Institutional Investors' Horizons and Corporate Employment Decisions

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Abstract

Monitoring by long-term investors should reduce agency conflicts in firms' labor investment choices. Consistent with this argument, we find that abnormal net hiring, measured as the absolute deviation from optimal net hiring predicted by economic fundamentals, decreases in the presence of institutional investors with longer investment horizons. Firms dominated by long-term shareholders reduce both over-investment (over-hiring and under-firing) and under-investment (under-hiring) in employees. The monitoring role of long-term investors is more pronounced for firms facing higher labor adjustment costs. We address endogeneity concerns by exploiting exogenous changes to long-term institutional ownership resulting from annual reconstitutions of the Russell indexes.

JEL Classifications: G23, G32, G34, M51.

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1. Introduction

Recent research has underscored the importance of corporate employment decisions, particularly the need for firms to maintain optimal investment in employees (Pinnuck and Lillis, 2007; Jung et al., 2014; Falato and Liang, 2016; Ellul et al., 2017). Divergence from optimal labor investment is costly to a firm since it leads to over-capacity problems, and thus lower productivity, in the case of over-investment, or insufficient growth in the case of under-investment (Williamson, 1963; Stein, 1989). These problems are likely to be more acute in modern firms since they are more human-capital intensive (Pfeffer, 1996; Zingales, 2000) and invest heavily in labor.[1] However, it is difficult to determine whether firms make sub-optimal employment decisions because these decisions involve considerable information asymmetry, typically in the form of managerial private information.[2] Anecdotal evidence, nevertheless, suggests that shareholders, and particularly institutional investors, appreciate both the importance of labor investments and the need to reduce the information asymmetries associated with them. For example, a coalition of institutional investors with over $2.8 trillion under management recently petitioned the Securities and Exchange Commission (SEC) to introduce rules requiring firms to enhance disclosure on their human capital management policies.[3] In this paper, we study

[1] The Annual Survey of Manufacturers reports that payroll and employee benefits in the U.S. manufacturing sector totaled $828 billion in 2015, compared to $175 billion in capital expenditure. The survey is available at https://www.census.gov/data/tables/2015/econ/asm/2015-asm.html.

[2] Managers have intimate knowledge of the number, skills, and productivity of employees required to perform specific tasks within a firm. This level of private information is bound to be greater compared to similar information about physical assets, where detailed specifications are readily available (Atanassov and Kim, 2009).

[3] On July 6 2017, the SEC received a petition for rulemaking (File No. 4-711) urging the adoption of standards requiring firms to disclose information on their human capital management policies, practices, and performance. The petition was submitted by the Human Capital Management Coalition, which is an initiative supported by 25 influential institutional investors, including some of the largest pension funds.

whether the presence of institutional investors in a firm is associated with a reduction in sub-optimal investments in employees. We argue that monitoring, or even the threat of monitoring, by institutional investors reduces agency conflicts associated with employment decisions.

An important factor that should affect the willingness of an institutional investor to engage in monitoring is the time horizon of his/her investment. Institutional shareholders can vary in their investment horizons because of differences in their trading strategies and/or the maturities of their liabilities. Many hedge funds and open-ended mutual funds, for example, are short term as a result of their trading strategies and their high liquidity needs, whereas pension funds and insurance companies usually have long horizons because of the longer maturities of their liabilities (Yan and Zhang, 2009; Derrien et al., 2013). In accordance with Gaspar et al. (2005) and Chen et al. (2007), we argue that long-term investors enjoy economies of scale in collecting and processing corporate information. In particular, long-term investors have lower monitoring cost functions since they build firm- and manager-specific knowledge over time. This knowledge helps them benefit from monitoring by increasing their ability to influence managers, as well as enhancing the quality of the information they collect, which could be used to inform future trading decisions (Chen et al., 2007). In contrast, short-term investors have weak incentives to monitor, since they have little time to learn about the firm during the short period in which they hold its shares, and hence face significant monitoring costs (Gaspar et al., 2005). This argument is in line with McCahery et al.'s (2016) survey evidence on the importance of investment horizons in explaining institutional investors' engagement with their portfolio firms. Therefore, we frame the underlying conflict under investigation in this study as an agency problem between managers and long-term (monitoring) shareholders.

Inefficiencies in human-capital investments can take the form of over- and/or under-investment in labor. Over-investment in labor takes place when agency conflicts lead self-interested managers to engage in over-hiring activities as part of their empire-building agendas. Williamson (1963) specifically uses the expansion of staff numbers beyond optimal levels as an example of managers' opportunistic behavior aimed at gaining more security, power, status, and prestige, as well as greater professional achievement. Over-investment in labor also occurs when managers decide to retain (under-fire) poorly performing employees as a mutually beneficial arrangement. Bertrand and Mullainathan (2003) show that managers may be reluctant to trim an unproductive workforce because of their preference for the quiet life and their desire to avoid the difficult decisions and costly effort associated with downsizing. Pagano and Volpin (2005) demonstrate that top managers facing potential dismissal for poor performance may form an alliance with the workforce by abstaining from worker layoffs and wage cuts. Workers, in return, may help retain such managers if they have sufficient power to affect such decisions. Similarly, Atanassov and Kim (2009) provide evidence that weak investor protection combined with strong union laws leads to worker-management alliances, in which poorly performing firms sell assets to prevent large-scale layoffs, garnering worker support for retaining the management. Landier et al. (2009) find that firms in the U.S. are less likely to lay off workers located geographically closer to the corporate headquarters, and that this behavior may, in part, reflect private benefits to CEOs that come from interacting with workers and communities close to the corporate headquarters.

Under-investment in labor, on the other hand, occurs when pressure from outside investors leads managers to over-fire underperforming employees or to under-hire to meet earnings targets. As stressed by Narayanan (1985), Stein (1989), Froot et al. (1992), Porter

(1992), and Von Thadden (1995), among others, myopic pressures from outside investors can result in managers turning down valuable investment opportunities due to concerns over the firm's short-term stock price. Therefore, a manager concerned with short-term results can end up under-investing in labor out of fear that such investments would depress earnings and adversely affect stock prices (Porter, 1992; Bushee, 1998). Indeed, empirical evidence produced by Graham et al. (2005) shows that a significant number of managers are willing to give up projects that will be profitable in the long run to meet short-run earnings targets. Of most relevance to our context is their finding that firms can postpone or eliminate hiring to avoid missing earnings targets.

Motivated by the abundant evidence on the agency conflicts associated with labor investments, we argue that the existence of long-term institutional investors in a firm's ownership structure can help mitigate these conflicts. We hypothesize that, in firms with longer investor horizons, direct monitoring or the threat of monitoring by long-term investors should result in fewer sub-optimal investments in employees.

To capture the investment horizon of a firm's shareholders, we follow the extant literature (e.g., Gaspar et al., 2005; Yan and Zhang, 2009; Cella et al., 2013) and measure the investment horizon of each institutional shareholder using his/her portfolio turnover level. We then aggregate individual turnover rates within each firm to get the (weighted) average portfolio turnover rate of all institutional investors with positive shareholdings in the firm. To ensure that higher values of our horizon proxy correspond to a longer investment horizon and to simplify the interpretation of our results, we multiply the investor turnover measure by -1. We call this proxy *Investor_Stability* and use it in subsequent analysis to study how the investment horizon of a firm's institutional shareholders affects the efficiency of its labor investments.

As in Pinnuck and Lillis (2007), Jung et al. (2014), and Benmelech et al. (2015), we use firms' net hiring (i.e., the percentage change in the number of employees) to proxy for their investment in employees. We measure investment inefficiencies as the absolute deviation of actual net hiring from its expected (optimal) level, predicted by economic fundamentals. Our measure thus captures firms' abnormal net hiring, that is, the amount of net hiring not attributable to those underlying economic factors. We note that our approach to measuring investment (in)efficiency is widely used in the extant literature (e.g., Richardson, 2006; Biddle et al., 2009; Cheng et al., 2013; García Lara et al., 2016; Stoughton et al., 2016). For our main analysis, we rely on the labor demand model of Pinnuck and Lillis (2007) to estimate a firm's expected level of net hiring. Their model specification is similar to those used in several recent studies (e.g., Chodorow-Reich, 2014; Benmelech et al., 2015; Falato and Liang, 2016; Giroud and Mueller, 2017; Ellul et al., 2017) but has the advantage of using a more comprehensive list of firm-level variables to explain normal hiring practices. Nevertheless, in our robustness tests, we consider several modifications to this model, for instance, by controlling for factors related to the supply of labor and frictions in local labor markets that may affect firms' investment in employees.[4] We further estimate expected net hiring using a firm's average investment in the previous three years (Titman et al., 2004; Cella, 2014) and median investment in the firm's industry (Harvey et al., 2004; Cella, 2014). Our findings are robust and thus do not depend on the use of the Pinnuck and Lillis (2007) labor demand model.

To test our predictions, we use a sample of 51,414 firm-year observations from 1982 to 2015. We find strong evidence that the presence of institutional investors with longer investment

[4] In Section 4.1, we augment the Pinnuck and Lillis (2007) model by including, among other things, industry- and state-level controls for wages, labor skills, and employment protection laws.

horizons is associated with significantly lower inefficiencies in labor investments. In particular, the impact of investor portfolio stability on abnormal net hiring is economically significant: a one standard deviation increase in *Investor_Stability* (0.059), which corresponds to an increase in investment horizon of 6.6 months, is associated with a reduction in abnormal net hiring of 8.9% relative to the median. This result holds across a variety of model specifications, different measures of expected net hiring, and is robust to controlling for known factors that might affect the efficiency of employment decisions. Specifically, our result is insensitive to the inclusion of standard corporate governance measures, as well as proxies for blockholding, managerial ownership, managerial ability, and accounting quality.

Next, we provide evidence on the interaction between *Investor_Stability* and different types of inefficiencies in labor investments. Specifically, we investigate over-investment (over-hiring and under-firing) and under-investment (under-hiring and over-firing) problems and find that, except for over-firing, each particular form of inefficiency is mitigated by the presence of long-term investors. Moreover, we show that the impact of *Investor_Stability* on abnormal net hiring is more pronounced for firms that face higher labor adjustment costs; namely, those firms that rely on skilled labor (Ochoa, 2013; Belo et al., 2017; Ghaly et al., 2017) or those operating in states that have recognized wrongful discharge laws (hereafter, WDLs) (Serfling, 2016). This finding is consistent with the notion that long-term investors play a stronger monitoring role when a deviation from optimal labor demand policy is more costly to the firm.

A major concern with a causal interpretation of our findings is self-selection. The coefficient on *Investor_Stability* may be biased if long-term investors select firms that are more efficient in their labor investments. Omitted variable bias poses yet another concern. A firm's ownership structure may be related to unobservable factors that also affect its labor investments, leading to a spurious correlation. We address those concerns in a number of ways. First, as mentioned above, we mitigate the omitted variable bias by controlling for a host of corporate governance variables, other non-labor investments, and alternative explanations that may be related to investor horizons. Second, we perform propensity score matching (hereafter, PSM) to alleviate the possibility that our results are driven by observable confounding effects. The PSM analysis shows that, in line with our baseline finding, the abnormal net hiring of firms with high *Investor_Stability* is significantly lower than that of matched firms with low *Investor_Stability*.

Third, following Derrien et al. (2013) and Kecskés et al. (2017), we split long-term investors into non-indexers and indexers. Using Bushee's (1998) institutional investor classifications, we show that our results are similar for both (potentially endogenous) non-indexers and (reasonably exogenous) indexers. The latter are passive investors that are widely diversified and do not trade much; that is, they cannot freely discard firms' stocks as they must replicate an index. For this reason, they are more likely to influence the firms in which they invest through voice. As Derrien et al. (2013) and Appel et al. (2016a) describe, indexers cannot be active investors but have an incentive to be activist investors. The fact that our results hold for long-term indexers mitigates the potential concern that long-term investors self-select to invest in firms with more efficient investments in employees.

Fourth, and most importantly, we adopt an instrumental variable (hereafter, IV) approach where we exploit the plausibly exogenous variation in the holdings of quasi-indexer investors as a result of the annual reconstitutions of the Russell 1000 and 2000 indexes. Following Schmidt and Fahlenbrach (2017), we track firms that switched from one index to the other in a particular year, focusing on changes in index assignment for firms ranked close to the Russell 1000/2000 threshold. Given that these indexes are value-weighted and quasi-indexer investors have to apply the index weights in their portfolios to mimic their benchmark index and minimize their tracking error, the (random) changes in index assignment for firms around the threshold lead to significant changes in quasi-indexer ownership levels. Using two-stage least squares (hereafter, 2SLS) estimations, we show that exogenous increases in long-term ownership are associated with reductions in labor investment inefficiency, which is consistent with our main finding. Overall, we conclude that our results remain unchanged after controlling for sample selection and endogeneity concerns using different strategies.

The main contribution of our study is that we provide novel evidence of the role of institutional investors in mitigating incentive problems associated with labor investments. Notably, we show that longer institutional investment horizons are associated with more efficient employment decisions. Recent evidence suggests that the presence of long-term investors can help reduce the agency conflicts associated with investments in capital (Cella, 2014), research and development (Bushee, 1998; Aghion et al., 2013; Harford et al., 2017), acquisitions (Gaspar et al., 2005; Chen et al., 2007), and corporate social responsibility (Neubaum and Zahra, 2006; Kecskés et al., 2017). However, existing results regarding the impact of investor horizons on firms' non-labor investments cannot be generalized to an analysis of labor investments due to the unique features of the latter, such as the potentially greater managerial private information about investments in labor. It is therefore an empirical question whether long-term investors dedicate significant resources (monitoring costs) to reduce inefficient investments in employees. We show that institutional investors with longer investment horizons indeed have a positive effect on decisions relating to investments in labor. This effect is incremental to the impacts of investor horizons on other non-labor investments that may be correlated with investments in employees.

We also contribute to a broader line of research that investigates the impact of investor horizons on various corporate financial variables, relations, and policies, including the cost of capital (Elyasiani et al., 2010; Attig et al., 2013), the potential for financial misreporting (Burns et al., 2010), the sensitivity of investment to internal cash flows (Attig et al., 2012), the tradeoff between dividends and share repurchases (Gaspar et al., 2013), seasoned equity offerings (Hao, 2014), and CEO turnover-performance sensitivity (Gao et al., 2017).

Our study is also related to a growing body of literature on the interactions between labor and corporate policies in the presence of incentive problems and various governance mechanisms. As reviewed above, this literature has examined managers' downsizing decisions (Bertrand and Mullainathan, 2003; Perry and Shivdasani, 2005), their incentives to collude with workers for mutual protection (Pagano and Volpin, 2005; Atanassov and Kim, 2009), their preference for maintaining strong ties with employees, increasing worker wages, and avoiding lay-offs (Cronqvist et al., 2009; Landier et al., 2009), as well as their incentives to under-invest in labor (Graham et al., 2005). We show that the existence of institutional investors with longer investment horizons in a firm's ownership structure can mitigate the incentive problems associated with the firm's employment decisions.

Finally, our paper is closely related to the recent study by Jung et al. (2014) that also considers the implications of agency conflicts for labor investments. However, the focus of this study is different from ours, as it examines the role of financial reporting quality in mitigating inefficiencies associated with labor investments. Our results suggest that investor horizons, as an external governance mechanism, can also help to reduce these inefficiencies. The impact of investor horizons on net hiring efficiency is above and beyond that of accounting quality.

The remainder of the paper is organized as follows. Section 2 describes the data and research design. Section 3 reports and discusses the main empirical results. Section 4 presents several robustness tests and Section 5 draws conclusions.

2. Data and research design

2.1 Sample and data sources

To empirically investigate the relation between institutional investment horizons and labor investment efficiency, we begin with all firms in Compustat between 1982 and 2015. We then exclude firms with missing data for the main variables used in our regressions. Consistent with the extant literature, we also exclude financial firms and utilities (i.e., firms with SIC codes between 6,000 and 6,999 or 4,900 and 4,999). We obtain data on the portfolio holdings of institutional investors from the Thomson-Reuters Institutional Holdings (13F) Database, which provides institutional common stock holdings and transactions, as reported on Form 13F that is filed with the SEC. This data set contains ownership information on common stock positions (of more than 10,000 shares or $200,000 in value) by institutional managers with $100 million or more in equity securities under discretionary management. Information on firms' net hiring and financial characteristics is obtained from Compustat.[5] Data on stock returns come from the Center for Research in Security Prices (CRSP). To mitigate the effect of outliers, we winsorize all Compustat variables at the 1st and 99th percentiles of their distributions. The final sample

[5] The Compustat variable reporting the number of employees (*emp*) contains missing values due to the fact that firms may choose whether or not to report these data. Nevertheless, in our sample of Compustat firms matched with the Thomson-Reuters Institutional Holdings (13F) database, *emp* is available for almost 97% of the firm-year observations, indicating that sample selection is not a concern.

consists of 51,414 firm-year observations representing 6,313 unique firms over the period 1982 to 2015.

2.2 Investment horizon measures

To measure the investment horizon of a firm's institutional investors based on the turnover rate, we proceed as follows. Using data on the portfolio holdings of institutional investors from the Thomson-Reuters Institutional Holdings (13F) database, and following the extant literature (e.g., Gaspar et al., 2005; Yan and Zhang, 2009; Cella et al., 2013; Gaspar et al., 2013), we compute each institutional shareholder's investment horizon by looking at the quarterly turnover level of their portfolio; that is, the ratio of dollar share purchases and sales during a quarter to the total dollar value of the portfolio. The logic behind this measure is that investors will be classified as long term if they churn their overall portfolio less frequently. Derrien et al. (2013) demonstrate the validity of the portfolio turnover measure as a proxy for the investment horizon by showing that the measure is persistent over time; that is, that the investor horizon is a characteristic of investors, and that the measure is accurate in classifying investors known to be long term, such as Warren Buffett (Berkshire Hathaway), CalPERS, and the Vanguard Group, and those known to be short term, such as György Soros (Soros Fund Management) and Stevie Cohen (SAC Capital Management). Specifically, the turnover rate of institutional investor *i* in quarter *q* is calculated as follows:

$$TR_{i,q} = \frac{\sum_{k=1}^{Q_q} \left| N_{k,i,q}P_{k,q} - N_{k,i,q-1}P_{k,q-1} - N_{k,i,q-1}\Delta P_{k,q} \right|}{\sum_{k=1}^{Q_q} \frac{N_{k,i,q}P_{k,q} + N_{k,i,q-1}P_{k,q-1}}{2}} \tag{1}$$

where $TR_{i,q}$ is the turnover rate of investor i in quarter q, Q_q is the set of companies held by investor i in quarter q, $N_{k,i,q}$ is the number of shares of company k held by investor i in quarter q, and $P_{k,q}$ is the share price of firm k in quarter q. By construction, the range of the turnover rate is the interval [0, 2]. To provide a more stable and accurate classification of an investor's horizon, we then calculate the average turnover level of his/her portfolio over the previous four quarters as follows:

$$Avg\_TR_{i,q} = \frac{1}{4}\sum_{r=1}^{4} TR_{i,q-r+1} \tag{2}$$

Using the investor-level turnover rate ($Avg\_TR_{i,q}$), we then calculate the firm-level turnover rate as the weighted average of the turnover rates of all institutional investors in a firm's ownership structure:

$$Inv\_Turnover_{k,q} = \sum_{i \in S_{k,q}} w_{k,i,q}\, Avg\_TR_{i,q} \tag{3}$$

where $w_{k,i,q}$ is the weight of investor i in the total percentage held by institutional investors in company k at quarter q, and $S_{k,q}$ is the set of institutional investors in company k at quarter q. Finally, to ensure that higher values of our horizon proxy correspond to a longer investment horizon and to simplify the interpretation of our results, we multiply the investor turnover measure by -1. We use this proxy, which we call *Investor_Stability*, to study how the investment horizon of a firm's institutional shareholders affects the efficiency of its labor investments.

In addition to our main proxy (*Investor_Stability*), we also use two measures of long-term investor horizons based on Bushee's (1998, 2001) institutional investor classifications (see

Section 4.4.2).[6] Bushee (1998) classifies each institutional investor into three categories: transient, dedicated, and quasi-indexer. We focus on the shareholdings by dedicated (*Dedicated Ownership*) and quasi-indexer investors (*Quasi-indexer Ownership*) in each firm, who by definition are likely to be long-term investors. As discussed in more detail in Section 4.4.2, an important benefit of these well-established classifications is that we can distinguish between potentially endogenous (dedicated) and plausibly exogenous (quasi-indexer) long-term investors and thus mitigate sample selection and endogeneity concerns (Derrien et al., 2013; Kecskés et al., 2017).

2.3 Measure of labor investment efficiency

Following Pinnuck and Lillis (2007), Benmelech et al. (2015), and Ellul et al. (2017), we use firms' net hiring, measured as the percentage change in the number of employees between year *t-1* and year *t*, to proxy for investment in employees. We then employ the standard approach in the investment literature (e.g., Richardson, 2006; Biddle et al., 2009; Cheng et al., 2013; García Lara et al., 2016; Stoughton et al., 2016) and measure labor investment inefficiencies ($Abnormal\_Net\_Hiring$) as the absolute deviation of actual net hiring from its expected (optimal) level predicted by economic fundamentals:

$$Abnormal\_Net\_Hiring = |Actual\_Net\_Hiring - Expected\_Net\_Hiring| \quad (4)$$

Our main estimate of a firm's expected level of net hiring is based on the labor demand model of Pinnuck and Lillis (2007). This model resembles the employment models estimated in

[6] We thank Brian Bushee for sharing his institutional investor classification data on his personal website: http://acct.wharton.upenn.edu/faculty/bushee/IIclass.html.

recent studies (e.g., Chodorow-Reich, 2014; Falato and Liang, 2016; Giroud and Mueller, 2017; Ellul et al., 2017). However, while the latter models typically include a limited number of explanatory variables, the Pinnuck and Lillis (2007) model uses an extensive list of firm-specific variables to explain normal hiring practices. Formally, the model takes the following form:

$$\begin{aligned} Net\_Hiring_{i,t} = \alpha &+ \beta_1 Sales\_Growth_{i,t} + \beta_2 Sales\_Growth_{i,t-1} + \beta_3 Profit_{i,t} + \beta_4 \Delta Profit_{i,t} \\ &+ \beta_5 \Delta Profit_{i,t-1} + \beta_6 Return_{i,t} + \beta_7 Size_{i,t-1} + \beta_8 Quick\_Ratio_{i,t-1} \\ &+ \beta_9 \Delta Quick\_Ratio_{i,t-1} + \beta_{10} \Delta Quick\_Ratio_{i,t} + \beta_{11} Leverage_{i,t-1} \\ &+ \sum_{L=1}^{5} \delta_L Loss\_Bins_t{}^{1to5} + \lambda_j + \varepsilon_{i,t} \end{aligned} \tag{5}$$

where the subscripts *i* and *t* refer to firm *i* and year *t*, respectively. *Net_Hiring* is the percentage change in the number of employees, *Sales_Growth* is the percentage change in sales revenue, *Profit* is net income scaled by beginning-of-year total assets, Δ*Profit* represents the change in net income scaled by beginning-of-year total assets, *Return* is the total annual stock return, *Size* is measured as the natural logarithm of the firm's book value of assets, *Quick_Ratio* is the ratio of cash and short-term investments plus receivables to current liabilities, *Leverage* is measured as long-term debt plus debt in current liabilities, scaled by the book value of assets, and *Loss_Bins* are five dummy variables indicating each interval of profitability of length 0.005 from 0 to -0.025. For example, *Loss_Bin1* takes the value of one if *Profit* is between -0.005 and 0, and zero otherwise, and so on for the other *Loss_Bins*; see Appendix A for detailed variable definitions. The model also includes industry fixed effects (λ_j) to control for unobserved industry characteristics affecting net hiring.

In Table B.1 of Appendix B, we present the regression results for the labor demand model, Eq. (5). We find that sales growth, profitability, stock returns, size, and corporate liquidity have a positive and significant impact on net hiring. Leverage and the loss bins, on the other hand, are negatively associated with net hiring. These results are consistent with Pinnuck and Lillis (2007) and prior theoretical predictions, suggesting that the labor demand model is well estimated. We note that the fitted value from the model is the estimate of a firm's *Expected_Net_Hiring*, while the unexplained portion (or residual) becomes our estimate of a firm's *Abnormal_Net_Hiring*.

To further confirm the validity of our measure of sub-optimal net hiring, we examine its relation with future firm performance. To the extent that *Abnormal_Net_Hiring* captures inefficiencies in labor investments, it is expected to have a negative effect on firm value and operating performance. In Table B.2 of Appendix B, we regress market-to-book and return on assets (ROA), respectively, on *Abnormal_Net_Hiring*, control variables, and industry and year fixed effects. Our models of firm value and operating performance follow the specifications used in Frésard (2010). The results show that the coefficient on *Abnormal_Net_Hiring* is significant and negative across all models, indicating that firms with greater labor investment inefficiencies have lower future market value and weaker operating performance. We interpret these results as additional evidence in support of our main measure of suboptimal net hiring.

Given the economic appeal and empirical validity of *Abnormal_Net_Hiring*, we adopt it as our proxy for labor investment inefficiencies in our main empirical analysis. However, in Section 4.1 we perform several robustness checks in which we consider alternative proxies based on augmented labor demand models or other approaches that do not rely on such models.

2.4 Empirical specification and control variables

To explore the interaction between institutional investment horizons and labor investment efficiency, we examine the effect of *Investor_Stability* on *Abnormal_Net_Hiring*. Specifically, we estimate the following baseline model:

$$Abnormal\_Net\_Hiring_{i,t} = \alpha + \delta Investor\_Stability_{i,t-1} + \beta' X_{i,t-1} + \lambda_j + \eta_t + \varepsilon_{i,t} \quad (6)$$

where *Investor_Stability* and *Abnormal_Net_Hiring* are defined as in Sections 2.2 and 2.3, respectively. The vector $X_{i,t-1}$ includes control variables that, based on previous literature (e.g., Jensen, 1986; Stulz, 1990; Richardson, 2006; Biddle et al., 2009), are likely to be associated with a firm's investment efficiency. In particular, as in Jung et al. (2014) we control for investment opportunities, size, corporate liquidity, dividend payouts, cash flow and sales volatilities, tangibility, any incidence of losses, net hiring volatility, labor intensity, and institutional ownership. We also include a proxy for inefficiencies associated with non-labor investments (capital expenditure, R&D expenditure, and acquisitions) to control for any indirect effect on *Abnormal_Net_Hiring* from other investment decisions; see Appendix A for detailed variable definitions. *Investor_Stability* and all other explanatory variables are lagged by one period.[7] Finally, we account for time-invariant industry heterogeneity and time trends by including a vector of industry fixed effects and time dummies (λ_j and η_t).[8] Standard errors are heteroskedasticity-robust and clustered at the firm level.

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[7] As a robustness test, we also control for a number of other variables in Sections 4.2 and 4.3. Our results remain qualitatively similar.

[8] As mentioned in Section 2.2, investor horizon is a persistent investor characteristic. It follows that most of the investor horizon variation we study comes from the cross-section not the time-series. Hence, we refrain from including firm fixed effects because little is gained by focusing on limited within firm variation; this modelling choice is common in research using a similar investor horizon measure (Gaspar et al., 2005; Gaspar et al., 2013;

2.5 Summary statistics and univariate test

Table 1 reports summary statistics for the labor investment, ownership, and control variables used in our main analysis.[9] The average and median values of our dependent variable, *Abnormal_Net_Hiring*, are 0.123 and 0.070, respectively; this means that actual net hiring deviates on average from expected net hiring by 12.3 percentage points. These figures are in line with Jung et al. (2014), who report mean and median *Abnormal_Net_Hiring* values of 0.113 and 0.070, respectively. Institutional investors own, on average, 43.4% of firms' equity. There is a clear time trend, with institutional ownership increasing substantially over the last 20 years (untabulated result). The average investor turnover (*Inv_Turnover*) is 0.191, which means that institutional investors hold an average stock in their portfolio for around 31.4 months.[10] Dedicated institutional investors hold, on average, 5.5% of their portfolio firms' shares, as compared to the 30.3% held by quasi-indexer investors. The summary statistics for the control variables used in our baseline specifications are generally comparable to those reported in Jung et al. (2014).

Harford et al., 2017). In robustness tests, we control for unobservable heterogeneity using a series of state, industry, and year fixed effects as well as their interactions. We present a formal identification strategy in Section 4.4.

[9] The descriptive statistics for the variables in Eq. (5) are similar to those reported in Pinnuck and Lillis (2007) and Jung et al. (2014). For example, the average expected annual percentage change in the number of employees (*Expected_Net_Hiring*) is 5%, which is close to the 5.4% reported in Pinnuck and Lillis (2007) and the 5.9% reported in Jung et al. (2014).

[10] Recalling that *Inv_Turnover* takes values in the interval [0, 2], an average *Inv_Turnover* of 0.191 means that 0.191/2 =9.55% of the portfolio is turned over in a given quarter. This corresponds to 38.2% of the position being turned over in a given year, which implies that institutional investors hold an average stock in their portfolio for around 12/0.382 = 31.4 months. There is a clear time trend in *Inv_Turnover*; that is, *Inv_Turnover* has increased in recent years (untabulated result).

We next conduct a univariate analysis in which we compare *Abnormal_Net_Hiring* for firms with above- and below-median *Investor_Stability* (untabulated). Our comparison reveals that firms with above-median *Investor_Stability* display significantly lower *Abnormal_Net_Hiring* than firms with below-median *Investor_Stability*. Specifically, the average (median) value of *Abnormal_Net_Hiring* is 11.4% (6.6%) for firms with above-median *Investor_Stability*, compared to a value of 13.2% (7.4%) for firms with below-median *Investor_Stability*. The difference of 1.8 (0.8) percentage points is statistically significant at the 1% level, and is economically significant as it amounts to around 15% (11%) of the average (median) value of *Abnormal_Net_Hiring*. This preliminary finding suggests that more stable ownership by institutional investors is associated with fewer sub-optimal employment decisions, consistent with our main hypothesis.

3. Empirical results

3.1 Investment horizons and labor investment efficiency: Main findings

Table 2 presents the regression results on the relation between long-term investors and abnormal net hiring. We report *t*-statistics based on heteroskedasticity-robust standard errors, clustered at the firm level. Models 1−3 include industry and year dummies. In Model 1, we exclude *Investor_Stability* and regress *Abnormal_Net_Hiring* on the control variables listed in Section 2.4. Firms with higher institutional ownership stakes, of a bigger size, with less liquidity, more conservative debt policies, positive dividend payouts, more tangible assets, and higher labor intensity tend to exhibit lower inefficiencies in their investments in employees. At the same time, *Abnormal_Net_Hiring* is positively related to a higher incidence of losses, abnormal non-labor investments, and the volatilities of cash flow, sales, and past net hiring. These results are broadly consistent with previous evidence in the literature (e.g., Jung et al., 2014).

Model 2 is identical to Model 1 except that *Investor_Stability*, our main variable of interest, is now introduced as an additional explanatory variable. In line with our main hypothesis, we find that the coefficient estimate for *Investor_Stability* is negative and highly significant, suggesting that a more stable institutional ownership structure helps improve the efficiency of a firm's labor investments. The impact of investor portfolio stability on abnormal net hiring is also economically significant: a one standard deviation increase in *Investor_Stability* (0.059), which corresponds to an increase in the investment horizon of 6.6 months, is associated with a reduction in *Abnormal_Net_Hiring* of 8.9% relative to the median.

In the last two models, we evaluate the robustness of our results to controlling for other sources of unobserved heterogeneity. Specifically, Model 3 repeats the analysis of Model 2 but also adds state-level fixed effects. Including state fixed effects allows us to account for persistent differences across states in characteristics that could affect the investment horizon and labor investment relation; for example, geographic differences, which are known to affect the relocation decisions of highly educated populations (Moretti, 2011), or differences in labor laws such as WDLs that are time-invariant during our sample period and affect the labor demand function (e.g., Serfling, 2016). In Model 4, instead of controlling for industry, year, and state fixed effects separately like we do in Model 3, we include industry-year and state-year fixed effects to control for time-varying heterogeneity across industries and time-varying differences in local economic environments (Gormley and Matsa, 2014). The sign and magnitude of the coefficient on *Investor_Stability* in Models 3 and 4 is comparable to that of Model 2.

Overall, our findings are qualitatively similar across a variety of model specifications; that is, institutional ownership stability has a robust and negative impact on abnormal net hiring practices.[11] This evidence is consistent with our main hypothesis that the investment horizon of a firm's institutional shareholders increases the efficiency of its labor investments.

3.2 Investment horizons and specific types of labor investment inefficiency

In this section, we provide evidence on the interaction between institutional investment horizons and specific forms of labor investment inefficiencies. Specifically, we investigate whether long-term institutional ownership mitigates over- and/or under-investment in labor. There is no *a priori* reason to anticipate an asymmetric effect on those two forms of investment inefficiencies. Hence, we expect the presence of long-term investors to be associated with lower inefficiencies in both over- and under-investment. We define over-investing firms as those with positive abnormal net hiring (i.e., *Actual_Net_Hiring* greater than *Expected_Net_Hiring*) and under-investing firms as those with negative abnormal net hiring (i.e., *Actual_Net_Hiring* less than *Expected_Net_Hiring*). We estimate Eq. (6) for these subsamples of over- and under-investing firms and report the results in Table 3.

Panel A of Table 3 presents the results on the relation between investor stability and over-investment. As in our baseline regressions in Table 2, we include the controls, year, and industry fixed effects. In Models 2, 4, and 6, we further control for state fixed effects. In Models 1−2, we find that *Investor_Stability* reduces *Abnormal_Net_Hiring* for over-investing firms. In Models 3–6, we further decompose over-investment into over-hiring and under-firing based on

[11] We note that across all specifications the adjusted R^2 is at 15%, which indicates a goodness-of-fit comparable to that reported by studies using similar specifications (e.g., Jung et al., 2014; Benmelech et al., 2015).

whether a firm's labor force is expected to grow or diminish according to economic fundamentals. Specifically, a firm over-hires (under-fires) if it over-invests when its expected level of net hiring is positive (negative). We find that each form of over-investment is mitigated by the presence of long-term investors.

In Panel B of Table 3, we report the results on the effect of investor stability on under-investment. We use the same model specifications as in Panel A. In Models 1−2, we find that *Investor_Stability* reduces the deviation between actual and expected net hiring for under-investing firms. In Models 3–6, we further break down under-investment into under-hiring and over-firing. A firm under-hires (over-fires) if it under-invests when its expected level of net hiring is positive (negative). We find that under-hiring is mitigated by the presence of long-term investors; however, in Models 5−6, the results for over-firing become insignificant.

In summary, we find that specific forms of labor investment inefficiency are mitigated by the presence of long-term investors. These results suggest that long-term investors are not solely associated with increases or reductions in labor investment, but actually play an important role in ensuring that firms' employment levels are generally closer to those justified by economic fundamentals.

3.3 Moderating effect of labor adjustment costs

In an attempt to better explain the investor incentives for the observed negative relation between investor horizons and labor investment inefficiencies, we examine whether the impact of *Investor_Stability* on *Abnormal_Net_Hiring* varies with the level of labor adjustment costs (hereafter LACs) a firm faces. Earlier studies document the presence of economically significant costs associated with firms' labor adjustments. These costs, which include the costs of firing (e.g., severance pay and lawsuits), searching (e.g., recruitment agency fees and advertising), selection and hiring (e.g., application screening and interviews), training, and costs due to productivity losses (e.g., peer and supervisor disruption), tend to rise with the skill level of the human capital that a firm employs (Oi, 1962; Pfann and Palm, 1993; Mortensen and Pissarides, 1994; Hamermesh and Pfann, 1996; Dixit, 1997).

Since firms cannot adjust their labor demand in a costless way, they have an incentive to keep labor turnover stable and to minimize deviations from the optimal labor demand policy implied by economic fundamentals (Dixit, 1997). Therefore, we expect long-term investors to have a stronger incentive to monitor the employment activities of the firm when it faces higher LACs, because deviations from the optimal labor demand policy are more costly to the firm in this case. An alternative argument is that firms faced with high LACs already have an incentive to reduce abnormal net hiring, in which case they would require less monitoring by long-term investors. However, this argument is based on a restrictive assumption that there is no agency conflict between management and shareholders. Our setting assumes that incentive problems exist and so the presence of high LACs, by itself, does not necessarily deter self-interested, utility-maximizing managers from making inefficient labor investments.

To proxy for LACs, we use two common measures in the literature: (a) firms' reliance on skilled labor and (b) the state-level passage of WDLs. First, previous research shows that skilled workers are associated with higher labor adjustment costs (e.g., Oi, 1962; Dixit, 1997; Ochoa, 2013). To measure firms' reliance on skilled labor, we follow Belo et al. (2017) and Ghaly et al. (2017), and use Occupational Employment Statistics (OES) data from the Bureau of Labor Statistics and the U.S. Department of Labor's O*NET program classification of occupations according to skill level, to construct an industry-specific index, *Labor_Skill*, that proxies for the labor adjustment costs faced by the average firm in that industry.[12] Second, as in Serfling (2016), we exploit an exogenous variation in firing costs, a major component of LACs, following the state-level recognition of WDLs since the 1970s.[13] We use *WDL* to measure the strength of WDLs in a state; *WDL* is constructed by summing three distinct dummy variables for each of the three WDLs exceptions.

Table 4 shows how the relation between firms' *Investor_Stability* and *Abnormal_Net_Hiring* varies, conditional on *Labor_Skill* and *WDL*. In Panel A, we define firms in the top (bottom) 30th percentile of *Labor_Skill* as high-(low-) skill firms, which face high (low) LACs.[14] Models 1 and 2 report the results for the whole sample. The coefficient on *Investor_Stability* is approximately four times the size for firms with high LACs (-0.248) as for firms with low LACs (-0.060); the difference is statistically significant at the 1% level. Models 3−4 and 5−6 reveal broadly similar patterns when we examine the impact of *Investor_Stability* on over- and under-investment problems separately.

In Panel B, we partition our sample firms into those headquartered in states that have recognized all three WDLs exceptions (i.e., firms with a *WDL* score of 3 and thus higher LACs) and those headquartered in states that have not adopted any of the exceptions (i.e., firms with a *WDL* score of 0 and thus lower LACs). The results continue to show that the impact of

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[12] The O*NET occupational classifications are based on how much education, related work experience, and training an employee would need to perform a given job at a competent level.

[13] WDLs include three common-law exceptions to the employment-at-will doctrine, which make it more costly and difficult for firms to dismiss workers. These exceptions include the public policy exception, the implied contract exception, and the good faith exception. A state can choose to adopt none to all of these exceptions (see Autor et al. (2006) for a detailed description of these laws).

[14] Our results are qualitatively similar when we define firms with above-(below-) median *Labor_Skill* scores as those with high and low LACs.

Investor_Stability on *Abnormal_Net_Hiring* is statistically more pronounced for firms with higher LACs; the only exceptions are the results for underinvestment in Models 5 and 6. In sum, our findings are broadly consistent with the hypothesis that long-term investors play a stronger monitoring role when the deviation from the optimal labor demand policy is more costly to the firm.

4. Robustness tests

4.1 Alternative proxies for expected and abnormal net hiring

A central issue in our research design is how we estimate a firm's expected (optimal) level of investment in employees. Following Pinnuck and Lillis (2007), we have thus far used the fitted value of net hiring in a regression of it on industry- and firm-level fundamentals as a proxy for the optimal level of investment in labor. To examine the robustness of our results, in Table 5 we replicate our analysis using several alternative measures of expected net hiring.

Since the original Pinnuck and Lillis (2007) model includes only industry fixed effects, we first test for the robustness of our findings by estimating expected net hiring with industry and year fixed effects in Model 1, as well as with firm and year fixed effects in Model 2. In Model 3, we further add state fixed effects as well as four additional controls: *WDL*, *Labor_Skill*, industry-level wages, and future industry sales growth. State fixed effects capture time-invariant state characteristics (e.g., geographic location and local economic conditions) that could affect the supply of labor to the local labor market. As argued above, *WDL* and *Labor_Skill* could affect *Abnormal_Net_Hiring* through their impact on LACs. Industry-level wages proxy for labor expenses at the firm-level, which may be relevant to firms' hiring and firing decisions. Future industry sales growth captures the forward-looking prospects of the industry where a firm operates, which may affect the firm's demand for employment. In Model 4, in addition to firm fixed effects, we add industry-year and state-year fixed effects to further control for time-varying heterogeneity across industries and time-varying differences in local labor markets. The results under all specifications are qualitatively similar to our baseline findings.

Next, we consider alternative definitions of optimal net hiring that are not based on the labor demand model suggested by Pinnuck and Lillis (2007). In Model 5, we estimate expected net hiring using the median investment in the firm's industry (Harvey et al., 2004; Cella, 2014), defining industries using the Fama-French (1997) 48-industry classification. In Model 6, we estimate expected net hiring using the firm's average investment in the previous three years (Titman et al., 2004; Cella, 2014). In both models, the coefficient on *Investor_Stability* remains negative and highly significant, suggesting that our results are robust to alternative definitions of expected net hiring that do not depend on the Pinnuck and Lillis (2007) model.

As noted earlier, our method for measuring investment inefficiency is common in the extant literature (e.g., Biddle et al., 2009; Cheng et al., 2013; García Lara et al., 2016). Still, a potential shortcoming of all approaches that rely on models of expected investment to identify abnormal levels of investment is that any deviation from the expected level is automatically classified as abnormal. This could lead to misclassification problems particularly if the deviation of actual investment from expected is small and temporary, which could be unintentional, caused by frictions unrelated to agency conflicts, and likely to mean revert the following year. Since our focus is on labor investment inefficiency caused by agency conflicts, we conduct further analyses to capture cases where the difference between actual and expect net hiring is more likely to be intentional and persistent. In unreported tests, we split our sample into (a) firms that experience substantial *Abnormal_Net_Hiring* (with above-median absolute residuals) versus those that experience only modest *Abnormal_Net_Hiring* (with below-median absolute residuals),[15] and (b) firms that consistently experience substantial over- or under-investment in labor for at least three years versus firms with substantial over/under-investment that is only temporary, and/or firms with modest over/under-investment. In line with the premise that long-term investors reduce inefficient investment in labor when it is significant and persistent, and thus likely to be intentional, we find that the coefficient on *Investor_Stability* is only significant for firms that experience substantial *Abnormal_Net_Hiring* and/or consistently deviate from expected net hiring.

4.2 Controlling for other types of investments

Investments in labor may be correlated with other forms of investments, such as capital expenditures, R&D expenses, and acquisitions. Thus, a concern with our finding regarding the relation between investor horizons and labor investment inefficiencies is that it could be primarily driven by contemporaneous non-labor investments. Although in our regressions we already include *Abn_Non-labor_Invest* to control for non-labor investment inefficiencies, in this section we perform additional analysis to mitigate the effects of those investments.

First, we examine scenarios in which investments in employees (net hiring) are positively or negatively related to capital expenditures, R&D expenditures, and acquisition expenditures; that is, when an increase in net hiring is associated with an increase or decrease in the other forms of investment. For each type of non-labor investment, we also study subsamples of firms that make investments in labor but report zero or missing values for the type of non-labor investment in question. Second, to further control for capital-labor complementarity, we examine

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[15] Our results are qualitatively similar when we use top and bottom 30th percentile cut-off points instead.

subsamples of industries in which the elasticity of substitution between capital and labor is either above or below unity.[16] The idea behind these tests is that if our findings are mainly driven by the relation between long-term investors and non-labor investment inefficiencies, then they should exist only for the subsamples of firms in which labor and non-labor investments move in the same direction and likely act as complements (Jung et al., 2014).

Panel A of Table 6 reports the results controlling for the relation between net hiring and capital expenditures. We find that the effect of *Investor_Stability* on *Abnormal_Net_Hiring* remains statistically and economically significant, whether a firm's labor and capital investments move in the same or opposite directions.[17] Similarly, the results are significant and economically comparable, whether a firm belongs to an industry characterized by high or low substitutability between labor and capital.

In Panel B, we control for the relation between net hiring and R&D expenditures (Models 1–3), and the relation between net hiring and acquisition expenditures (Models 4–6). The results are not necessarily stronger for the subsample of firms in which there is a positive relation between net hiring and non-labor investments. Moreover, the coefficient on *Investor_Stability* is still significant and negative for those firms that invest in labor but make no investment in R&D or acquisitions (i.e., firms with zero or missing values for the type of investment in question). Taken together, and consistent with recent research examining labor investments and financing

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[16] Following Young (2013), industries with high substitutability between capital and labor (i.e., with an elasticity of substitution that is greater than one) include textile mill products (SIC code 22), apparel (SIC code 23), lumber and wood (SIC code 24), leather (SIC code 31), transportation equipment and ordnance (SIC code 37), miscellaneous manufacturing (SIC code 39), communications (SIC code 48), and trade (SIC codes 50–59).

[17] The results for the subsample of firms with zero or missing capital expenditures are insignificant. We note, however, that very few firms fall into this group.

frictions (e.g., Benmelech et al., 2015), our analysis suggests that the results on labor investments are not simply due to the effects of contemporaneous non-labor investments.

4.3 Controlling for alternative explanations

Even though we formally address endogeneity concerns in Section 4.4, in what follows we carry out a number of tests to control for potential omitted variables or alternative explanations that may drive our results. First, long-term shareholders typically invest in firms that adopt good governance practices. Therefore, our findings could be driven by omitted governance variables rather than monitoring by long-term investors. Based on Bhagat and Bolton (2013), we control for a firm's governance by including five variables in our regressions: the Gompers et al. (2003) corporate governance index (*G-index*), the Bebchuck et al. (2009) entrenchment index (*E-index*), the natural logarithm of the dollar value of common stock owned by the median director (*Direct_Own*), the percentage of board members classified as independent (*Ind_Direct*), and *Duality* (i.e., an indicator variable that takes the value of one if the CEO of the sample firm is also the board chair, and zero otherwise). The results reported in Table 7 show that the impact of *Investor_Stability* on *Abnormal_Net_Hiring* survives the inclusion of standard corporate governance measures.[18] The coefficient estimate for *Investor_Stability* remains negative and highly significant in all models. Overall, these results mitigate the concern that our findings may be driven by the quality of firms' other governance practices.

[18] In untabulated tests, we find that the additional results reported in Tables 3 and 4 also remain qualitatively unchanged after controlling for the five governance characteristics. However, we refrain from using the specification with the governance variables throughout the analysis given the significant reduction in the number of observations due to missing governance data.

To further address the concern about omitted governance mechanisms, we conduct a two-step analysis (non-tabulated) similar to those in Chen et al. (2007) and Fich et al. (2015). The first stage of this analysis involves estimating a regression of *Investor_Stability* on firm size, lagged stock return, leverage, Tobin's Q, and the *G-index*. We then use the abnormal level of *Investor_Stability* (the residual from the above regression) as the key independent variable in a regression similar to our baseline model in Eq. (6). The abnormal level of *Investor_Stability* captures the investment horizon of the firm's institutional investors that is unexplained by the governance of the firm. The results of the second-stage regression show that the investment horizon of the firm's institutional investors, as captured by the abnormal level of *Investor_Stability*, has a negative and significant impact on the firm's *Abnormal_Net_Hiring*. This result adds support to our main conclusions regarding the role of long-term investors and mitigates the concern that our results may be driven by omitted governance variables.

Blockholders play a critical role in the governance of firms because their sizable stakes give them incentives to bear the cost of monitoring managers.[19] Thus, an alternative explanation for our findings could be that blockholders tend to be more long-term because of the high costs associated with trading their large ownership stakes. If this is the case, then our results may be primarily driven by investors' ownership concentration, rather than by their investment horizons. To alleviate this concern, we control for the separate effect of block ownership in our regressions. We classify investors that own at least 5% of a firm's shares as blockholders and we repeat our main analysis after including the number of blockholders in a firm's ownership structure as an additional control variable. The results in Model 1 of Table 8 show that block

[19] Edmans (2014) provides a comprehensive survey of the theoretical and empirical literature on the role of blockholders in corporate governance.

ownership is negatively but insignificantly related to *Abnormal_Net_Hiring*. Importantly, controlling for blockholdings does not affect the statistical and economic significance of the *Investor_Stability* coefficient.[20]

Prior research shows that managerial ownership affects the alignment of interests between managers and shareholders and thus is associated with firms' investment incentives and performance (e.g., Morck et al., 1988; McConnell and Servaes, 1990). To the extent that long-term investors may choose to invest in firms with certain managerial ownership structures, our results regarding the relation between investor horizons and firms' employment decisions could be spurious. We alleviate this concern by controlling for managerial ownership (*Managerial Ownership*) in our regression. Following Daniel et al. (2016), we measure *Managerial Ownership* as the value of the CEO's stock and option portfolio. The results of Model 2 in Table 8 show that the coefficient on *Managerial Ownership* is insignificant. Notably, however, controlling for managerial ownership, *Investor_Stability* still has a negative and significant impact on *Abnormal_Net_Hiring*, consistent with our baseline results.

If long-term shareholders invest in companies that happen to have more efficient labor investments simply because they have more able managers, then our results could be driven by managerial ability rather than investor horizons. To rule out this explanation, we control for managerial ability in our baseline regression. To define managerial ability, we use a measure proposed by Demerjian et al. (2012).[21] This measure is highly relevant to our analysis as it

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[20] Our result for *Investor_Stability* is robust to the use of alternative measures of blockholdings, such as the total ownership of blockholders, total ownership of the five largest institutions, ownership of the largest institution, or ownership concentration.

[21] Demerjian et al. (2012) use data envelopment analysis to estimate firm efficiency. They then remove from the total firm efficiency measure any firm-specific characteristics that are expected to assist or hamper the management's efforts. The unexplained portion of firm efficiency is attributed to management ability.

defines managerial ability based on managers' efficiency, relative to their industry peers, in transforming corporate resources into revenues. As explained by Demerjian et al. (2012), this includes the ability to manage employees more efficiently. The results of Model 3 in Table 8 show that, consistent with Demerjian et al. (2012), firms experience less inefficiency in their labor investments when they have more able managers. However, the coefficient on *Investor_Stability* remains statistically and economically significant, even after controlling for the effect of managerial ability.

Recent research shows that high-quality financial reporting can help reduce information asymmetry between insiders and outsiders, thus leading to more efficient investments (Biddle and Hilary, 2006; Biddle et al., 2009), including investments in labor (Jung et al., 2014). On the other hand, the quality of financial reports can be affected by institutional investors with some evidence pointing to a positive relation between financial misreporting and ownership by institutions with shorter investment horizons (Burns et al., 2010). These results suggest that our evidence on the effect of investor horizons on labor investment inefficiencies may be driven by financial reporting quality. To rule out this explanation, we additionally control for accounting quality. Our proxy for accounting quality maps accruals to cash flows and is constructed using the Dechow and Dichev (2002) model and further modifications in McNichols (2002). Model 4 of Table 8 shows that higher quality financial reporting helps reduce abnormal net hiring, consistent with Jung et al. (2014). More importantly, the coefficient on *Investor_Stability* remains significant and negative after controlling for accounting quality.

4.4 Addressing endogeneity concerns

There are major concerns with a causal interpretation of our empirical results because of the potential self-selection in long-term investors' investment decisions, and the role of omitted variables as well as reverse causality inferences. Throughout the paper, we have presented model specifications that attempt to alleviate some of these concerns. For example, we control for time-invariant omitted variables by including industry, state, and year fixed effects. In addition, we have presented several specifications where we control for additional time variant effects (e.g., corporate governance practices and alternative explanations related to blockholders, managerial ownership, managerial ability, and financial reporting quality) as well as other non-labor investments that might be affecting our inferences.

In this section, we present three additional analyses to further alleviate concerns about self-selection and endogeneity. First, we perform PSM to reduce the impact of omitted (observable) variables on our results. Second, we split long-term ownership into indexed and non-indexed ownership, which helps us deal with the self-selection problem. Third, we run IV/2SLS regressions that take advantage of plausibly exogenous changes in ownership by quasi-indexer investors as a result of the annual Russell indexes reconstitutions.

4.4.1 Propensity score matching

Since the characteristics of firms with high *Investor_Stability* may differ from those with low *Investor_Stability*, we use PSM analysis to control for observable differences in firm and industry attributes among the two groups of firms. We match firms with above-median *Investor_Stability* with those with below-median *Investor_Stability* on year, industry (Fama-French 48-industry classification), and all the control variables from our baseline regression. By matching on industry, we also remove unobserved industry heterogeneity that may be correlated with *Investor_Stability*. We use two matching algorithms: (a) nearest-neighbor matching (without replacement) with common support and a caliper constraint of 0.01 and (b) radius matching with common support and a caliper constraint of 0.01.

Panels A and B of Table 9 report the PSM results obtained using the nearest-neighbor matching technique and radius matching technique, respectively.[22] We find that, on average, the abnormal net hiring of firms with high investor portfolio stability is between 1.0 and 1.2 percentage points lower than that of propensity score matched firms with low investor portfolio stability, the difference being significant at the 1% level. This result adds support to our main tests and further mitigates the concern that our findings may be driven by confounding effects.

4.4.2 Indexers versus non-indexers long-term investors

Following Derrien et al. (2013) and Kecskés et al. (2017), we use long-term indexers to mitigate the impact of self-selection. Using indexers is appropriate for our analysis for two main reasons. First, long-term indexers are passive investors that are widely diversified and do not trade much. They cannot choose their portfolio firms based on the firms' labor investment efficiency because they must replicate an index; their incentive is to minimize the tracking error relative to their benchmark index. Therefore, long-term indexers are plausibly exogenous; that is, they are not affected by self-selection. Second, index funds do not have the flexibility to sell their holdings of stocks. As a result of this inability to follow the "Wall Street Rule", they are more likely to try to influence the firms in which they invest through voice or private negotiations

[22] Further analysis (untabulated) indicates that the significant pre-matching differences in the covariates' means between firms with above-median *Investor_Stability* and those with below-median *Investor_Stability* no longer exist after we perform the matching.

(Carleton et al., 1998; Del Guercio and Hawkins, 1999; Becht et al., 2009; Fenn and Robinson, 2009). As Derrien et al. (2013) and Kecskés et al. (2017) argue, indexers cannot be active investors but they can play an activist role.[23]

To examine the effect of long-term indexers on abnormal net hiring, we use Bushee's (1998) classifications of institutional investors. Using factor and cluster analysis, and focusing on investor characteristics such as portfolio turnover, ownership concentration, and investment sensitivity to earnings announcements, Bushee (1998) classifies each institutional investor into three categories: transient, dedicated, and quasi-indexer.[24] We focus on the shareholdings by dedicated and quasi-indexer investors in each firm, who by definition are likely to be long-term investors. Specifically, we repeat our baseline analysis using *Dedicated* and *Quasi-indexer Ownership* as our main independent variables in place of *Investor_Stability*.

The results in Models 1 and 2 of Table 10 show that, as expected, both types of long-term institutional ownership are negatively associated with abnormal net hiring, which is consistent with our main hypothesis that direct monitoring by long-term investors should reduce sub-optimal labor investments. In Models 3–6, we find that both types of long-term investors have a significantly negative impact on two forms of labor investment inefficiencies, namely over-investment and under-investment. Overall, by showing that our results hold for reasonably

[23] Indeed, a number of recent papers show that the presence of long-term indexers in a firm's ownership structure and/or the increase in their ownership following a firm's inclusion in an index can affect a wide range of corporate policies and outcomes, including corporate governance practices (Mullins, 2014; Appel et al., 2016a; Bird and Karolyi, 2017; Schmidt and Fahlenbrach, 2017), payout policy (Crane et al., 2016), disclosure policy (Boone and White, 2015; Bird and Karolyi, 2016), investment in stakeholder capital (Rubio and Vàzquez, 2016; Kecskés et al., 2017), and innovation (Aghion et al., 2013; Harford et al., 2017).

[24] We match the classification data to every institutional investor on the 13F database and aggregate the firm-level holdings of all investors by classification and firm-quarter.

exogenous long-term indexers, we are able to largely mitigate the concern that our results may be driven by self-selection.

4.4.3 Russell indexes' reconstitutions

Recent studies use the annual reconstitutions of the Russell 1000 and 2000 indexes as a source of exogenous variation to the ownership by long-term indexer investors to identify its impact on corporate policies (e.g., Appel et al., 2016a; Crane et al., 2016; Bird and Karolyi, 2016; Schmidt and Fahlenbrach, 2017). The Russell 1000 (2000) index includes the 1000 (1001−3000) largest US listed firms by market capitalization. Both indexes are value weighted and exhibit highly significant differences in weights between firms at the top and bottom of each index (Appel et al., 2016a). Indexer investors that track these indexes have strong incentives to apply similar weights to their index-mimicking portfolios since they wish to minimize their tracking error. Thus, indexers are expected to hold relatively large (small) equity positions in firms ranked at the top (bottom) of each index.

In Fig. 1, we confirm this assertion by graphically showing the discontinuity in long-term quasi-indexer ownership around the Russell 1000/2000 threshold. We plot the average end-of-September quasi-indexer ownership (calculated using bins of ten firms) for the bottom 500 firms of the Russell 1000 and the top 500 firms of the Russell 2000 over the 1991–2006 period. The *x*-axis represents the distance from the Russell 1000/2000 threshold as determined using the actual Russell assigned ranks within each index. The zero threshold represents the bottom (top) firm within the Russell 1000 (2000) index. The figure shows a clear discontinuity in long-term quasi-indexer ownership around the Russell threshold. As expected, firms at the top of the Russell

2000 have significantly higher holdings by quasi-indexer investors relative to firms at the bottom of the Russell 1000.

FTSE Russell reconstitutes the indexes on an annual cycle (every June) using firms' end-of-May market capitalizations. Following Schmidt and Fahlenbrach (2017), we focus on firms that switch from one index to the other as a result of these reconstitutions, since they are bound to experience significant changes in long-term indexer investment. This is particularly true for firms that are close to the Russell 1000/2000 threshold; that is, they were at the bottom of 1000 but moved to the top of 2000, or vice versa. These switches around the threshold should lead to exogenous changes in long-term indexer ownership since we can safely assume that index assignment around the threshold is random (Appel et al., 2016a; Schmidt and Fahlenbrach, 2017). In other words, managers cannot take decisions that affect market capitalization in a way that will accurately predict index assignment so close to the threshold.

Following the arguments presented in Section 4.4.2, we expect a significant increase in long-term indexer holdings to lead to a reduction in labor investment inefficiency. To test this prediction, we run 2SLS estimations.[25] As in Schmidt and Fahlenbrach (2017), we use three instrumental variables: the first two are indicator variables equal to one if a stock switches from the Russell 1000 index to the Russell 2000 index ($R1000_{t-1} \rightarrow R2000_{t}$) or the Russell 2000 index to the Russell 1000 index ($R2000_{t-1} \rightarrow R1000_{t}$) at the annual Russell index reconstitution. The third instrument tracks the change in index rank from one year to another ($Rank_{t} - Rank_{t-1}$). The first-stage dependent variable is the annual change in quasi-indexer ownership (*ΔQuasi-indexer Ownership*) measured at the end of the first quarter following the reconstitution, whereas

[25] Appel et al. (2016b) offer a detailed discussion as to why it is not appropriate to adopt a regression discontinuity design in this setting.

the annual change in abnormal net hiring (*ΔAbnormal_Net_Hiring*) becomes the second-stage dependent variable.[26]

Table 11 reports the results from these 2SLS regressions. We consider two model specifications. In Panel A, we include the same set of controls as in Schmidt and Fahlenbrach (2017). In Panel B, we further add the controls from our baseline specification (Eq. (6)) and the float adjusted market cap (Appel et al., 2016a; Crane et al., 2016). In both panels, and as mentioned above, we follow recent studies (Appel et al., 2016a; Schmidt and Fahlenbrach, 2017) and focus on switches that are close to the threshold (i.e., those switches resulting from small changes in market capitalization). Specifically, we examine two subsamples of firms that switched by at most 200 and 100 ranks between the two Russell indexes. We do not study all switchers because switches far from the threshold may happen as a result of large changes in market capitalization, which could in turn be related to unobservable changes in firms' characteristics. This means that the index switch may affect labor investment efficiency not only through its impact on long-term ownership, which could violate the exclusion restriction.

In Panel A of Table 11, the first-stage regression results suggest that for both samples of switchers, the coefficients on the instruments are highly significant and with the anticipated sign. In particular, the coefficient on $R1000_{t-1} \rightarrow R2000_{t}$ ($R2000_{t-1} \rightarrow R1000_{t}$) is positive (negative) and highly significant, consistent with the prediction that *Quasi-indexer Ownership* increases

[26] Our sample consists of the Russell 1000 and Russell 2000 index constituents during the 1991–2006 period. Similar to Appel et al. (2016a) and Crane et al. (2016), our sample period ends in 2006. This is because Russell modified its indexing methodology in 2007 by introducing a "banding" policy, which allows firms that should otherwise switch indexes to remain within their index if their market capitalizations did not deviate much from the threshold. This banding policy could potentially affect the local continuity of firm assignment around the threshold and would likely violate the exclusion restriction because the assignment of firms into the indexes is no longer affected only by market capitalization rankings.

(decreases) as firms move from the bottom of the Russell 1000 index to the top of the Russell 2000 index (the top of the Russell 2000 index to the bottom of the Russell 1000 index). The coefficient on $Rank_{t} - Rank_{t-1}$ is negative and significant, which is expected given that as firms move to higher ranks (i.e., when the variable takes negative values), the index weights become larger, and therefore indexer investors increase their holdings. Diagnostic tests (i.e., the *F*- and *J*-tests) both suggest that these instruments are valid. Importantly, the second-stage results show that the coefficient on the fitted *ΔQuasi-indexer Ownership* is negative and highly significant, consistent with the prediction that increases in long-term ownership lead to reductions in labor investment inefficiency.

Panel B of Table 11 shows that the results are robust to including the original controls used in our baseline analysis and the float adjustment market cap. Specifically, in the first-stage regressions, the coefficients on the three instruments $R1000_{t-1} \rightarrow R2000_{t}$, $R2000_{t-1} \rightarrow R1000_{t}$, and $Rank_{t} - Rank_{t-1}$ remain significant with the expected signs. Diagnostic tests are also satisfactory. Moreover, in the second-stage regressions, *ΔQuasi-indexer Ownership* continues to have a negative and significant impact on *ΔAbnormal_Net_Hiring*. The magnitude of the effect appears to be larger for firms around the threshold, which are expected to experience the largest change in *Quasi-indexer Ownership*.

Overall, the results presented in this section suggest that our findings are robust to controlling for sample selection and endogeneity concerns. Even though we cannot completely rule out sample selection and endogeneity affecting our inferences, collectively our findings point to a causal effect of long-term investment on labor investment efficiency.

5. Conclusion

This paper examines the relationship between the investment horizon of institutional shareholders and the efficiency of their portfolio firms' labor investments. We argue that monitoring by long-term investors deters managers from deviating from the optimal level of investment in employees. Consistent with this argument, we find that abnormal net hiring, measured as the absolute deviation from net hiring predicted by economic fundamentals, decreases in the presence of long-term investors. We further provide evidence that the presence of long-term investors mitigates both over-investment and under-investment in labor. This finding suggests that long-term investors are not simply linked with increases or reductions in labor investments, but in fact play an important role in ensuring that firms' employment levels are generally closer to those justified by economic fundamentals. We also show that the monitoring role of long-term investors is more pronounced for firms facing higher labor adjustment costs. This supports the argument that long-term investors play a stronger monitoring role when deviation from the optimal labor demand policy would be more costly to the firm.

To mitigate sample selection and endogeneity concerns, we perform several additional tests. Specifically, we estimate model specifications that control for standard corporate governance measures, proxies for blockholdings, managerial ownership, managerial ability, and accounting quality, as well as other alternative explanations including the effects of non-labor investments. We also show that our main results hold for both potentially endogenous long-term non-indexers and plausibly exogenous long-term indexers, which helps mitigate sample selection concerns. In addition, we report the findings from analyses using PSM. Finally, we conduct an IV analysis aimed at examining the impact of exogenous changes to long-term ownership on changes in labor investment inefficiency as a result of the annual reconstitution of the Russell

1000 and 2000 indexes. The results from the PSM and 2SLS analyses both support our main findings. Overall, our study suggests that institutional investors, and in particular their investment horizons, play an important role in firm-level employment decisions.

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Appendix A: Variable definitions

Variable	Definition (Compustat data items in parentheses)
Ownership variables	
Investor_Turnover	The weighted average of the turnover rates of all institutional investors in a firm's ownership structure based on Gaspar et al. (2005).
Investor_Stability	*Investor_Turnover* multiplied by -1.
Institutional Ownership	Percentage of shares owned by institutional investors.
Dedicated_Ownership	Percentage of shares owned by dedicated institutional investors based on Bushee (1998).
Quasi-indexer_Ownership	Percentage of shares owned by quasi-indexed institutional investors based on Bushee (1998).
Blockholdings	The number of institutions whose ownership is at least 5% of the firm's outstanding shares.
Labor investment variables	
Net_Hiring	Percentage change in the number of employees (*emp*).
Expected_Net_Hiring	Expected percentage change in the number of employees (*emp*) based on the Pinnuck and Lillis (2007) model.
Abnormal_Net_Hiring	|*Actual_Net_Hiring – Expected_Net_Hiring*|
Over-investment	Positive abnormal net hiring.
Under-investment	Negative abnormal net hiring.
Over-hiring	Over-investment when the expected level of net hiring is positive.
Under-firing	Over-investment when the expected level of net hiring is negative.
Under-hiring	Under-investment when the expected level of net hiring is positive.
Over-firing	Under-investment when the expected level of net hiring is negative.
Firm characteristics	
Sales_Growth	Percentage change in sales revenue (*sale*).
Profit	Net income (*ni*) scaled by beginning-of-year total assets (*at*).
Δ*Profit*	The change in net income (*ni*) scaled by beginning-of-year total assets (*at*).
Return	Total stock return in the last 12 months.
Size	The logarithm of the firm's book value of assets (*at*).
Quick_Ratio	The ratio of cash and short-term investments (*che*) plus receivables (*rect*) to current liabilities (*lct*).
Leverage	Long-term debt (*dltt*) plus debt in current liabilities (*dlc*), all scaled by the book value of assets (*at*).
Loss_Bins	Five dummy variables indicating each interval of profitability of length 0.005 from 0 to -0.025. For example, Loss_Bin1 takes the value of one if Profit is between -0.005 and 0 and zero otherwise, and so on for the other Loss_Bins.
Market-to-book	Book value of assets (*at*) plus the market value of common equity (*prcc_f* × *csho*) minus the book value of common equity (*ceq*), all scaled by the book value of assets (*at*).
Dividend Dummy	A dummy variable set equal to one in years in which a firm pays common dividends (*dvc*), and zero otherwise.
Cash Flow Volatility	The standard deviation of the ratio of firm-level cash flow (*oibdp* − *xint* − *txt* − *dvc*) to assets (*at*) for the previous five years.
Sales Volatility	The standard deviation of firm-level sales revenue (*sale*) for the previous five years.
Net Hiring Volatility	The standard deviation of a firm's *Net_Hiring* for the previous five years.

Tangibility	The ratio of property, plant, and equipment (*ppent*) to total assets (*at*).
Loss Dummy	A dummy variable set equal to one in years in which a firm makes a loss (*Profit* < 0).
Labor Intensity	The ratio of the number of employees (*emp*) to total assets (*at*).
Abn_Non-labor_Invest	Abnormal non-labor investments, defined as the absolute value of the residual from the regression of *Non-labor_Invest* on *Sales_Growth* where *Non-labor_Invest* is measured as the sum of capital expenditure (*capx*), acquisition expenditure (*aqc*), and research and development expenditure (*xrd*), less cash receipts from the sale of property, plant, and equipment (*sppe*), all scaled by lagged total assets.
Labor_Skill	A firm's reliance on skilled labor measured as $\text{Labor\_Skill}_i = \sum_{j=1}^{O}\left(\frac{E_{ji}}{E_i} * Z_j\right)$, where E_{ji} is the number of employees in industry i working in occupation j, E_i is the total number of employees in industry i, O is the total number of occupations in industry i, and Z_j is the U.S. Department of Labor's O*NET program classification of occupations based on skill level.
WDL	*WDL* measures the strength of Wrongful Discharge Laws (WDLs) in the state where the firm is headquartered and is constructed by summing three distinct dummy variables for each of the three WDLs exceptions, where each dummy is set equal to one if the firm is in a state that has adopted the exception in question, and zero otherwise.
Accounting Quality	*Accounting Quality* is defined based on Dechow and Dichev's (2002) model and its modification by McNichols (2002). The model is a regression of working capital accruals on one-year-lagged, current, and one-year-ahead cash flows from operations, the change in revenue, and property, plant, and equipment. The model is estimated by industry-year and the residuals are collected. We then compute the standard deviation of the residuals over the years t-5 to t-1. The standard deviation is then multiplied by -1.
<u>Governance variables</u>	
G-index	The Gompers et al. (2003) corporate governance index of 24 antitakeover provisions.
E-index	The Bebchuck et al. (2009) managerial entrenchment index.
Direct_Own	The natural log of the dollar value of common stock owned by the median director based on Bhagat and Bolton (2013).
Ind_Direct	The percentage of board members classified as independent.
Duality	An indicator variable that takes the value of one if the CEO of the sample firm is also the board chair, and zero otherwise.
<u>Managerial characteristics</u>	
Managerial Ownership	The value of the CEO's stock and option portfolio based on Daniel et al. (2016).
Managerial Ability	Managers' efficiency, relative to their industry peers, in transforming corporate resources to revenues based on Demerjian et al. (2012).

Appendix B: Table B.1. Estimation of the expected level of net hiring

This table reports the regression results for the estimation of the expected level of net hiring using Pinnuck and Lillis' (2007) labor demand model. All variables are defined in Appendix A. The *t*-statistics in parentheses are based on robust standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

		Dependent variable: Net hiring
Variables	Predicted Sign	
$Sales\_Growth_{t}$	+	0.313*** (28.96)
$Sales\_Growth_{t-1}$	+	0.050*** (9.37)
$Profit_{t}$	+	0.090*** (5.45)
$\Delta Profit_{t}$	-	-0.030 (-1.48)
$\Delta Profit_{t-1}$	+	-0.001 (-1.09)
$Return_{t}$	+	0.027*** (10.83)
$Size_{t-1}$	+	0.003*** (6.68)
$Quick\_Ratio_{t-1}$	+	0.008*** (8.42)
$\Delta Quick\_Ratio_{t-1}$	+	0.000*** (2.60)
$\Delta Quick\_Ratio_{t}$	+/-	-0.001 (-0.64)
$Leverage_{t-1}$	-	-0.062*** (-9.33)
$Loss\_Bin1_{t-1}$	-	-0.018** (-2.35)
$Loss\_Bin2_{t-1}$	-	-0.027*** (-3.92)
$Loss\_Bin3_{t-1}$	-	-0.019** (-2.23)
$Loss\_Bin4_{t-1}$	-	-0.011 (-1.18)
$Loss\_Bin5_{t-1}$	-	-0.019** (-2.15)
Intercept	+/-	-0.017*** (-4.28)
Industry fixed effects		Yes
Observations		51,414
Adjusted R^2		0.23

Table B.2. The impact of abnormal net hiring on firm value and operating performance

This table presents results on the effect of abnormal net hiring on firm value and operating performance. In Models 1 and 2, the dependent variable is the *Market-to-Book* ratio at time *t*. In Models 3 and 4, the dependent variable is the return on assets (*ROA*) at time *t*. *Investment* is the growth in property, plant, and equipment (*ppent*), computed as $ppent_t$ minus $ppent_{t-1}$, divided by $ppent_{t-1}$. *ROA* is net income (*ni*) scaled by beginning-of-year total assets (*at*). All other variables are defined in Appendix A. The *t*-statistics in parentheses are based on robust standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Market-to-book		ROA	
Variables	(1)	(2)	(3)	(4)
Abnormal_Net_Hiring $_{t-1}$	-0.200***	-0.063*	-0.045***	-0.020***
	(-4.02)	(1.76)	(-4.00)	(-3.44)
Size $_{t-1}$	0.011	0.001	0.006***	0.003***
	(1.18)	(0.35)	(3.66)	(5.66)
Investment $_{t-1}$	0.028***	-0.003	-0.002***	-0.001**
	(4.43)	(-0.27)	(-2.98)	(-2.37)
Leverage $_{t-1}$	-0.643***	-0.051	-0.060***	-0.012**
	(-6.38)	(-1.50)	(-4.74)	(-2.55)
Cash Flow $_{t-1}$	-1.093***	-0.132	0.452***	0.226***
	(-4.58)	(-1.27)	(4.88)	(4.00)
Dividend Dummy $_{t-1}$	0.094***	0.037***	0.036***	0.021***
	(2.99)	(3.72)	(17.68)	(12.49)
Sales Growth $_{t-1}$	0.585***	-0.030	-0.000	-0.012***
	(11.64)	(-0.98)	(-0.00)	(-2.97)
ROA $_{t-1}$	0.076	-0.229**		0.453***
	(0.33)	(-2.28)		(11.73)
Market-to-book $_{t-1}$		0.739***	0.006***	0.004***
		(67.51)	(3.09)	(3.28)
Intercept	2.119***	0.465***	-0.053***	-0.031**
	(14.04)	(6.03)	(-3.56)	(-2.12)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	43,449	43,449	43,449	43,449
Adjusted R^2	0.19	0.64	0.36	0.47

Table 1. Summary statistics

This table presents summary statistics for the labor investment, ownership, and control variables used in our main analysis. We also report descriptive statistics for the control variables used in the estimation of the expected level of net hiring. Our sample consists of 51,414 firm-year observations representing 6,313 unique firms over the period 1982 to 2015. All variables are defined in Appendix A.

Variable	Mean	Std. Dev.	Median	Q1	Q4
Labor investment variables:					
Actual_Net_Hiring	0.050	0.245	0.020	-0.050	0.110
Expected_Net_Hiring	0.050	0.116	0.040	-0.004	0.085
Abnormal_Net_Hiring	0.123	0.177	0.070	0.032	0.142
Ownership variables:					
Investor_Turnover	0.191	0.059	0.187	0.155	0.220
Dedicated Ownership	0.055	0.069	0.032	0.007	0.078
Quasi-indexer Ownership	0.303	0.203	0.287	0.123	0.465
Institutional Ownership	0.434	0.277	0.425	0.184	0.669
Other variables:					
Sales_Growth	0.105	0.326	0.069	-0.021	0.175
Profit	0.020	0.165	0.047	-0.003	0.092
Return	0.173	0.596	0.085	-0.178	0.381
Size	5.606	2.011	5.470	4.127	6.955
Quick_Ratio	1.822	2.075	1.226	0.800	2.006
Leverage	0.220	0.201	0.191	0.049	0.330
Market-to-book	2.527	3.446	1.782	1.088	2.995
Dividend Dummy	0.440	0.496	0.000	0.000	1.000
Cash Flow Volatility	0.058	0.334	0.029	0.016	0.057
Sales Volatility	0.187	0.648	0.132	0.077	0.225
Tangibility	0.291	0.216	0.240	0.122	0.404
Loss Dummy	0.257	0.437	0.000	0.000	1.000
Net Hiring Volatility	0.285	2.388	0.131	0.073	0.230
Labor Intensity	0.010	0.011	0.007	0.003	0.013
Abn_Non-labor_Invest	0.096	0.112	0.075	0.040	0.110

Table 2. The relation between investor horizons and abnormal net hiring

This table reports the regression results on the impact of institutional investment horizons on abnormal net hiring. In Model 1, we regress *Abnormal_Net_Hiring* on the set of control variables, and industry and year fixed effects. In Model 2, we include *Investor_Stability* as an additional explanatory variable. In Model 3, we repeat the specification of Model 2 but also control for state fixed effects. In Model 4, we include industry-year and state-year fixed effects instead of controlling for industry, year, and state fixed effects separately. All variables are defined in Appendix A. The *t*-statistics in parentheses are based on robust standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1)	(2)	(3)	(4)
Investor_Stability $_{t-1}$		-0.106***	-0.104***	-0.113***
		(-5.91)	(-5.74)	(-6.11)
Institutional Ownership $_{t-1}$	-0.024***	-0.028***	-0.027***	-0.028***
	(-5.20)	(-5.85)	(-5.78)	(-5.61)
Market-to-book $_{t-1}$	0.001***	0.001***	0.001***	0.001***
	(3.52)	(3.31)	(3.31)	(3.30)
Size $_{t-1}$	-0.005***	-0.005***	-0.006***	-0.006***
	(-7.28)	(-7.52)	(-7.60)	(-7.30)
Quick_Ratio $_{t-1}$	0.007***	0.007***	0.007***	0.007***
	(9.84)	(9.78)	(9.84)	(9.81)
Leverage $_{t-1}$	0.026***	0.025***	0.025***	0.027***
	(4.06)	(3.99)	(3.94)	(4.00)
Dividend Dummy $_{t-1}$	-0.015***	-0.014***	-0.013***	-0.012***
	(-7.30)	(-6.62)	(-6.17)	(-5.59)
Cash Flow Volatility $_{t-1}$	-0.000	-0.001	-0.001	-0.001
	(-0.11)	(-0.17)	(-0.19)	(-0.43)
Sales Volatility $_{t-1}$	0.005	0.005	0.005	0.006
	(1.28)	(1.28)	(1.36)	(1.38)
Tangibility $_{t-1}$	-0.039***	-0.039***	-0.038***	-0.038***
	(-5.42)	(-5.35)	(-5.30)	(-5.23)
Loss Dummy $_{t-1}$	0.022***	0.022***	0.022***	0.021***
	(9.70)	(9.83)	(9.89)	(9.21)
Net Hiring Volatility $_{t-1}$	0.002***	0.002**	0.002***	0.002**
	(2.88)	(2.83)	(2.84)	(2.55)
Labor Intensity $_{t-1}$	-0.655***	-0.648***	-0.647***	-0.643***
	(-5.24)	(-5.19)	(-5.16)	(-4.80)
Abn_Non-labor_Invest $_t$	0.455***	0.453***	0.451***	0.452***
	(27.40)	(27.37)	(27.23)	(27.01)
Intercept	0.120***	0.105***	0.127***	0.120***
	(6.62)	(5.73)	(5.26)	(5.01)
Year fixed effects	Yes	Yes	Yes	No
Industry fixed effects	Yes	Yes	Yes	No
State fixed effects	No	No	Yes	No
Industry-year fixed effects	No	No	No	Yes
State-year fixed effects	No	No	No	Yes
Observations	51,414	51,414	51,414	51,241
Adjusted R^2	0.15	0.15	0.15	0.15

Table 3. Investor horizon and specific types of labor investment inefficiency

This table reports the regression results on the impact of institutional investment horizon on specific types of labor investment inefficiency. In Panel A, we examine the relation between investor horizon and over-investment in labor. Panel B reports the results on the relation between investor horizon and under-investment in labor. In Models 1 and 2 of Panel A, we estimate Eq. (6) for a subsample of over-investing firms where over-investment is defined as positive abnormal net hiring. In Models 3–6 of Panel A, we further decompose over-investment into over-hiring and under-firing. A firm over-hires (under-fires) if it over-invests when its expected level of net hiring is positive (negative). In Models 1 and 2 of Panel B, we estimate Eq. (6) for a subsample of under-investing firms, where under-investment is defined as negative abnormal net hiring. In Models 3–6 of Panel B, we further decompose under-investment into under-hiring and over-firing. A firm under-hires (over-fires) if it under-invests when its expected level of net hiring is positive (negative). All regressions include year and industry fixed effects, and all the covariates from our baseline specification. In Models 2, 4, and 6, we also control for state fixed effects. All variables are defined in Appendix A. The *t*-statistics in parentheses are based on robust standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. The relation between investor horizon and over-investment in labor

	Over-investment		Over-hiring		Under-firing	
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Investor_Stability $_{t-1}$	-0.137***	-0.135***	-0.141***	-0.139***	-0.106**	-0.105**
	(-4.51)	(-4.45)	(-3.67)	(-3.62)	(-2.15)	(-2.10)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effects	No	Yes	No	Yes	No	Yes
Observations	21,422	21,422	15,816	15,816	5,606	5,606
Adjusted R^2	0.17	0.17	0.18	0.18	0.14	0.14

Panel B. The relation between investor horizon and under-investment in labor

	Under-investment		Under-hiring		Over-firing	
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Investor_Stability $_{t-1}$	-0.066***	-0.063***	-0.097***	-0.094***	-0.003	0.001
	(-3.97)	(-3.76)	(-4.58)	(-4.44)	(-0.12)	(0.02)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effects	No	Yes	No	Yes	No	Yes
Observations	29,992	29,992	21,727	21,727	8,265	8,265
Adjusted R^2	0.16	0.16	0.19	0.19	0.09	0.09

Table 4. Moderating effect of labor adjustment costs

This table presents the impact of institutional investment horizon on abnormal net hiring for firms facing high labor adjustment costs (LACs) versus firms facing low LACs. In Panel A, we proxy for LACs using firms' reliance on skilled labor (*Labor_Skill*). For each year, we define firms in the top (bottom) 30th percentile of *Labor_Skill* as high (low) LACs firms. In Panel B, we proxy for LACs using the strength of wrongful discharge laws (*WDL*) in the state where a firm is headquartered. For each year, we define firms with a *WDL* score of 3 (i.e., firms in states that recognize all three exceptions) as high LACs firms and those with a *WDL* score of 0 (i.e., firms in states that recognize none of the exceptions) as low LACs firms. The last row reports the p-values of the *F*-tests for differences in the coefficients on *Investor_Stability* for the two subsamples of high and low LACs firms. All regressions include year and industry fixed effects. All variables are defined in Appendix A. The *t*-statistics in parentheses are based on robust standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Proxy for LACs: Reliance on skilled labor

	Whole Sample		Over-investment		Under-investment	
Variables	High LACs (1)	Low LACs (2)	High LACs (3)	Low LACs (4)	High LACs (5)	Low LACs (6)
Investor_Stability $_{t-1}$	-0.248***	-0.060	-0.373***	-0.050	-0.111**	-0.014
	(-4.14)	(-1.33)	(-3.61)	(-0.67)	(-2.16)	(-0.42)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,502	7,515	2,827	3,072	3,675	4,443
Adjusted R^2	0.19	0.17	0.19	0.20	0.24	0.13
p-value (*F*-test of equal coefficient estimates on Investor_Stability)	(0.01)		(0.01)		(0.12)	

Panel B. Proxy for LACs: Wrongful discharge laws

	Whole Sample		Over-investment		Under-investment	
Variables	High LACs (1)	Low LACs (2)	High LACs (3)	Low LACs (4)	High LACs (5)	Low LACs (6)
Investor_Stability $_{t-1}$	-0.124***	-0.025	-0.192***	0.012	-0.052	-0.045
	(-3.18)	(-0.71)	(-3.07)	(0.19)	(-1.44)	(-1.29)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,313	5,186	4,745	2,159	6,568	3,027
Adjusted R^2	0.16	0.14	0.18	0.17	0.21	0.12
p-value (*F*-test of equal coefficient estimates on Investor_Stability)	(0.06)		(0.02)		(0.89)	

Table 5. Alternative proxies for the expected level of net hiring

This table presents the results of robustness tests in which we replicate our main analysis using several alternative measures of expected net hiring. In all models, we regress *Abnormal_Net_Hiring* on *Investor_Stability* and the control variables. In Model 1, we estimate expected net hiring using the Pinnuck and Lillis (2007) model with industry and year fixed effects. In Model 2, we estimate expected net hiring using the Pinnuck and Lillis (2007) model after adding time effects and replacing the industry dummies with firm fixed effects. In Model 3, we estimate expected net hiring using the Pinnuck and Lillis (2007) model controlling for year, firm, and state fixed effects as well as four additional controls. In particular, we control for (a) *WDL,* which captures the time-variant state-level recognition of Wrongful Discharge Laws (Serfling, 2016); (b) *Labor_Skill,* which tracks the time-variant industry-level dependence on skilled labor; (c) Industry-level wages, measured as the logarithm of the mean annual wage in a firm's industry and (d) future industry sales growth, which captures the forward-looking prospects of the industry where a firm operates. In Model 4, we estimate expected net hiring using the Pinnuck and Lillis (2007) model controlling for firm, industry-year and state-year fixed effects. In Model 5, we estimate expected net hiring using the median investment in the firm's industry. Industries are defined using the Fama-French (1997) 48-industry classification. In Model 6, we measure expected net hiring using the firm's average investment in the previous three years. All regressions include year and industry fixed effects. All variables are defined in Appendix A. The *t*-statistics in parentheses are based on robust standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	P&L model with industry and year fixed effects	P&L model with firm and year fixed effects	P&L model with firm, year, and state fixed effects, & additional controls	P&L model with firm, industry-year, and state-year fixed effects	Expected Net Hiring = industry median	Expected Net Hiring = average in past 3 years
	(1)	(2)	(3)	(4)	(5)	(6)
Investor_Stability $_{t-1}$	-0.102***	-0.094***	-0.181***	-0.081***	-0.118***	-0.100***
	(-5.73)	(-5.40)	(-6.24)	(-4.69)	(-6.06)	(-3.53)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	51,414	51,414	21,985	51,414	51,414	26,882
Adjusted R^2	0.15	0.15	0.15	0.15	0.15	0.14

Table 6. Investor horizons and abnormal net hiring: The effect of other investments

This table reports the results for the effect of non-labor investments on the relation between institutional investment horizons and abnormal net hiring. We present the results for capital expenditures (Panel A), as well as R&D and acquisition expenditures (Panel B). In all models, we regress *Abnormal_Net_Hiring* on *Investor_Stability* and the control variables. Model 1 of each panel reports the results for the sub-sample of firms for which an increase (a decrease) in the non-labor investment in question is accompanied by a decrease (an increase) in net hiring (i.e., a negative relation between labor and non-labor investments). Model 2 reports the results for the sub-sample of firms for which an increase (a decrease) in the non-labor investment in question is accompanied by an increase (a decrease) in net hiring (i.e., a positive relation between labor and non-labor investments). Model 3 presents the results for the sub-sample of firms with a zero or missing value for the non-labor investment in question. In Model 4 (5) of Panel A, we present the results for a subsample of industries with an elasticity of substitution between capital and labor that is greater (less) than one. All regressions include year and industry fixed effects. All variables are defined in Appendix A. The *t*-statistics in parentheses are based on robust standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Capital expenditures

	Correlation between ΔCapex and ΔNet hiring			Elasticity of substitution between capital & labor	
	Negative (1)	Positive (2)	Zero (Capex zero or missing) (3)	Above unity (4)	Below unity (5)
Investor_Stability $_{t-1}$	-0.076**	-0.086***	0.231	-0.099***	-0.104***
	(-2.54)	(-3.51)	(1.10)	(-2.97)	(-4.89)
Controls	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	15,655	26,572	494	11,644	39,770
Adjusted R^2	0.12	0.17	0.14	0.12	0.16

Panel B. R&D and acquisition expenditures

	Correlation between ΔR&D and ΔNet hiring			Correlation between ΔAcquisitions and ΔNet hiring		
	Negative (1)	Positive (2)	Zero (R&D zero or missing) (3)	Negative (4)	Positive (5)	Zero (Acquisitions zero or missing) (6)
Investor_Stability $_{t-1}$	-0.079*	-0.083**	-0.082***	-0.111**	-0.083*	-0.065***
	(-1.84)	(-2.41)	(-3.30)	(-2.55)	(-1.74)	(-3.46)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,689	14,978	24,554	7,503	11,655	34,339
Adjusted R^2	0.15	0.20	0.13	0.09	0.24	0.11

Table 7. Controlling for alternative explanations: Corporate governance

This table reports the regression results on the impact of institutional investment horizons on abnormal net hiring, controlling for five firm-level corporate governance variables (based on Bhagat and Bolton, 2013). G-index is the Gompers et al. (2003) corporate governance index of 24 antitakeover provisions. E-index is the Bebchuck et al. (2009) managerial entrenchment index. Direct_Own is the natural log of the dollar value of common stock owned by the median director. Ind_Direct is the percentage of board members classified as independent. Duality is an indicator variable that takes the value of one if the CEO of the sample firm is also the board chair, and zero otherwise. Models 1−5 include each governance variable separately. Model 6 controls for all governance variables. All the other variables are defined in Appendix A. The *t*-statistics in parentheses are based on robust standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Variables	G-index (1)	E-index (2)	Direct_Own (3)	Ind_Direct (4)	Duality (5)	All (6)
Investor_Stability $_{t-1}$	-0.176*** (-3.05)	-0.178*** (-3.05)	-0.158*** (-2.82)	-0.171*** (-3.06)	-0.170*** (-3.04)	-0.159*** (-2.79)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,883	5,883	6,146	6,304	6,331	5,813
Adjusted R^2	0.14	0.14	0.14	0.15	0.15	0.14

Table 8. Controlling for alternative explanations: Blockownership, managerial ownership and ability, and financial reporting quality

This table reports the regression results on the impact of institutional investment horizon on abnormal net hiring, controlling for block ownership, managerial ownership, managerial ability, and financial reporting quality. All variables are defined in Appendix A. The *t*-statistics in parentheses are based on robust standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent variable: Abnormal_Net_Hiring $_t$			
Variables	(1)	(2)	(3)	(4)
Investor_Stability $_{t-1}$	-0.089***	-0.182***	-0.091***	-0.090***
	(-4.68)	(-5.13)	(-5.41)	(-3.51)
Blockholders $_{t-1}$	-0.001			
	(-0.70)			
Managerial Ownership $_{t-1}$		-0.000		
		(-0.30)		
Managerial Ability $_{t-1}$			-0.045***	
			(-4.87)	
Financial Reporting Quality $_{t-1}$				-0.101**
				(-2.06)
Controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	46,019	17,122	50,898	27,896
Adjusted R^2	0.14	0.15	0.14	0.15

Table 9. Propensity score matching

This table presents the results of the propensity score matching used to test for the difference in abnormal net hiring between firms with above-median investor portfolio stability and matched firms with below-median investor portfolio stability. Specifically, we report the difference in average abnormal net hiring between firms with above-median *Investor_Stability* and firms with below-median *Investor_Stability* before and after the matching. We match firms on industry (Fama-French 48-industry classification), year, and all the control variables from our baseline specification. In Panel A, we use the nearest-neighbor matching technique (without replacement) with common support and a caliper constraint of 0.01. In Panel B, we use the radius matching technique with common support and a caliper constraint of 0.01. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Nearest-neighbor matching

	Before matching			After matching		
	Firms with above-median Investor_Stability (1)	Unmatched Firms with below-median Investor_Stability (2)	Difference in means (1) – (2) (3)	Firms with above-median Investor_Stability (4)	Matched Firms with below-median Investor_Stability (5)	Difference in means (4) – (5) (6)
Abnormal_Net_Hiring	0.114	0.132	-0.018***	0.114	0.126	-0.012***
Observations	25,707	25,707		19,685	19,685	

Panel B. Radius matching

	Before matching			After matching		
	Firms with above-median Investor_Stability (1)	Unmatched Firms with below-median Investor_Stability (2)	Difference in means (1) – (2) (3)	Firms with above-median Investor_Stability (4)	Matched Firms with below-median Investor_Stability (5)	Difference in means (4) – (5) (6)
Abnormal_Net_Hiring	0.114	0.132	-0.018***	0.114	0.124	-0.010***
Observations	25,707	25,707		25,707	25,707	

Table 10. Long-term investors: Indexers versus non-indexers

This table presents the results from regressions in which we classify long-term investor ownership into long-term non-indexer (dedicated) ownership and long-term indexer (quasi-indexed) ownership. We regress *Abnormal_Net_Hiring* on the percentage ownership of dedicated (*Dedicated Ownership*) and quasi-indexed (*Quasi-indexer Ownership*) investors. We report the results for the whole sample and the subsamples of over- and under-investing firms. Firms with over-(under-) investment in labor are those with positive (negative) abnormal net hiring. All regressions include year and industry fixed effects. In Models 2, 4, and 6, we also control for state fixed effects. All variables are defined in Appendix A. The *t*-statistics in parentheses are based on robust standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Whole sample		Over-investment		Under-investment	
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Dedicated Ownership $_{t-1}$	-0.071***	-0.072***	-0.091***	-0.095***	-0.033**	-0.031**
	(-4.26)	(-4.25)	(-3.06)	(-3.16)	(-2.13)	(-1.96)
Quasi-indexer Ownership $_{t-1}$	-0.081***	-0.080***	-0.076***	-0.080***	-0.066***	-0.062***
	(-5.43)	(-5.34)	(-2.95)	(-3.09)	(-4.82)	(-4.51)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effects	No	Yes	No	Yes	No	Yes
Observations	35,701	35,701	14,580	14,580	21,121	21,121
Adjusted R^2	0.16	0.16	0.18	0.18	0.16	0.17

Table 11. Identification strategy: The reconstitution of Russell indexes

This table reports the results from instrumental variable (IV) regressions using two-stage least squares (2SLS) estimations. The dependent variable in the first stage is the change in quasi-indexer ownership (*ΔQuasi-indexer Ownership*), which is calculated as the annual change in the fraction of shares held by quasi-indexer institutional investors in a firm, measured at the end of the first quarter after the reconstitution. The first two instruments for *ΔQuasi-indexer Ownership* are indicator variables equal to one if a stock switches from the Russell 1000 index to the Russell 2000 index ($R1000_{t-1} \rightarrow R2000_t$) or the Russell 2000 index to the Russell 1000 index ($R2000_{t-1} \rightarrow R1000_t$) at the annual Russell index reconstitution. The third instrument tracks the change in index rank from one year to another ($Rank_t - Rank_{t-1}$). The regressions in the second stage include the fitted values of *ΔQuasi-indexer Ownership* as well as all the control variables included in the first-stage regressions. The dependent variable in the second stage is the annual change in abnormal net hiring (*ΔAbnormal_Net_Hiring*). The IV regressions focus only on switchers around the threshold. The first regression includes firms that, in a given year, switched by at most 200 ranks between the two Russell indexes, whereas the second regression focuses only on firms that switched by at most 100 ranks. All regressions include year and industry fixed effects. In Panel A, we report the results using the same set of controls as in Schmidt and Fahlenbrach (2017). In Panel B, we also include the controls from our baseline specification (Eq. (6)) and the float adjusted market cap. *End-of-May Market Cap* is CRSP price (prc) multiplied by number of shares outstanding (shrout). *Float Adjustment* is the difference between the rank implied by the observed end-of-May CRSP market capitalization and the rank assigned by Russell in June (Crane et al., 2016). All the other variables are defined in Appendix A. F-statistic is the statistic from the F-test of the joint significance of the instruments in the first-stage regressions. J-statistic (p-value) is the p-value from the Hansen (J) test of instrument overidentification. The *t*-statistics in parentheses are based on robust standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Without original controls

	Dependent variable in 2nd stage: ΔAbnormal_Net_Hiring $_t$			
Variables	Switchers around the threshold (at most 200 ranks)		Switchers around the threshold (at most 100 ranks)	
	1st Stage	2nd Stage	1st Stage	2nd Stage
ΔQuasi-indexer Ownership $_t$		-2.461***		-2.525***
		(-4.25)		(-4.37)
$R1000_{t-1} \rightarrow R2000_t$	0.015***		0.036***	
	(3.06)		(3.71)	
$R2000_{t-1} \rightarrow R1000_t$	-0.015***		-0.021**	
	(-3.13)		(-2.54)	
$Rank_t - Rank_{t-1}$	-0.002***		-0.002***	
	(-7.11)		(-7.08)	
End-of-May Market Cap $_{t-1}$	-0.004***	-0.005**	-0.004***	-0.005**
	(-13.94)	(-2.30)	(-13.90)	(-2.42)
Return $_t$	-0.003***	-0.004	-0.003***	-0.003
	(-3.03)	(-0.59)	(-2.99)	(-0.54)
Return $_{t-1}$	-0.008***	-0.035***	-0.008***	-0.035***
	(-5.56)	(-5.22)	(-5.52)	(-5.23)
ROA $_{t-1}$	0.012***	-0.099***	0.012***	-0.097***
	(3.01)	(-4.09)	(3.11)	(-3.96)
ΔSize	0.017***	0.307***	0.017***	0.305***
	(6.77)	(13.14)	(6.77)	(13.03)
Original controls	No	No	No	No
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	18,980	18,980	18,745	18,745
F-statistic	21.45		23.22	
J-statistic (p-value)	0.16		0.31	

Panel B. With original controls

	Dependent variable in 2nd stage: ΔAbnormal_Net_Hiring $_t$			
Variables	Switchers around the threshold (at most 200 ranks)		Switchers around the threshold (at most 100 ranks)	
	1st Stage	2nd Stage	1st Stage	2nd Stage
ΔQuasi-indexer Ownership $_t$		-2.222***		-2.782***
		(-3.03)		(-3.40)
R1000 $_{t-1}$ $\rightarrow$ R2000 $_t$	0.016***		0.034***	
	(3.30)		(3.37)	
R2000 $_{t-1}$ $\rightarrow$ R1000 $_t$	-0.016***		-0.021**	
	(-3.10)		(-2.42)	
Rank $_t$ − Rank $_{t-1}$	-0.001***		-0.001***	
	(-4.60)		(-4.57)	
End-of-May Market Cap $_{t-1}$	-0.003***	-0.004**	-0.003***	-0.006**
	(-8.59)	(-2.03)	(-8.53)	(-2.46)
Return $_t$	-0.002*	0.002	-0.002*	0.000
	(-1.84)	(0.26)	(-1.83)	(0.06)
Return $_{t-1}$	-0.008***	-0.036***	-0.008***	-0.040***
	(-5.01)	(-4.85)	(-4.96)	(-4.83)
ROA $_{t-1}$	0.028***	0.017	0.028***	0.033
	(4.99)	(0.44)	(4.88)	(0.80)
ΔSize	0.015***	0.236***	0.016***	0.244***
	(5.22)	(9.62)	(5.26)	(9.32)
Float Adjustment $_{t-1}$	0.000	-0.000	0.000	-0.000
	(0.63)	(-0.30)	(0.74)	(-0.09)
Original controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	17,034	17,034	16,815	16,815
F-statistic	12.41		12.56	
J-statistic (p-value)	0.10		0.55	

Figure 1. Discontinuity in quasi-indexer ownership around the Russell 1000/2000 threshold

This figure plots the average end-of-September quasi-indexer ownership for the Russell 1000 and 2000 constituent firms over the 1991–2006 period. The sample includes the bottom 500 firms of the Russell 1000 and the top 500 firms of the Russell 2000. The *x*-axis represents the distance from the Russell 1000/2000 threshold as determined using the actual Russell assigned ranks within each index. The threshold represents the bottom (top) firm within the Russell 1000 (2000) index. Averages are calculated using bins of ten firms.