Russell 1000 index consists of the largest 1,000 firms, while the Russell 2000 index comprises the 2,000 next largest firms. The composition of both indices is revised once every year. Since the index portfolio weights are value-weighted, stocks at the top of the Russell 2000 receive significantly higher weights than stocks at the bottom of the Russell 1000, even though they have similar market capitalisation (see Figures 1 and 2). This has a significant impact on the extent of passive ownership due to passive investors' benchmarking strategy to mimic the respective indices. Our empirical analysis confirms that there exists a significant jump in passive investor holdings at the top of the Russell 2000 relative to firms at the bottom of the Russell 1000 (see Figure 3). We exploit this difference in passive institutional holdings in our empirical tests.

We assess the impact of passive ownership on earnings quality in an instrumental variable (IV) estimation, where we instrument for passive ownership with an indicator of a stock's assignment to the Russell 2000 (instead of the Russell 1000) in a given year. A similar identification methodology with the same setting of Russell indices is used in Appel *et al.* (2016). In doing so, we focus on a narrow bandwidth of firms around the Russell 1000 and Russell 2000 cut-off threshold. The validity of our identification hinges on the exclusion assumption that firms close to the Russell 1000/2000 threshold are similar, thus assignment to the Russell 2000 does not directly affect earnings quality except through its impact on passive ownership. We argue that this assumption is reasonable because the variation in passive ownership in those firms is plausibly exogenous after controlling for their market capitalisation that determines index assignment and index weights.[17] We provide more supportive details in Section III.

Using the instrumented value of passive ownership from the first-stage regression, we

[16] Note that Bushee (1998) studies the manipulation in investment in research and development expenses to manage earnings, Baig *et al.* (2018) study earnings manipulation, and DeLisle *et al.* (2017) study earnings predictability. Although these three papers examine different properties of earnings, they all fall under the category of earnings quality in Dechow *et al.* (2010), which we use for empirical tests in our paper.

[17] We are not aware of any theoretical or empirical research papers showing that inclusion in the Russell indices affects firms' earnings quality.

investigate the impact of passive investors on earnings quality. In an attempt to provide a comprehensive picture, we use three proxies of earnings quality as categorised in Dechow *et al.* (2010). The first set relates to the properties of earnings, including discretionary accruals, timely loss recognition, and target beating. The second set pertains to investor responsiveness to earnings using the earnings response coefficient (ERC) as the proxy. The third set captures external indicators of earnings misstatements, such as the presence of misstatements.

We find that, on all three fronts, the earnings quality of firms at the top of the Russell 2000 is significantly higher than that of the bottom firms in the Russell 1000. For instance, we find that a one standard deviation increase in passive ownership is associated with a 0.314 standard deviation decrease in accruals management, a 0.023 standard deviation increase in timely loss recognition, and a 0.438 (0.717) standard deviation decrease in the instances of meeting or beating earnings (expectations management), respectively. Our results are robust to alternative specifications, such as the use of broader or narrower bandwidths, higher-order polynomials of market capitalisation, alternative definitions of passive investors, and numerous other robustness checks.

We conjecture that passive investors improve earning quality because they hold stocks long term. If true, we expect that such long-termism affects firms' long-term investments as well. We empirically test this conjecture and find that firms with higher passive ownership have higher capital expenditure and R&D expenses. This is consistent with the notion that passive investors have long-term profits in mind and, thus, put less pressure on firms to manage earnings for short-term benefits.

In addition, passive investors may strategically invest in monitoring efforts as they are likely to have insufficient resources to monitor every portfolio firms. The effect of passive ownership on earnings quality may be more salient when other shareholders do not actively monitor (Iliev *et al.*, 2020). We conduct a formal test to investigate this issue. Specifically, we divide our sample into firms with high and low active ownership on the basis of the sample median of active institutional ownership and repeat our main regressions with the interaction term. We continue to find that an exogenous increase in passive ownership due to Russell index reconstitution has a positive effect on earnings quality, with the effect being more pronounced for firms with low active ownership. This finding is consistent with the notion that passive investors strategically monitor firms on the basis of the monitoring effect of other investors. This is consistent with our monitoring conjecture.

Our paper contributes mainly to two strands of literature. First, it extends the literature examining the effect of passive ownership on earnings quality. As stated above, prior research has produced mixed and thus inconclusive results (e.g. Bushee, 1998; Baig *et al.*, 2018; DeLisle *et al.*, 2017). The conflicting results documented in these papers could be due to endogeneity and/or the particular earnings quality measure chosen. In this paper, we try to shed more light on this important question by relying on a cleaner identification strategy. We

do this by exploiting the annual Russell index reconstitution as a quasi-natural experiment to establish causality. In addition, we use a more comprehensive set of proxies for earnings quality. Our findings suggest that passive ownership has a positive effect on firms' earnings quality.

Second, our paper builds on the literature that examines the monitoring role of passive investors. The extant literature documents mixed results. For example, Appel *et al.* (2016) find that passive investors actively monitor firms, while Schmidt and Fahlenbrach (2017) document that the rise of passive investors enables CEOs to increase their power and thus puts them in a better position to advance their personal interests. In contrast, we contribute to this debate from an earnings quality perspective since higher quality of earnings is a manifestation as well as an outcome of an effective governance mechanism.[18] Prior studies (e.g. Bushman and Smith, 2001) argue that accounting reporting not only plays a crucial role in the corporate governance process but is also the vital component of this process. Our finding that higher passive ownership improves earnings quality in passive investors' portfolio firms suggests that passive investors ameliorate at least one dimension of corporate governance.

Our paper is also related to the spate of recent studies that exploit Russell reconstitution. This literature builds on the seminal work of Shleifer (1986) on the addition of stocks to the S&P 500 index. Recent studies have been focusing on the price impact of addition to/deletion from an index (Chang *et al.*, 2015), and the effect of institutional ownership on the information environment (Boone and White, 2015; Bird and Karolyi, 2016), corporate governance (Appel *et al.*, 2016), and corporate decisions (Crane *et al.*, 2016). We extend this setting to earnings quality, an essential and important part of the financial reporting system. Our paper is particularly both complementary to and different from Boone and White (2015) and Bird and Karolyi (2016). Both of those studies focus on studying the effect of passive ownership on disclosure. Although both disclosure and earnings quality constitute the information environment of a firm to its investors, they do not necessarily have a predictable correlation (Francis *et al.*, 2008). Recent studies (e.g. Abramova *et al.*, 2020) document that managers sometimes increase the level of disclosure but with no intention to improve information quality. Thus, our paper complements these studies by investigating disclosure from an earnings quality perspective.

The rest of our paper is organised as follows. Section II discusses our data and variable definitions, and Section III outlines our research design and identification strategy. Section IV discusses the results of our empirical tests, while Section V presents the test results of our underlying conjectures. Section VI reports the results of various robustness checks. Concluding remarks are presented in Section VII.

[18] For example, the Sarbanes-Oxley Act of 2002 was intended to improve corporate governance through an improvement in accounting quality (better financial reporting and disclosure).

II. Data and Description of Variables

2.1 Data

We draw data from a variety of sources. We obtain data on Russell index constituents, index weights, and proprietary float-adjusted market capitalisation measures from Russell Investments. We start the sample period from 1998 because Russell makes its proprietary end-of-June float-adjusted market capitalisation of index constituents available only from that year.[19] We end our sample in 2006 because starting with its 2007 reconstitution, Russell implemented a banding methodology that was intended to mitigate index turnover but also made index assignment not dependent solely on end-of-May market capitalisation. This would invalidate the use of Russell index assignment as an instrument for passive investor holdings.

Data on institutional holdings are obtained from the Thomson Reuters Institutional (13F) Holdings database. Firm-level accounting data are obtained from COMPUSTAT, while stock price and return data for all available firms are obtained from the Center for Research in Security Prices (CRSP). Data on earnings forecasts and actual earnings are obtained from I/B/E/S. Restatement data are from Audit Analytics. In some of our tests, we also use other auxiliary data sources, which we mention when describing the respective tests below. Next, we describe our main variables.

2.2 Passive Investors

In our baseline regressions, we follow Bushee (2001) and define passive investors as institutions classified as quasi-indexers. Bushee (2001) implements factor and cluster analyses to classify institutional investors as quasi-indexers on the basis of their past investment behaviour if they have low turnover but diversified holdings (e.g. Vanguard). Passive institutional ownership is then computed as the fraction of market capitalisation for stock i owned by quasi-indexers at the end of September of year t. We also employ an alternative definition of passive investors based on Appel *et al.* (2016).[20] Specifically, we classify a fund as passive if either the CRSP Mutual Fund Database classifies the fund as an index fund or its fund name contains a string that identifies it as an index fund.[21] In untabulated results, we further refine this definition of passive investors by only looking at the ownership stake of Vanguard, State Street, and Barclays Bank (iShares), which were the three largest passive institutions during the period 1998 to 2006.[22]

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[19] Some papers (e.g. Boone and White, 2015) use the Russell index setting with samples starting from the year before 1998 because they do not control for float-adjusted market capitalisation.

[20] Results using this definition of passive investors are available in the Internet Appendix.

[21] Similar to Appel *et al.* (2016), the index funds are identified by the following strings: "Index, Idx, Indx, Ind_(where _ indicates a space), Russell, S & P, S and P, S&P, SandP, SP, DOW, Dow, DJ, MSCI, Bloomberg, KBW, NASDAQ, NYSE, STOXX, FTSE, Wilshire, Morningstar, 100, 400, 500, 600, 900, 1000, 1500, 2000, and 5000."

[22] iShares was acquired by BlackRock in 2009 and made BlackRock one of the three largest passive institutions.

2.3 Measures of Earnings Quality

In order to gain a comprehensive understanding of passive institutions' impact on earnings quality, we measure earnings quality using three sets of proxies from Dechow *et al.* (2010). The first set relates to the properties of earnings, including discretionary accruals, timely loss recognition, and target beating. The second set pertains to investor responsiveness to earnings, such as the ERC. The third set includes external indicators of earnings misstatements, such as the presence of misstatements. A detailed definition of each measure can be found in the Appendix. We choose these proxies because they should be of interest to passive investors. Discretionary accruals identify abnormal accruals adjustment beyond firms' fundamentals. It directly captures earnings management problems. Thus, it should be of importance to passive investors if they are concerned about managerial earnings manipulation and therefore low-quality earnings. Similarly, timely loss recognition captures whether or not firms recognise losses in a timely manner. Thus, it provides a means to produce a "decision-useful" number (Dechow *et al.*, 2010). For example, timely loss recognition can provide passive investors with timely information to facilitate their monitoring if they do in fact monitor. Next, target beating measures firms' intention to manage earnings just to beat analysts' forecasts. Passive investors may exert a different influence in such firms because their benchmark strategy makes them hold firms long term, which in turn alleviates the short-term pressure on managers to meet/beat analysts' forecasts. Finally, the ERC is a proxy for earnings informativeness that measures investor responsiveness to earnings. This is relevant to passive investors because they rely on public disclosure for information (Bushee and Noe, 2000). Earnings informativeness is a direct measure of the usefulness of earnings information to investors (Liu and Thomas, 2000). The presence of misstatements identifies firms with earnings quality problems. It is less likely to misidentify firms with low-quality earnings than earnings-based measures (Dechow *et al.*, 2010). Thus, it is a good complementary measure to earnings-based measures.[23]

We also employ additional firm-specific control variables, which we will define in later sections. Before conducting the empirical analyses, we winsorise all continuous variables at the 1st and 99th percentiles to curtail the impact of outliers on our findings.

III. Russell Index Construction and Identification Strategy

3.1 Construction of Russell Indices

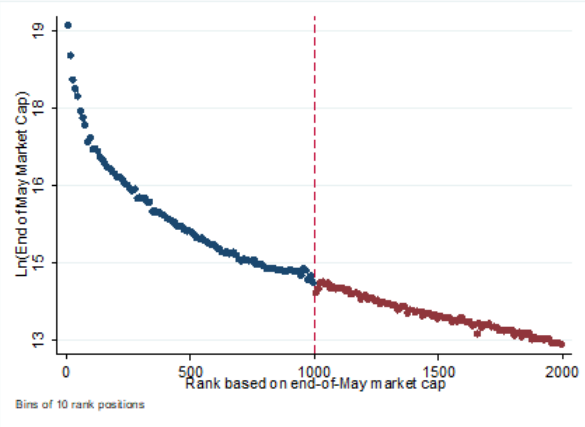
Russell indices are constructed using a market capitalisation-based methodology. As of May 2018, "$8.6 trillion in assets [were] benchmarked to the Russell indexes … covering 98%

[23] Dechow *et al.* (2010) also talk about the limitation of each earnings quality proxy and the assumption of the models. Please refer to their paper for details.

of investable global equity, making them more representative of the market."[24] The broadest US index is the Russell 3000 index, which contains the largest 3,000 US companies. Firms comprising the Russell 3000 index and its subsets are determined each year. Russell Investments ranks all eligible exchange-listed US common stocks by their proprietary market capitalisations, which are calculated using their last trading price on the last trading day in May.[25] The largest 1,000 firms comprise the Russell 1000, while the remaining 2,000 firms form the Russell 2000 index. Therefore, firms around the cut-off of the Russell 1000 and Russell 2000 exhibit a local continuity of their end-of-May market capitalisation. This fact holds true until the 2007 reconstitution, when Russell initiated a "banding" policy to mitigate index turnover. Under this banding policy, firms that were in the Russell 1000 (Russell 2000) in the previous year but are currently ranked below (above) the end-of-May breakpoint between the Russell 1000 and the Russell 2000 need not be slated to be moved to the Russell 2000 (Russell 1000). The switch happens only if an index constituent's market capitalisation deviates significantly enough from the cut-off threshold. Therefore, we end our sample period in 2006. As Russell Investments uses its proprietary end-of-May market capitalisation to rank firms, we use market capitalisation obtained from CRSP for our study. Figure 1 shows that the ranking is mostly smooth using data from CRSP.

Figure 1

This figure presents the average end-of-May market capitalisation (obtained from CRSP) for 1,000 firms on each side of the index cut-off for the time period 1998 to 2006. The ranking of firms is centred on the cut-off between the Russell 1000 and Russell 2000 indices. Firms to the left of this cut-off belong to the Russell 1000 index, while firms to the right belong to the Russell 2000 index. Each dot represents an average market capitalisation calculated using bins of 10 firms in the sample. Firms are assigned to the Russell 1000 or 2000 on the basis of the market capitalisation of the firm at the end of the last trading day in May.



[24] Russell US Equity Indexes (May 2018), accessed from http://www.ftse.com/products/downloads/Russell-US-indexes.pdf

[25] Companies with a total market capitalisation of less than $30 million or companies with 5% or less shares available in the marketplace are not eligible for inclusion in the Russell indices. Furthermore, a stock with a closing price below $1 on its primary exchange on the last trading day in May is also excluded if the average daily closing price from its primary exchange during May is less than $1.

Once the index membership is defined, index constituents will remain in their respective indices for the next full year except in special circumstances.[26] Annual reconstitution occurs on the last Friday in June. During the reconstitution, Russell Investments determines each index constituent's weight within the index using its proprietary float-adjusted market capitalisation as of the end of June. The free float adjustment excludes shares that are unavailable for purchase by adjusting for unlisted share classes, IPO lock-ups, employee stock ownership plan (ESOP) or leverage employee stock ownership plan (LESOP) shares, shares held by large corporate and private holdings, and government holdings. This adjustment does not affect index membership, and the ranking of stocks based on index weights could be (and often is) different from the ranking based on the end-of-May market capitalisation that determines the index assignment.

Since weights assigned to stocks in each Russell index are value weighted, we expect to observe a large discontinuity in index weights around the Russell index cut-off point. This is because stocks that narrowly missed being included in the Russell 1000 will be compared to other small stocks in the Russell 2000 index, while stocks that barely made it into the Russell 1000 will be compared to relatively larger firms in the Russell 1000. Therefore, firms in the lower tail of the Russell 1000 will be assigned smallest index weights, while firms at the top of the Russell 2000 will be given largest weights. This is apparent in Figure 2. Over our sample period of 1998 to 2006, the average index weight for the top 10 firms in the Russell 2000 is 0.2%, while the mean index weight for the bottom 10 firms in the Russell 1000 is 0.003%. As is obvious from Figure 2, the difference in index weights persists over a wider range of stocks around the index cut-off point (although declining in magnitude).

This difference in index weights around the index cut-off point has significant implications for passive institutional ownership. In particular, we expect to see substantially greater ownership by passive funds in stocks at the top of the Russell 2000 than in stocks at the bottom of the Russell 2000 for the following reason: Since passively managed funds seek to minimise tracking error, their holding weights will closely mimic the index weights of the respective indices. To the extent that the exclusion of stocks with small index weights has little to no real impact on performance metrics and the reduction in tracking error is lower than the transaction costs of trading stocks with small index weights (Roll, 1992; Frino and Gallagher, 2001), passive funds will hold stocks at the top of the index and exclude (or hold little) stocks at the bottom of the index. Consequently, passive investors will buy significantly more stocks at the top of the Russell 2000 (compared to stocks at the bottom of the Russell 1000) in response to fund flows.

[26] During the next 12 months, stocks are deleted from an index if the related firms have Chapter 7 bankruptcy filings, get delisted, or are acquired, while firms that have had an IPO or been spun-off are added based on the market capitalisation break of the most recent reconstitution.

Figure 2

This figure presents the average index weights for 1,000 firms on each side of the index cut-off for the time period 1998 to 2006. The ranking of firms (based on Russell-determined proprietary float-adjusted market capitalisation) is centred on the cut-off between the Russell 1000 and Russell 2000 indices. Firms to the left of this cut-off belong to the Russell 1000 index, while firms to the right belong to the Russell 2000 index. Each dot represents an average weight calculated using bins of 10 firms in the sample. Firms are assigned to the Russell 1000 or 2000 on the basis of the market capitalisation of the firm at the end of the last trading day in May. Index weights are determined by using Russell's proprietary float-adjusted market capitalisation measure within each index during annual reconstitution.

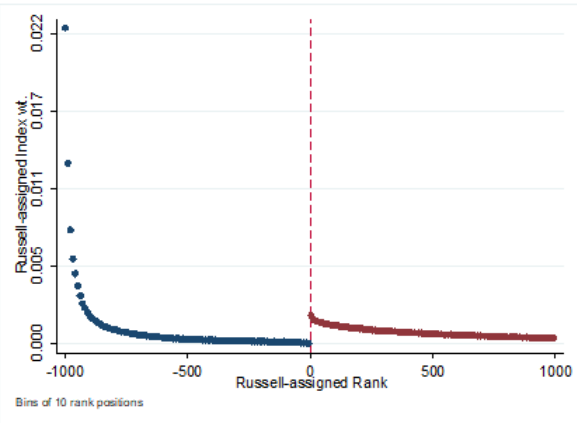


Figure 3.1 illustrates the impact of Russell index assignment on passive investor holdings. The sample includes 1,000 firms on either side of the Russell index cut-off point during the period 1998 to 2006. We sort these stocks on the basis of their end-of-May market capitalisation, obtained from CRSP, and then plot the average end-of-September (one quarter following the index reconstitution) passive investor holdings (average is calculated using bins of 10 firms).[27] Consistent with the index assignment having a significant impact on passive ownership, we see a distinct jump in passive ownership around the cut-off point of the Russell indices. In contrast, Figure 3.2 shows an absence of a significant jump in active investor ownership due to the Russell index assignment.

Figure 3

The graph in this section presents the passive and active investor ownership for 1,000 firms on each side of the index cut-off for the time period 1998 to 2006. We use the 13F institutional holdings data from Thomson Reuters to compute passive ownership. Specifically, passive investor ownership is the total holdings by institutions classified as quasi-indexers by Bushee (2001) in a stock as a percentage of its market capitalisation. Active investor ownership is the total holdings by institutions classified as dedicated by Bushee (2001) in a stock as a percentage of its market capitalisation. Firms to the left of the cut-off are in the Russell 1000 index, while firms to the right of the cut-off are in the Russell 2000 index. The firms' ranks are based on end-of-May market capitalisation (obtained from CRSP). Each dot represents an average ownership calculated using bins of 10 firms in the sample. Ownership is measured one quarter after the Russell indices are reconstituted and is winsorised at the 1st and 99th percentiles to mitigate the effects of outliers.

[27] We find a similar jump in passive investor holdings during the two-quarter and three-quarter time periods following index reconstitution, which suggests that the jump in passive holdings is persistent over time in the year following reconstitution (results not shown for brevity but are available upon request).

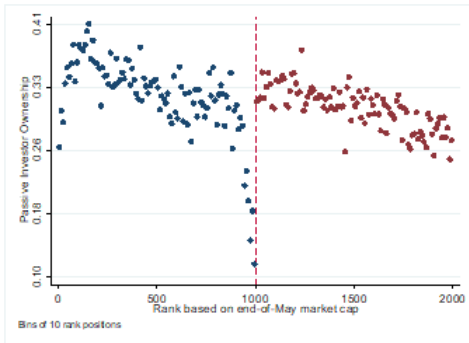


Figure 3.1

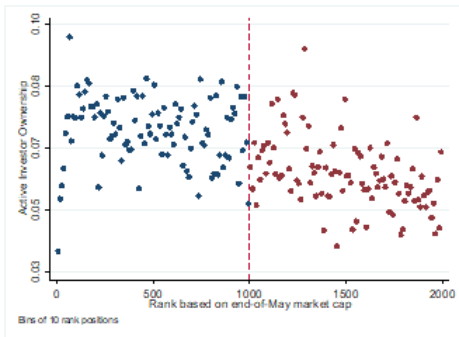


Figure 3.2

Table 1 Panel A presents summary statistics for various characteristics of firms across the Russell index cut-off point. As noted previously, our sample spans 1998 to 2006 and our baseline regressions focus on a bandwidth of 250 firms on either side of the Russell index cut-off point.[28] After removing observations with missing passive ownership and primary earnings quality data, our final sample consists of 3,791 observations. The average passive ownership is 34.3 per cent. The mean (median) value of discretionary accruals (*ACCRUALS*) is 0.022 (0.019). There is approximately half a quarter with non-negative earnings surprise and negative net revision in analysts' forecasts of earnings for the quarter (*MBE*). About 16 per cent of firm-year observations have misstatements, and about 10 per cent have irregularities. Irregularities are more severe misstatements that are more likely to be intentional by managers (Hennes *et al.*, 2008).

Panel B presents summary statistics for two subsamples of firms on each side of the Russell index cut-off point. As shown in the table, on average, firms at the top of the Russell 2000 have 5 per cent more passive ownership than firms at the bottom of the Russell 1000, and this is statistically significant. In addition, because of the way that both indices are constructed, both end-of-May market cap and float-adjusted market cap are higher for firms

[28] There is a trade-off in selecting higher bandwidths. On the one hand, it will increase the number of observations and thus increase statistical power. On the other hand, it will lower the accuracy (increase bias). However, we do implement different bandwidths as robustness tests. More detail on this is presented in the next section.

at the top of the Russell 2000 than for firms at the bottom of the Russell 1000. Furthermore, the proxies for (low) earnings quality—*ACCRUALS, MBE, EXPECT MGMT, Misstate,* and *Irreg*—are all lower for firms at the top of the Russell 2000 than for firms at the bottom of the Russell 1000. This provides us with preliminary evidence that passive ownership is positively associated with earnings quality. Lastly, the two long-term investment proxies, *CAPEX* and *R&D*, are both higher for firms at the top of the Russell 2000 than for firms at the bottom of the Russell 1000. This indicates that passive ownership is positively associated with long-term investment, corroborating our conjecture that passive investors are long-term investors.

Table 1 Summary Statistics

This table presents the baseline summary statistics for a bandwidth of 250 firms on each side of the cut-off between the Russell 1000 and 2000 indices. Firms to the left of the cut-off are at the bottom of the Russell 1000 index, while firms to the right of the cut-off are at the top of the Russell 2000 index. The sample spans the period 1998 to 2006. Panel A presents summary statistics for the full sample, and Panel B presents summary statistics for two subsamples of firms on each side of the cut-off point. Definitions for all variables are provided in the Appendix. All continuous variables are winsorised at the 1st and 99th percentiles.

Panel A

	N	Mean	SD	Median
PASSIVE_OWN	3,791	0.343	0.241	0.316
ACCRUALS	3,791	0.022	0.106	0.019
MBE	3,208	0.407	0.640	0.000
EXPECT MGMT	3,208	1.206	0.925	1.000
Misstate	3,791	0.162	0.369	0.000
Irreg	3,791	0.098	0.298	0.000
CAPEX	3,791	0.002	0.008	0.001
R&D	3,791	0.033	0.078	0.000

Panel B

	Russell 1000		Russell 2000		Difference (t-test
	N	Mean	N	Mean	significance)
PASSIVE_OWN	1,921	0.32	1,870	0.37	-0.05***
LN(FLOAT)	1,921	20.99	1,870	20.87	0.12***
LN(MAY MCAP)	1,921	14.39	1,870	13.99	0.40***
ACCRUALS	1,921	0.03	1,870	0.02	0.01*
MBE	1,619	0.45	1,589	0.37	0.08***
EXPECT MGMT	1,619	1.26	1,589	1.14	0.12***
Misstate	1,921	0.17	1,870	0.15	0.02
Irreg	1,921	0.11	1,870	0.09	0.02***
CAPEX	1,921	0.002	1,870	0.003	-0.001***
R&D	1,921	0.03	1,870	0.04	-0.01***

3.2 Identification Strategy

As highlighted above, Russell Investments computes index weights using end-of-June

market capitalisations that are float adjusted, but the index constituents are determined by the end-of-May float-unadjusted market capitalisation. The best empirical identification thus cannot ideally utilise the regression discontinuity design (RDD) set-up because one critical identification assumption in RDD is local continuity: conditional on the forcing variable, all potential outcome variables are continuous at the threshold of the forcing variable (Angrist and Pischke, 2009; Lee and Lemieux, 2010; Roberts and Whited, 2013). Since there is a discontinuity of float-adjusted market capitalisation and other variables at the threshold, it violates the local continuity assumption of RDD.[29]

Following Appel *et al.* (2016), we implement a two-stage least squares (2SLS) regression whereby the first stage involves estimating the effect of Russell index reconstitution on passive institutional ownership. The second stage analyses the effect of the predicated passive institutional holdings, obtained from the first stage, on firms' earnings quality. Specifically, our first stage multivariate regression has the following specification:

$$PASSIVE\_OWN_{it} = \alpha + \beta\ R2000_{it} + \sum_{n=1}^{N} \gamma_n (LN(MAY\ \ MCAP)_{it})^n + \theta LN(FLOAT)_{it} + \delta_t + \varepsilon_{it} \quad (1)$$

Here, $PASSIVE\_OWN_{it}$ is the percentage of a firm's shares held by passive institutions at the end of the first quarter of the reconstitution year t (e.g. end of September) scaled by its sample standard deviation. $R2000_{it}$ is an indicator variable that equals one if firm i is included in the Russell 2000 for reconstitution year t and zero otherwise. $LN(MAY\ MCAP)_{it}$ is the natural logarithm of the end-of-May CRSP market capitalisation of stock i in year t. $LN(FLOAT)_{it}$ is the natural logarithm of the float-adjusted end-of-June market capitalisation of firm i in year t (data for this are provided by Russell Investments). We control for end-of-May market capitalisation because it determines index assignment and can also affect passive ownership for reasons other than index assignment. Because Russell Investments does not provide its proprietary end-of-May market capitalisation data, we use CRSP end-of-May market capitalisation as in Appel *et al.* (2016). We also control for Russell's proprietary float-adjusted end-of-June market capitalisation because it directly affects passive ownership through the channel of index weights. We also control for year fixed effects δ_t to mitigate the concern that our results are driven by the yearly upward trend in passive ownership.[30] The standard errors are clustered at the firm level.

In the second stage, we explicitly test our prediction using the following multivariable regression specification:

$$Y_{it} = \tau + \sigma\ \widehat{PASSIVE\_OWN}_{it} + \sum_{n=1}^{N} \rho_n (LN(MAY\ \ MCAP)_{it})^n + \varphi LN(FLOAT)_{it} + \delta_t + \omega_{it} \quad (2)$$

[29] For more on this, please see Appel *et al.* (2016).
[30] Our results are robust if we control for industry fixed effects as well.

Here, Y_{it} is a series of proxies for earnings quality for firm i in the reconstitution year t (i.e. the period from 1 July in year t to the end of the following June). $\widehat{PASSIVE\_OWN}_{it}$ is the instrumented passive institutional ownership of firm i from the first stage. In our baseline regression, we use a bandwidth of 250 firms on either side of the Russell index cut-off and the first-order polynomial (n=1). As a robustness check, we use a bandwidth of 400[31] and a polynomial order of n (for brevity, we only report results for n=3).[32] Unless otherwise mentioned, we scale all continuous variables by their sample standard deviation so that the coefficients can be interpreted as the standard deviation difference in Y_{it} for a one standard deviation increase in $\widehat{PASSIVE\_OWN}_{it}$.

The validity of our methodology hinges on the fact that the exogenous shock to passive institutional holdings is driven only by inclusion in the Russell 1000 or 2000 indices and not by differences in firms' policy choices. In the previous section, we presented arguments in support of the relevance condition that inclusion in the top of the Russell 2000 (as opposed to the bottom of the Russell 1000) is associated with higher passive institutional ownership. We further verify this in the first-stage regression (Table 2). In our baseline regression with a bandwidth of 250 firms around the cut-off point and a first-order polynomial on end-of-May market capitalisation, we find that the difference in passive institutional holdings in firms at the top of the Russell 2000 (versus firms at the bottom of the Russell 1000) is statistically significant. The results are robust to wider bandwidths and higher order polynomials (for brevity, we only show results for a bandwidth of 400 and a polynomial order of 3). In order to check whether our instrument is weak, we calculate both the Cragg-Donald Wald F statistic and the Kleibergen-Paap rk Wald F statistic. For tests corresponding to a bandwidth of 250, the Cragg-Donald Wald F statistic is 12.07 and the Kleibergen-Paap rk Wald F statistic is 16.52.[33] For tests with a bandwidth of 400, the Cragg-Donald Wald F statistic is 33.58 and the Kleibergen-Paap rk Wald F statistic is 9.33. Thus, our IV tests pass weak instrument checks.

Table 2 Russell index reconstitution and passive ownership

This table presents estimates of the first-stage regression of passive ownership on an indicator of index assignment into the Russell 2000 index. Specifically,

$$PASSIVE\_OWN_{it} = \alpha + \beta\ R2000_{it} + \sum_{n=1}^{N} \gamma_n (LN(MAY\ MCAP)_{it})^n + \theta LN(FLOAT)_{it} + \delta_t + \varepsilon_{it,}$$

where *R2000* is an indicator variable that takes a value of one if the firm is in the Russell 2000 index after reconstitution. The firms' ranks are based on end-of-May market capitalisation (obtained from CRSP). The sample in each year is restricted to a bandwidth (indicated at the bottom of the table) on each side of the index cut-off threshold. Variable definitions are provided in the Appendix. For brevity, we only tabulate β. The model is estimated over the period 1998–2006. Standard errors are clustered at the firm level and are reported in parentheses. *, **, and *** indicate significance better than 10%, 5%, and 1%, respectively.

[31] Our results are robust for a bandwidth of 100.

[32] We include higher-order polynomials to account for any non-linearity in the size of the firm.

[33] Note that an F-value over 10 is typically considered as a sign of a strong instrument (Cameron and Trivedi, 2005).

	(1)	(2)	(3)
Dependent variable:	***PASSIVE_OWN***	***PASSIVE_OWN***	***PASSIVE_OWN***
R2000	0.102***	0.058***	0.161***
	(0.025)	(0.008)	(0.053)
Observations	3791	3791	6119
Adjusted R^2	0.381	0.388	0.362
Bandwidth	250	250	400
Polynomial order (N)	1	3	1
Controls	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes

We now provide reasons in support of the exclusion assumption of our IV estimation. First, firms around the Russell 1000/2000 indices cut-off point are similar in firm fundamentals except for the small difference in market capitalisation at a single point in time at the end of May. Second, the fact that the Russell indices are constructed using an open, published, market capitalisation-based methodology makes them transparent and the assignment procedure a sole function of stock market capitalisation.[34] Thus, reverse causality is unlikely to be of concern. Third, it is also highly unlikely that firms self-select into the Russell 1000 and Russell 2000 indices.[35] As pointed out by Chang *et al.* (2015) and Crane *et al.* (2016), there is no incentive for hedge funds to manipulate when there is a price impact of trading. Furthermore, firms cannot precisely control their ranking around the time Russell Investments reorganises the index (end of May), especially when other firms could also simultaneously manipulate (Crane *et al.*, 2016). Therefore, once we control for market capitalisations, the exclusion restriction seems to be satisfied as well.

IV. Empirical Results

In this section, we present results from tests of our prediction discussed earlier.

4.1 Passive Investors and Earnings Quality

4.1.1 Passive investors and properties of earnings

To select the earnings quality outcomes for our analysis, we start with three categories of earnings quality proxies summarised by Dechow *et al.* (2010): properties of earnings, investor responsiveness to earnings, and external indicators of earnings misstatements. The first proxy category, properties of earnings, includes accruals management, timely loss

[34] Note that we end our sample in 2006 due to the "banding" methodology implemented by Russell Investments from 2007 onwards.

[35] This would be of concern because if firms can self-select into the Russell 1000 or 2000 index by manipulating their end-of-May market capitalisation, especially around the cut-off point, then the shock to passive holdings will no longer be independent of firm policy.

recognition, and target beating. Although the preliminary evidence from Figure 4 hints at a negative relation between passive institutions and accruals management, we empirically test this using a 2SLS multivariate regression. Because we run a local linear regression in a narrow bandwidth of 250 firms on either side of the index cut-off to non-parametrically estimate the effect of passive holdings on earnings quality, it is unnecessary to control for other variables or fixed effects apart from the ones included in our regression specification. The results for this IV estimation are presented in Table 3. Panel A reports the results using accruals management as proxy for (negative) earnings quality. We expect a negative coefficient on passive ownership if passive investors increase earnings quality. The estimated results from this regression are strongly supportive of our prediction and indicate that passive institutions do indeed have a significant impact on accruals management. Specifically, we find a statistically significant and negative relation (at the 1% level) between passive institutions and accruals management. This finding is robust to using a wider bandwidth and/or a higher-order polynomial on end-of-May market capitalisation. The magnitudes of the coefficients are economically meaningful as well. A one standard deviation increase in passive ownership is associated with a 0.231 to 0.685 standard deviation decrease in accruals management.

Figure 4

The graphs in this section present the level of various measures of earnings quality in a narrow window centred on the index cut-off. The associated 90% confidence intervals are also added. Firms to the left of the cut-off are at the bottom of the Russell 1000 index, while firms to the right of the cut-off are at the top of the Russell 2000. The firms' ranks are based on end-of-May market capitalisation (obtained from CRSP). Each dot represents an average value of earnings quality calculated using bins of 10 firms in the sample. Ownership is measured one quarter after the Russell indices are reconstituted and is winsorised at the 1st and 99th percentiles to mitigate the effects of outliers.

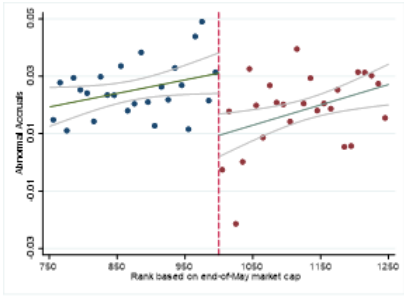


Figure 4.1

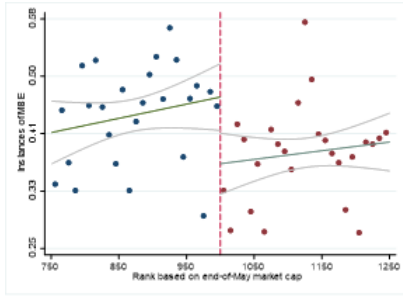


Figure 4.2

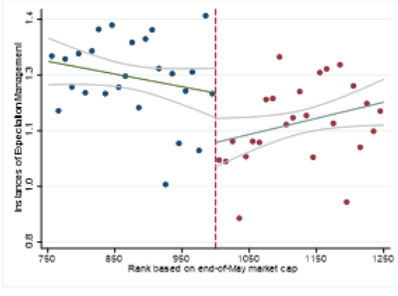


Figure 4.3

Table 3 Passive Ownership and Properties of Earnings

This table presents estimates of the second-stage regression of the instrumental variable estimation. Specifically,

$$Y_{it} = \tau + \sigma\ \widehat{PASSIVE\_OWN}_{it} + \sum_{n=1}^{N} \rho_n (LN(MAY\ \ MCAP)_{it})^n + \varphi LN(FLOAT)_{it} + \delta_t + \omega_{it,}$$

where Y_{it} is the measure of accruals management. Variable definitions are provided in the Appendix. In column (1), the sample consists of equities in the 250 bandwidth around the cut-off between the two indices. In column (2), we repeat the regressions in column (1) but with a polynomial order of 3. In column (3), the sample consists of equities in the 400 bandwidth around the cut-off. For brevity, we only report σ. Standard errors are clustered at the firm level and are reported in parentheses. *, **, and *** indicate significance better than 10%, 5%, and 1%, respectively.

Panel A: Accruals Management			
	(1)	**(2)**	**(3)**
Dependent Variable:	***ACCRUALS***	***ACCRUALS***	***ACCRUALS***
$\widehat{PASSIVE\_OWN}$	-0.314***	-0.685***	-0.231***
	(0.114)	(0.147)	(0.064)
Observations	3791	3791	6119
Bandwidth	250	250	400
Polynomial order (N)	1	3	1
Controls	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes

This table presents estimates of the second-stage regression of the instrumental variable estimation. Specifically,

$$\begin{aligned} NI_{it} = {} & \tau + \sigma\ \widehat{PASSIVE\_OWN}_{it} + \sigma_1\ D_{it} \times \widehat{PASSIVE\_OWN}_{it} + \sigma_2\ D_{it} \times RETURN_{it} \\ & + \sigma_3\ D_{it} \times RETURN_{it} \times \widehat{PASSIVE\_OWN}_{it} + \sigma_4\ RETURN_{it} \times \widehat{PASSIVE\_OWN}_{it} \\ & + \sigma_5 D_{it} + \sigma_6 RETURN_{it} + \sum_{n=1}^{N} \rho_n (LN(MAY\ \ MCAP)_{it})^n + \varphi LN(FLOAT)_{it} \\ & + \delta_t + \omega_{it,} \end{aligned}$$

where NI_{it} is net income scaled by beginning of the year market value of equity. D_{it} is an indicator equal to one if net income is negative and zero otherwise. $RETURN_{it}$ is accumulated stock price return. Variable definitions are provided in the Appendix. For brevity, we only report σ, σ_2, and σ_3. Standard errors are clustered at the firm level and are reported in parentheses. *, **, and *** indicate significance better than 10%, 5%, and 1%, respectively.

Panel B: Timely Loss Recognition			
	(1)	**(2)**	**(3)**
Dependent Variable:	***NI***	***NI***	***NI***
$\widehat{PASSIVE\_OWN}$	0.006***	0.001	0.016
	(0.002)	(0.005)	(0.030)
*D*RETURN*	0.000	0.001	-0.017
	(0.003)	(0.003)	(0.068)
*D*RETURN*PASSIVE_OWN*	0.023***	0.025***	0.034
	(0.003)	(0.001)	(0.050)
Observations	3506	3506	5699
Bandwidth	250	250	400
Polynomial order (N)	1	3	1
Controls	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes

This table presents estimates of the second-stage regression of the instrumental variable estimation. Specifically,

$$Y_{it} = \tau + \sigma\ \widehat{PASSIVE\_OWN}_{it} + \sum_{n=1}^{N} \rho_n (LN(MAY\ \ MCAP)_{it})^n + \varphi LN(FLOAT)_{it} + \delta_t + \omega_{it},$$

where Y_{it} is the measure of instances of meeting and/or beating analysts' earnings forecast (MBE) (columns 1–3) and expectations management (columns 4–6). Variable definitions are provided in the Appendix. For brevity, we only report σ. Standard errors are clustered at the firm level and are reported in parentheses. *, **, and *** indicate significance better than 10%, 5%, and 1%, respectively.

Panel C: Target Beating

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	***MBE***	***MBE***	***MBE***	***EXPECT MGMT***	***EXPECT MGMT***	***EXPECT MGMT***
$\widehat{PASSIVE\_OWN}$	-0.438***	-0.625**	-0.260**	-0.717***	-1.137***	-0.362*
	(0.185)	(0.305)	(0.122)	(0.169)	(0.249)	(0.215)
Observations	3208	3208	5170	3208	3208	5170
Bandwidth	250	250	400	250	250	400
Polynomial order (N)	1	3	1	1	3	1
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes

Having established the effect of passive ownership on accruals, we now shift our attention to timely loss recognition. Timely loss recognition results in bad news in earnings being recognised more quickly than good news. Following Basu (1997), we study timely loss recognition by regressing net income on accumulated stock returns (*RETURN*), a dummy variable indicating negative stock returns (*D*), and their interaction (*D*RETURN*). To test whether firms with high passive ownership exhibit more accounting conservatism, we add the predicted passive ownership ($\widehat{PASSIVE\_OWN}$) into the regression along with its interaction terms with the three aforementioned variables. The regression model can be represented as follows:

$$\begin{aligned} NI_{it} = {} & \tau + \sigma\ \widehat{PASSIVE\_OWN}_{it} + \sigma_1\ D_{it} \times \widehat{PASSIVE\_OWN}_{it} \\ & + \sigma_2\ D_{it} \times RETURN_{it} + \sigma_3\ D_{it} \times RETURN_{it} \times \widehat{PASSIVE\_OWN}_{it} \\ & + \sigma_4\ RETURN_{it} \times \widehat{PASSIVE\_OWN}_{it} + \sigma_5 D_{it} + \sigma_6 RETURN_{it} \\ & + \sum_{n=1}^{N} \rho_n (LN(MAY\ \ MCAP)_{it})^n + \varphi LN(FLOAT)_{it} + \delta_t + \omega_{it} \end{aligned} \quad (3)$$

Our variable of interest is the three-way interaction term ($D \times RETURN \times \widehat{PASSIVE\_OWN}$). A positive (negative) coefficient on this term indicates more (less) conservative accounting reporting for firms with higher passive ownership. Panel B presents the estimated coefficients. The coefficients on $D \times RETURN \times \widehat{PASSIVE\_OWN}$ are positive and significant in the first two columns. To the extent that conservatism provides high-quality earnings numbers (Ball *et al.*, 2000; García Lara *et al.*, 2009), our results indicate a positive relation between passive ownership and earnings quality.

Finally, we explore the implication of high passive ownership on target beating. We

present the estimated coefficients in Panel C. The dependent variable in columns (1) to (3) is the instances of meeting and/or beating analysts' earnings forecast, while in columns (4) to (6), it is the instances of expectations management. We find that firms with high passive investor holdings tend to have fewer quarters with non-negative earnings surprise and a negative net revision in analyst's forecasts of earnings for the quarter.[36] For instance, these effects translate to a 0.26 to 0.63 standard deviation decrease in the instances of MBE for a one standard deviation increase in passive ownership. The results are supportive of our prediction and imply that firms with high ownership by passive institutions are less likely to have short-term pressure to beat analysts' forecasts. To the extent that target beating indicates manipulation of accounting numbers (Matsumoto, 2002; Cheng and Warfield, 2005; Gleason and Mills, 2008), our results indicate that firms with high passive holdings are less likely to manipulate their earnings reporting and therefore are more likely to have higher earnings quality.

4.1.2 Passive investors and investor responsiveness to earnings

To further bolster these results and confirm that passive holdings improve earnings quality, we re-estimate the second stage of the 2SLS model presented in equation (2) using a second proxy for earnings quality: investor responsiveness to earnings measured by the ERC. Following Fan and Wong (2002), Francis *et al.* (2005), Wang (2006), and Warfield *et al.* (1995), we study the ERC by regressing stock returns (*RETURN*) on net income (*NI*) to measure how stock returns respond to net income and on the interaction term of *NI* and $\widehat{PASSIVE\_OWN}$. The regression model can be represented as follows:

$$\begin{aligned} RETURN_{it} = \tau + \ & \sigma \ \widehat{PASSIVE\_OWN}_{it} + \ \sigma_1 \ NI_{it} \times \ \widehat{PASSIVE\_OWN}_{it} \\ & + \ \sigma_2 \ NI_{it} + \ \sum_{n=1}^{N} \rho_n (LN(MAY \ \ MCAP)_{it})^n + \varphi LN(FLOAT)_{it} \\ & + \ \delta_t + \omega_{it} \end{aligned} \tag{4}$$

Liu and Thomas (2000) state that the ERC could be viewed as a measure of earnings quality. They find that ERC is high when earnings are informative, as captured by the high correlation between unexpected earnings and forecast revisions. To this end, our primary coefficient of interest in the above regression is σ_1. A positive (negative) coefficient indicates that the stock returns of firms with higher passive ownership are more (less) responsive to earnings. Table 4 presents the estimated coefficients. As can be seen, σ_1 is positive in all cases and significant at the one per cent level in the first two columns. These results suggest that the stock returns of firms at the top of the Russell 2000 index are more responsive to earnings than similar firms at the bottom of the Russell 1000, indicating that the earnings of firms with higher passive ownership are more informative. Thus, we find consistent evidence that firms with high passive ownership have high earnings quality.

[36] Although not reported, the results are robust even after controlling for forecast error and net revision in analysts' forecasts of earnings.

Table 4 Passive Ownership and Investor Responsiveness to Earnings

This table presents estimates of the second-stage regression of the instrumental variable estimation. Specifically,

$$RETURN_{it} = \tau + \sigma\ \widehat{PASSIVE\_OWN}_{it} + \sigma_1\ NI_{it} \times \widehat{PASSIVE\_OWN}_{it} + \sigma_2\ NI_{it} + \sum_{n=1}^{N} \rho_n (LN(MAY\ MCAP)_{it})^n + \varphi LN(FLOAT)_{it} + \delta_t + \omega_{it,}$$

where NI_{it} is net income scaled by beginning of the year market value of equity. $RETURN_{it}$ is accumulated stock price return. Variable definitions are provided in the Appendix. For brevity, we only report σ and σ_1. Standard errors are clustered at the firm level and are reported in parentheses. *, **, and *** indicate significance better than 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)
Dependent Variable:	***RETURN***	***RETURN***	***RETURN***
$\widehat{PASSIVE\_OWN}$	0.289***	0.470*	0.120
	(0.066)	(0.245)	(0.082)
$NI*\widehat{PASSIVE\_OWN}$	6.633***	7.345***	1.622
	(1.861)	(2.570)	(6.726)
Observations	3726	3726	6008
Bandwidth	250	250	400
Polynomial order (N)	1	3	1
Controls	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes

4.1.3 Passive investors and external indicators of earnings misstatements

Next, we repeat the analysis by estimating equation (2) using the external indicators of earnings misstatements as the dependent variable. Earnings misstatements are most likely the *ex post* effect of lower earnings quality. If a firm has higher earnings quality, it will be less likely to misstate its financial reporting. This is particularly true for intentional misstatements. Thus, we use two proxies to measure external indicators of earnings misstatements. The first one is the general definition of earnings misstatements that includes misstatements due to errors or irregularities. Error misstatements happen due to clerical and mathematical (unintentional) errors, while irregularity misstatements happen due to the intentional manipulation of accounting numbers. To this end, our second proxy is the irregularity misstatements.

Estimates from these regressions are reported in Table 5. Columns (1) to (3) present the estimated coefficients, where the dependent variable is the broadly defined earnings misstatements. Meanwhile, columns (4) to (6) report the coefficient estimates from regressions that use irregularity misstatements as the dependent variable. The coefficients on the main variable of interest—predicted passive ownership from first stage—are negative in all cases and statistically significant in five out of the six cases. The fact that this result continues to hold for both proxies of earnings misstatements suggests that the increase in passive ownership decreases the probability of firms (intentionally) misstating their earnings.

The magnitudes of the coefficients are economically meaningful as well. For instance, a one standard deviation increase in passive institutional ownership leads to a 0.1 to 0.42 standard deviation (i.e. 3.0 to 12.5 percentage point) decrease in the likelihood of irregularity misstatements. Thus, firms with high passive ownership are more likely to have high earnings quality indicated by the low likelihood of having misstatements.

Table 5 Passive Ownership and External Indicators of Earnings Misstatements

This table presents estimates of the second-stage regression of the instrumental variable estimation. Specifically,

$$Y_{it} = \tau + \sigma\ \widehat{PASSIVE\_OWN}_{it} + \sum_{n=1}^{N} \rho_n (LN(MAY\ \ MCAP)_{it})^n + \varphi LN(FLOAT)_{it} + \delta_t + \omega_{it},$$

where Y_{it} is the indicator of misstatement. The misstatement measure used in each regression is indicated at the top of the table. Variable definitions are provided in the Appendix. For brevity, we only report σ. Standard errors are clustered at the firm level and are reported in parentheses. *, **, and *** indicate significance better than 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	***Misstate***	***Misstate***	***Misstate***	***Irreg***	***Irreg***	***Irreg***
$\widehat{PASSIVE\_OWN}$	-0.072***	-0.157**	-0.004	-0.199***	-0.415***	-0.100*
	(0.023)	(0.086)	(0.049)	(0.059)	(0.116)	(0.067)
Observations	3791	3791	6110	3791	3791	6110
Bandwidth	250	250	400	250	250	400
Polynomial order (N)	1	3	1	1	3	1
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes

V. Tests on Underlying Conjectures

5.1 Long-Term Investment Horizon of Passive Investors

In this subsection, we test the implication of high passive ownership on one aspect of firm policy: long-term capital investment. Firms with a short-term earnings goal have the incentive to reduce investment (Bushee, 1998). If passive investors increase earnings quality due to their long-term investment horizon, we expect that they also encourage firms' long-term investment. Therefore, we re-estimate the second stage of the 2SLS model with (1) capital expenditures (*CAPEX*) and (2) research & development expenses (*R&D*) as the proxies for a firm's long-term investment level. The coefficient estimates are tabulated in Table 6. The estimated coefficients on predicted passive holdings are positive and significant across all specifications. A one standard deviation increase in passive holdings ($\widehat{PASSIVE\_OWN}$) results in a 0.34 to 0.78 (0.62 to 2.08) standard deviation increase in CAPEX (R&D). This indicates that passive investors encourage firms to take on long-term investments, which

corroborates our conjecture that passive investors increase earnings quality because of their long-termism.

Table 6 Long-Term Investment Horizon of Passive Ownership

This table presents estimates of the second-stage regression of the instrumental variable estimation. Specifically,

$$Y_{it} = \tau + \sigma\ \widehat{PASSIVE\_OWN}_{it} + \sum_{n=1}^{N} \rho_n (LN(MAY\ \ MCAP)_{it})^n + \varphi LN(FLOAT)_{it} + \delta_t + \omega_{it},$$

where Y_{it} is the measure of long-term investment. The long-term investment used in each regression is indicated at the top of the table. Variable definitions are provided in the Appendix. For brevity, we only report σ. Standard errors are clustered at the firm level and are reported in parentheses. *, **, and *** indicate significance better than 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	***CAPEX***	***CAPEX***	***CAPEX***	***R&D***	***R&D***	***R&D***
$\widehat{PASSIVE\_OWN}$	0.415**	0.777***	0.344**	1.131**	2.084**	0.617*
	(0.220)	(0.314)	(0.176)	(0.579)	(0.929)	(0.363)
Observations	3791	3791	6119	3791	3791	6119
Bandwidth	250	250	400	250	250	400
Polynomial order (N)	1	3	1	1	3	1
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes

5.2 Strategic Monitoring of Passive Investors

We conjecture that because of their benchmark strategy, passive investors can only monitor for profit so that they can compete for customers, while other investors can also trade stocks whenever they see necessary. However, passive investors are also cost sensitive. Monitoring every constituent of a portfolio equally would be cost-inefficient as indexing an index fund essentially means buying and selling every component of the underlying index. Thus, we expect that passive investors monitor strategically. Specifically, we predict that passive investors' monitoring effect is likely to be more salient when there are not many active investors. Passively managed funds track an index, and the portfolio managers of such funds do not select securities individually. In contrast, portfolio managers of actively managed funds select securities individually and buy and sell securities on the basis of company's specific fundamentals. Thus, active investors, by definition, find it beneficial to monitor the firm they invest in. As such, passive investors might find it optimal to remain "passive" if there are already sufficient active investors investing in (and thus monitoring) the firm. In other words, passive investors may play a substitute role for activists in regard to earnings quality.

We formally test this conjecture by re-estimating the baseline regressions with two

additional control variables and present our findings in Table 7.[37] More specifically, we run the regression of the following form:[38]

$$Y_{it} = \tau + \sigma_1 \widehat{PASSIVE\_OWN}_{it} + \sigma_2 \widehat{PASSIVE\_OWN}_{it} \times LOW_{DED} + \sigma_3 LOW_{DED} + \sum_{n=1}^{N} \rho_n (LN(MAY\ MCAP)_{it})^n + \varphi LN(FLOAT)_{it} + \delta_t + \omega_{it} \quad (5)$$

Here, LOW_{DED} is an indicator variable that takes the value of one if the stock holdings by "dedicated" investors (as classified in Bushee (2001)) are less than the sample median, and zero otherwise. Our primary coefficients of interest are σ_1 and σ_2. Several findings are worth noting. First, barring two cases, we still find statistically significant impact of $\widehat{PASSIVE\_OWN}$ on various proxies of earnings quality. However, the magnitude of the coefficient estimates on $\widehat{PASSIVE\_OWN}$ is smaller compared to the cases with no interaction term (Tables 3 to 5). Nonetheless, these results still support our prediction that passive investors improve earnings quality. Second, the coefficient estimates of the interaction term indicate that the effects of passive ownership on the various earnings quality proxies are stronger in the absence of high active institutional ownership. These results corroborate our earlier inference. Passive investors exert stronger monitoring efforts when other forms of firm monitoring are weaker, such as when there are not many active investors.

This test has another purpose. Although the yearly Russell Index reconstitution setting helps us mitigate concerns that the results are due to omitted factors, such as the possibility that firms with high passive ownership may at the same time also have high active ownership that monitors the firms to improve earnings quality, this test directly excludes this possibility. If the effect of passive ownership on earnings quality is due to the omitted variable of active investors, we will only find a significant effect of active ownership when we add it as an additional control variable. The fact that we continue to find a significant effect of passive ownership suggests otherwise.

Table 7 Strategic Monitoring of Passive Investors

This table presents estimates of the second-stage regression of the instrumental variable estimation. Specifically,

$$Y_{it} = \tau + \sigma_1 \widehat{PASSIVE\_OWN}_{it} + \sigma_2 \widehat{PASSIVE\_OWN}_{it} \times LOW_{DED} + \sigma_3 LOW_{DED} + \sum_{n=1}^{N} \rho_n (LN(MAY\ MCAP)_{it})^n + \varphi LN(FLOAT)_{it} + \delta_t + \omega_{it},$$

where Y_{it} is the measure of earnings quality proxy. The earnings quality measure proxy in each regression is indicated in the left column of the table. LOW_{DED} is a dummy variable that takes a value of one if the stock holdings by "dedicated" investors is less than the sample median, and zero otherwise. Variable definitions are

[37] For brevity, we only report the results for the regression of our baseline specifications (i.e. bandwidth of 250 firms and a polynomial order of 1) on Ln(MAY MCAP). The results are robust to alternative specifications used in the paper and are available upon request.

[38] Since this test involves interaction terms, we do not test timely loss recognition and earnings response coefficient in this test because that would involve four-way interactions, which do not provide a clear interpretation.

provided in the Appendix. For brevity, we only report results for the sample consisting of equities in the 250 bandwidth around the cut-off between the two indices (our baseline regression). Standard errors are clustered at the firm level and are reported in parentheses. *, **, and *** indicate significance better than 10%, 5%, and 1%, respectively.

Dependent Variable:	$\widehat{PASSIVE\_OWN}$	$\widehat{PASSIVE\_OWN}$*LOW_{DED}	LOW_{DED}	Observations
ACCRUALS	-0.103***	-0.545**	0.530*	3791
	(0.015)	(0.275)	(0.318)	
MBE	-0.198***	-0.122***	0.030	3561
	(0.021)	(0.019)	(0.029)	
EXPECT	-0.182**	-1.462***	1.575***	3561
MGMT	(0.072)	(0.357)	(0.393)	
Misstat	-0.018	-0.131***	0.123***	4351
	(0.032)	(0.020)	(0.024)	
Irreg	-0.109**	-0.198***	0.157***	4351
	(0.045)	(0.056)	(0.047)	

VI. Robustness Checks

In this section, we report a series of additional tests conducted to make sure that the results presented so far are robust to using different regression specifications and variable definitions.

6.1 Falsification Test

As stated in the previous section, our identification strategy relies on the fact that firms' inclusion in the Russell 1000 and 2000 indices results in disproportionate holdings by passive investors and this is not a function of firms' corporate strategy. To bolster this argument, we conduct falsification tests by choosing arbitrary cut-off points (for brevity, we report results for two cut-off points on either side of the actual Russell index cut-off point: 600 and 1400). If we observe significantly different holdings by passive investors around these arbitrary cut-off points, then it would imply the existence of some omitted variable bias in our regression and that the disproportionate passive ownership around the Russell 1000 and 2000 indices cut-off point is not exogenous.

Panel A of Table 8 presents the coefficient estimates from the first-stage regression of the IV estimation with an arbitrary cut-off of 600 (column (1)) and 1400 (column (2)).[39] When the cut-off of 600 is used, R2000 is defined as a dummy variable that equals one if firm *i*'s end-of-May market capitalisation, as reported in CRSP, is ranked 601st or above in year *t* and zero if it is ranked below 600th. Similarly, when the arbitrary threshold of 1400 is used, we define R2000 as an indicator variable that equals one if firm *i*'s end-of-May market

[39] For brevity, we only report the results for the regression of our baseline specifications (i.e. bandwidth of 250 firms and a polynomial order of 1) on Ln(MAY MCAP). The results are robust to alternative specifications used in the paper and are available upon request.

capitalisation, as reported in CRSP, is ranked 1401st or above in year *t* and zero if it is ranked below 1400th. The coefficient on R2000 is positive in column (1) but negative in column (2), but more importantly, the coefficients are not statistically significant in either of the two cases. In addition, we do not see a break in the passive ownership distribution around any of the arbitrarily chosen breakpoints (untabulated for brevity). These observations serve as a validation of our empirical design.

Table 8 Falsification Test

Panel A presents estimates of the first-stage regression of the instrumental variable estimation but with an arbitrary cut-off of 600 (column 1) and 1400 (column 2). Specifically, in column 1 (column 2), we define *R2000* as an indicator variable that takes a value of one if the firm's rank is above 600 (above 1400) based on end-of-May market capitalisation, and zero otherwise. In Panel B (Panel C), we repeat baseline regressions with a cut-off of 600 (1400). Standard errors are clustered at the firm level and are reported in parentheses. *, **, and *** indicate significance better than 10%, 5%, and 1%, respectively.

Panel A

	(1)	**(2)**
Dependent variable:	***PASSIVE_OWN***	***PASSIVE_OWN***
R2000	0.006	-0.038
	(0.061)	(0.052)
Observations	3956	3848
Adjusted R^2	0.326	0.354
Bandwidth	250	250
Polynomial order (N)	1	1
Controls	Yes	Yes
Year F.E.	Yes	Yes

Panel B

Dependent Variable:	$\widehat{PASSIVE\_OWN}$	*D* RETURN*	*D*RETURN* $\widehat{PASSIVE\_OWN}$*	*NI* $\widehat{PASSIVE\_OWN}$*	Observations
ACCRUALS	-5.126				3956
	(52.530)				
MBE	10.377				3567
	(91.294)				
EXPECT MGMT	-4.720				3567
	(41.401)				
NI	-0.001	0.0001	0.001		3720
	(0.003)	(0.009)	(0.009)		
RETURN	-15.999			-3431.87	3867
	(245.49)			(62470.29)	
Misstate	-1.284				3956
	(13.981)				
Irreg	1.117				3956
	(11.990)				

Panel C					
Dependent Variable:	$PASSIVE\_OWN$	*D* RETURN*	*D*RETURN* PASSIVE_OWN*	*NI* PASSIVE_OWN*	Observations
ACCRUALS	-0.134				3848
	(0.980)				
MBE	-0.037				3133
	(0.912)				
EXPECT	-1.012				3133
MGMT	(1.746)				
NI	0.046	-0.013	0.011		3589
	(0.130)	(0.133)	(0.091)		
RETURN	-1.852			166.41	3796
	(13.214)			(642.09)	
Misstate	1.506				3848
	(2.139)				
Irreg	1.250				3848
	(1.787)				

In Panel B (Panel C), we re-estimate the 2SLS model presented in equation (2) but now use 600 (1400) as the arbitrary index cut-off point and the respective predicted passive institutional holdings from Panel A. In both panels, our main coefficients of interest are statistically insignificant for the entire spectrum of earnings quality proxies we used in the previous section. It is fairly important that the signs on several coefficients of interest are opposite to what we found earlier. This further implies that our baseline results are unlikely to be driven by some omitted factors.

6.2 Alternative Definitions of Passive Investors

In all the regression models presented thus far, we define passive investors as quasi-indexers on the basis of Bushee's (2001) classification. However, Appel *et al.* (2016) classify a fund as passive if either the fund name contains a string that identifies it as an index fund or the CRSP Mutual Fund Database classifies the fund as an index fund (please see footnote 15). To ensure that our results are not driven by our choice of definition, we re-estimate our entire regression models with the latter definition of passive investors. For brevity, we tabulate the results in the Internet Appendix. We find that our baseline results are robust to this alternative definition. Furthermore, we refine this alternative definition of passive investors by only looking at the ownership stake of Vanguard, State Street, and Barclays Bank (which owned iShares during our sample period), which were the three largest passive institutions during our sample period. A similar approach can be found in Appel *et al.* (2016). Again, our baseline results hold.[40] This series of tests confirms that our earlier results are robust to this alternate definition of passive institutions.

[40] For brevity, we leave the results untabulated but they are available on request.

VII. Conclusion

How active are passive investors? This is an important question for both policymakers and academics and has thus been the focus of recent studies in the accounting and finance literature. The recent trend of large inflows into passive funds and outflows from actively managed funds necessitates a deeper understanding of how passive investors affect the firms they invest in. Our paper tries to address one firm policy that is affected by passive investment, namely earnings quality. In doing so, our paper contributes to the mixed results documented in the literature (e.g. Appel *et al.*, 2016; Schmidt and Fahlenbrach, 2017) on whether passive investors improve corporate governance. Earnings quality is a fundamental mechanism of corporate governance (Bushman and Smith, 2001) and directly affects institutions' ability to monitor cost-efficiently (Bushee and Noe, 2000). This meets passive investors' objective of minimising monitoring costs and therefore it is a necessary angle to study passive investors' impact on corporate governance. Our results show that passive investors improve earnings quality.

Our paper also tries to shed light on the conflicting evidence found in the existing literature on passive institutional holdings and earnings quality. The reason for the conflicting findings in the extant literature is that passive ownership and earnings quality are endogenously determined. We overcome the endogeneity problem by using the annual reconstitution of the Russell indices. This quasi-natural setting serves as an exogenous shock to passive institutional holdings because stocks that are assigned to the top of the Russell 2000 (which are otherwise very similar to those at the bottom of the Russell 1000 in terms of firm characteristics) get a large influx of index-tracking passive investors. The fact that the Russell index assignment process is an open, published, market capitalisation-based methodology makes the assignment procedure a sole function of stock market capitalisation (more specifically, it is not related to firms' earnings quality). Thus, we exploit this exogenous setting to study the effect of an increase in passive ownership in firms at the top of the Russell 2000 (versus firms at the bottom of the Russell 1000) on earnings quality. By implementing a 2SLS methodology on a narrow band of firms around the Russell 1000 and Russell 2000 cut-off, we are able to find positive effects of passive holdings on earnings quality that are likely to be causal.

In an attempt to get a complete picture, we use three categories of earnings quality proxies: properties of earnings, investor responsiveness to earnings, and external indicators of earnings misstatements. We find consistent evidence that points in the direction of higher passive ownership improving earnings quality. We carry out several robustness checks (that include alternative specifications and definitions) to ensure that our findings are robust. Overall, we conclude that high passive institutional ownership encourages firms to improve earnings quality and to think long term.

The cross-sectional tests also provide consistent evidence that passive investors monitor

firms' earnings quality. Because passive investors seek to minimise monitoring costs, they only monitor when necessary. For example, we find that the effect of passive investors on earnings quality is more pronounced when active ownership is low in the invested firms. This indicates that in the absence of monitoring by other shareholders, passive investors step in as monitors.

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Appendix: Variable Definitions

Variable	Definition
PASSIVE_OWN	The total holdings by institutions classified as quasi-indexers by Bushee (2001) in a stock as a percentage of its market capitalisation. We scale this variable by its sample standard deviation.
ACCRUALS	The modified Jones model (Jones, 1991), the residual from the following cross-sectional regression for each industry and year as described in Dechow *et al.* (1995): $$TA_{it}/Assets_{it-1} = \alpha_1(1/Assets_{it-1}) + \alpha_2((\Delta Sales_{it} - \Delta Net\ Receivables_{it}) /Assets_{it-1}) + \alpha_3(PPE_{it}/Assets_{it-1}) + \varepsilon_{it},$$ where TA is the total accruals for firm i in year t. We scale this variable by its sample standard deviation.
Timely loss recognition	Measured by regressing net income on the interaction term of stock returns, negative return dummy, and passive ownership as well as on their stand-alone terms and two-way interactions. The coefficient on the three-way interaction term captures the conservatism of firms with passive ownership.
MBE	Number of quarters with a zero or positive earnings surprise (i.e. the difference between the actual earnings per share (EPS) and the last forecast for the quarter made prior to the release of the earnings announcement for that quarter is at most 0.02 and at least 0). Following Bartov *et al.* (2002), we require the following: (1) there to be at least two earnings forecasts for the quarter which are at least 20 trading days apart; (2) the first forecast made for the quarter occurs at least 3 trading days after the announcement of the previous quarter's earnings; and (3) the latest forecast for the quarter occurs at least 3 days prior to the announcement of the actual EPS.
EXPECT MGMT	Number of quarters with non-negative earnings surprise (defined as the difference between the actual EPS for the quarter and the first forecast for the quarter made at least three trading days after the announcement of the previous quarter's earnings) and the negative net revision in analysts' forecasts of earnings for the quarter (defined as the difference between the latest forecast for the quarter occurring at least 3 days prior to the announcement of the actual EPS and the first forecast for the quarter made at least 3 trading days after the announcement of the previous quarter's earnings). Following Bartov *et al.* (2002), we require there to be at least two earnings forecasts for the quarter which are at least 20 trading days apart.
Earnings response coefficient	Measured by regressing stock returns on net income and its interaction with passive ownership. The coefficient on the interaction between net income and passive ownership captures the earnings responsiveness of firms with passive ownership.
Misstate	An indicator that equals one if the firm restates the earnings statements of this year in the future and zero otherwise.

Irreg	An indicator that equals one if the firm's misstatement is defined as irregularity and zero otherwise. Following Hennes *et al.* (2008) and Badertscher and Burks (2011), we define a misstatement as an irregularity if it indicates the occurrence of fraud or has a related external investigation by the Securities and Exchange Commission and/or the Department of Justice, or an internal investigation by the firm's board of directors.
LN(MAY MCAP)	The natural logarithm of the CRSP market value of equity of stock i measured at the last trading day of May in year t.
Ln(FLOAT)	The natural logarithm of the float-adjusted market value of equity on 30 June in year t.
CAPEX	Capital expenditure scaled by lagged assets. We scale this variable by its sample standard deviation.
RD	Research and development expenditure scaled by lagged assets. We scale this variable by its sample standard deviation.