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Competitive pressure and firm investment efficiency: Evidence from corporate employment decisions

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Abstract

This study examines the link between product market competition and labour investment efficiency. We find that competitive pressure distorts the efficiency of corporate employment decisions by creating an underinvestment problem. This finding withstands a battery of robustness checks and remains unchanged after accounting for endogeneity concerns. Additional analysis shows that the relationship between product market competition and labour investment efficiency is stronger for firms facing higher competitive threats, greater financial constraints, higher information asymmetry and higher labour adjustment costs. Our results suggest that as competition increases

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bankruptcy risk, it leads managers to underinvest in labour to avoid incurring labour-related costs.

KEYWORDS
import tariffs, investment efficiency, labour investment, product market competition, risk exposure

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G31, G34, G38, M51

1 | INTRODUCTION

Understanding the determinants of corporate investment decisions has long been a central issue in corporate finance research. Since the irrelevance theorem of Modigliani and Miller (1958), an important stream of literature has shown that, under less restrictive capital market assumptions, firm real investment is relevant and is affected by various factors; see Hubbard (1998) and Stein (2003) for comprehensive literature reviews. Recently, a growing number of studies highlight the role of product market characteristics in shaping firm investment policies and asset returns (e.g., Aguerrevere, 2009; Gu, 2016; Stoughton et al., 2017). Following substantial changes in the U.S. competitive landscape,[1] some research focuses on how product market competition influences corporate investment. However, most of this literature examines firm investments in capital expenditure, research and development (R&D) and innovation (e.g., Akdoğu & MacKay, 2012; Frésard & Valta, 2016; Jiang et al., 2015). There is surprisingly little work on the effects of competition on firm investment in labour, an equally important factor of production. Indeed, labour-related costs exceed two-thirds of the economy-wide value added (Jung et al., 2014) and represent a significant portion of total production costs. For example, the U.S. Census Bureau's Annual Survey of Manufacturers shows that payroll and employee benefits in the manufacturing sector amounted to about $840 billion in 2017, relative to $169 billion in capital expenditures.[2] More importantly, human capital is considered an asset vital to firms, particularly to those operating in competitive and rapidly changing environments. Zingales (2000, p. 1642) remarks that '[…] increased competition at the worldwide level has increased the demand for process innovation and quality improvement, which can only be generated by talented employees'.

The present paper addresses this void in the literature by investigating the implications of product market competition for labour investment efficiency. The rationale behind our research question is twofold. First, although recent studies highlight the prominent role of product market competition in shaping firm R&D and capital investment decisions, the results and conclusions of such studies cannot be used to infer the impact on labour investment decisions. This is because capital and labour investments differ with respect to their adjustment costs, which represent an important driver of firm investment

[1]Many factors have contributed to changes in the U.S. competitive environment, including antitrust laws, deregulatory initiatives, import competition and economic globalization (e.g., Bloom et al., 2016; Irvine & Pontiff, 2009).
[2]These statistics are from https://www.census.gov/programs-surveys/asm/data/tables.html.

strategies.[3] Accordingly, the greater the difference between labour adjustment costs (LACs) and capital adjustment costs (CACs), the greater the difference in the impact of competition on labour and capital investment.[4] In addition, labour markets are highly regulated and strongly coordinated, making it costly for companies to undertake employment adjustments (Matsa, 2018). For example, many U.S. states have passed minimum wage laws and employment protection regulations, increasing the costs of hiring and retaining employees.

Second, labour investment presents unique characteristics that make it more subject to market frictions, leading to more inefficient behaviour. As an intangible asset, labour investment is hard to monitor as it often falls within the discretion of managers. Accordingly, it is characterized by more managerial private information than capital investment,[5] making it easier for managers to deviate from the optimal level of investment to the detriment of shareholder interests. To the extent that investment in labour requires high input costs, such as wages, costs of hiring, training, retaining and firing (e.g., Dube et al., 2010), managers may be reluctant to engage in costly labour-related activity, creating a potential underinvestment problem in labour. These arguments underscore the unique characteristics of labour and the importance of extending the literature by considering the impact of competition on firm employment decisions.

We develop and examine two competing views on the relation between product market competition and labour investment efficiency. The first view, known as the 'bright side' of product market competition, suggests that competitive pressure improves labour investment efficiency. The argument behind this conjecture is that competition acts as an effective tool to discipline managers and alleviate the divergence of interests between managers and shareholders (e.g., Hart, 1983; Nalebuff & Stiglitz, 1983; Schmidt, 1997). According to agency theory, such a divergence of interests is considered the major cause of inefficient management behaviour, which can take the form of empire-building through overinvestment or effort aversion through underinvestment (e.g., Jensen & Meckling, 1976; Jensen, 1986). Specifically, firm overinvestment in labour is reflected in either overhiring by expanding the number of staff beyond its optimal level or underfiring by retaining an unproductive workforce (e.g., Ghaly et al., 2020). Underinvestment in labour can also be caused by manager preference for the 'quiet life' and reluctance to expand investment in labour (Bertrand & Mullainathan, 2003), which results in an underhiring or overfiring problem. On the basis of the disciplinary effect of competition, we expect firms facing stiffer competitive pressures to undertake more efficient labour investment.

In contrast, the alternative view suggests that competitive pressure in the product market is negatively associated with labour investment efficiency due to the 'dark side' of competition. This view predicts that firms facing greater product market competition may either underinvest or overinvest in labour, following two different mechanisms. First, to the extent that competition impinges on a firm's expected profits (e.g., Tirole, 2010) and exposes the firm to risk of

[3]The literature on investment dynamics shows that corporate investments respond slowly to shocks, such as uncertainty shocks, due to factor adjustment costs. However, LACs appear to be substantially lower than CACs (e.g., Bloom, 2009; Shapiro, 1986).

[4]In additional analysis (see our online Supporting Information Appendix and Table S5), we provide empirical support for the argument that the difference between LACs and CACs leads to a more pronounced effect of competition on labour investment.

[5]Rampini and Viswanathan (2013) further explain that investment decisions in physical assets suffer less from agency and information asymmetry problems, due to the availability of more detailed information about such assets, which makes it harder for managers to hide opportunistic behaviour.

predation (Bolton & Scharfstein, 1990), it increases the firm's liquidation and default risk (Schmidt, 1997; Valta, 2012) as well as managerial concerns about short-term performance (Stein, 1988). Such unfavourable circumstances might exacerbate myopic managerial behaviour, incentivizing risk-averse managers to engage in short-term actions to avoid depressing short-term earnings. Indeed, several studies show that, due to increased risk arising from competitive pressure, firms face higher costs of bank debt (Valta, 2012) and resort to conservative financial policies (MacKay & Phillips, 2005; Hoberg et al., 2014; Xu, 2012). In the same vein, Porter (1992) argues that managers may also respond to the risk-increasing effect of competition by delaying investment projects whose costs can distort current performance. This argument suggests that companies facing intense competition tend to reduce investment in labour (i.e., by overfiring or underhiring), as labour investment requires high input costs that could significantly depress short-term earnings.

Instead of reducing investment in labour, managers may respond to competitive pressure by overinvesting in labour, for two main reasons. First, due to competitive threats from rivals, managers may have incentives to demonstrate a strong commitment to fair treatment of stakeholders, which enhances their reputation in the debt market and enables them to raise funds at better terms. Managers can accomplish this by overhiring employees, a key stakeholder and improving their welfare, for example, through underfiring employees and increasing their job security, satisfaction and motivation. On the contrary, competitive pressure may induce myopic managers to protect their private benefits in the short run by engaging in unethical behaviour, such as earnings management and tax avoidance (e.g., Gokalp et al., 2017; Lee & Liu, 2016; Wang & Winton, 2012). Another tool by which managers may engage in such activity is to overinvest in labour, as this would allow them to collude with employees to extract private benefits (e.g., Bertrand & Mullainathan, 2003; Pagano & Volpin, 2005). In sum, we hypothesize that, due to the risk-increasing effect of competition and its implications for managerial incentives, product market competitive pressure decreases labour investment efficiency by creating both underinvestment and overinvestment incentives.

To test these competing hypotheses, we use a recently proposed proxy for product market competition, product market fluidity (FLUIDITY). Developed by Hoberg et al. (2014), FLUIDITY is a text-based measure of competitive threats that reflects the similarity between a firm's products and overall change in rivals' products. As for our main dependent variable, we follow recent studies (e.g., Ben-Nasr & Alshwer, 2016; Jung et al., 2014) and create an inverse measure of labour investment efficiency, abnormal net hiring (|AB_NET_HIRE|). This variable is defined as the absolute deviation of actual net hiring from its optimal level. As in prior research (e.g., Benmelech et al., 2011; Ellul et al., 2018), we measure actual net hiring as percentage change in the number of employees. The optimal level of net hiring is then estimated using a model that explains the change in a firm's labour force as a function of an extensive list of underlying economic fundamentals. Simply put, |AB_NET_HIRE| reflects the amount of labour investment that is not predicted by the economic fundamentals in a model of optimal labour demand. Our estimation approach builds on the literature on capital investment (e.g., Biddle et al., 2009; Richardson, 2006) and labour investment (e.g., Ben-Nasr & Alshwer, 2016; Khedmati et al., 2019). Specifically, we follow the latter strand of research and use the comprehensive labour demand model of Pinnuck and Lillis (2007) to estimate optimal net hiring. As a sensitivity analysis, we consider alternative definitions of optimal labour investment and add to the Pinnuck and Lillis model several factors deemed closely related to firms' net hiring practices.

Using U.S. data over the period 1998–2017, our empirical analysis shows strong evidence that product market competition negatively influences firms' labour investment efficiency. The market competition effect is not only statistically significant, but also economically important. An increase in the intensity of competition (FLUIDITY) from the first to third quartiles is associated with an increase in the deviation of actual net hiring from its optimal level by about 8%. This finding is consistent with our alternative hypothesis and the 'dark side' view of competition. We also provide evidence on the specific forms of efficiency in labour investment that product market competition is likely to distort. Consistent with our prediction, we find that product market competition exacerbates underinvestment problems, particularly underhiring and overfiring.

A major concern in our study is the possibility that the relation between product market competition and labour investment efficiency could be driven by endogeneity arising from omitted variables or reverse causality. We take great care to address this concern by (1) applying the propensity score matching (PSM) technique to ensure that our findings are not driven by confounding effects due to observable covariates and (2) rerunning our analysis in a quasi-natural experimental setting, using large import tariff reductions as an exogenous source of variation in competitive pressure. As suggested by Frésard (2010), softening of trade barriers and reduced tariff rates facilitate penetration by foreign rivals, triggering intensified foreign competitive pressure on firms. To exploit this exogenous shock, we use U.S. trade data for the manufacturing sector and identify large reductions in tariff rates as trade liberalization events. The results from this analysis are consistent with our main inference. In further analysis, we alleviate omitted-variable bias by introducing additional control variables. We also provide evidence of a direct association between competition and labour investment efficiency by showing that our results are not simply driven by other nonlabour investments, such as R&D and capital investment.

We next investigate how the relation between product market competition and labour investment efficiency varies in the cross-section of the sample firms. To the extent that the risk-increasing effect of competition prompts managers to reduce investment, this effect should vary, depending on the degree of competitive pressure, financing constraints, information asymmetry and labour-related costs faced by firms. In the first set of cross-sectional tests, we investigate the role of firm exposure to competitive threats. We conjecture that greater exposure to competitive pressure increases firms' inability to cope with external competitive threats, which, in turn, exacerbates the risk-increasing effect of product market competition (S. Li & Zhan, 2019; Valta, 2012). Consistent with this prediction, our results show that labour investment reacts more strongly to competition for firms with weaker market share, as such firms are less able to fight off competitive threats. We find similar patterns for undiversified firms, which have less ability to spread risk across multiple segments and, thus, are less protected from competitive pressure.

In further cross-sectional analysis, we examine the impact of product market competition on labour investment efficiency, conditional on the severity of financial constraints. Financial constraints are a major impediment to investment and growth, as they limit firm access to external financing and expose firms to aggressive competitive strategies adopted by financially stronger rivals (Bolton & Scharfstein, 1990; Campello, 2006). Therefore, we expect product market competition to play a more important role in discouraging firm investment in labour under binding financial constraints. Using conventional measures of financial constraint, we find that the relation between product market competition and labour investment efficiency is more pronounced for more financially constrained firms, consistent with our expectation.

Next, we investigate the role of information asymmetry in shaping the relation between product market competition and labour investment efficiency. Information asymmetry is likely to make it costlier for firms to obtain external financing, thus limiting their ability to fight competition and imposing a greater competitive risk on them. Accordingly, one would expect asymmetric information to increase firm sensitivity to the risk-increasing effect of product market competition, which is likely to distort labour investment efficiency. Using several proxies for information asymmetry, we find consistent evidence that intensified competition exacerbates abnormal net hiring in firms facing more severe information asymmetry problems.

Our fourth cross-sectional test exploits the fact that firms face varying LACs, which affect their ability to maintain labour investment efficiency. Specifically, we examine whether the effect of product market competition on abnormal net hiring is more pronounced for firms with higher LACs. We find that the negative impact of competition on labour investment efficiency is indeed stronger for firms with greater dependence on skilled labour and firms in highly un-ionized industries, that is, those facing high LACs. Taken together, our analyses provide corroborating evidence that the relation between product market competition and labour investment efficiency, particularly underinvestment, arises from the risk-increasing effect of competition, as this relation is more pronounced among firms facing greater competitive pressure, tighter financing constraints, severe information asymmetries and higher LACs.

Finally, we shed light on the issue of whether the documented impact of competition on labour investment can be directly inferred from existing work on the relation between competition and nonlabour investment (capital investment). We specifically examine whether the differences between LACs and CACs can impact the relation between competition and labour investment efficiency. Our results are consistent with the notion that the risk-increasing effect of competition is not homogeneous across all types of investment and that it is particularly pronounced for investment types that have higher adjustment costs. These findings further highlight the necessity of extending the literature on the link between competition and capital investment to labour investment.

This study contributes to the literature in several respects. First, we add to research on product market competition by demonstrating the important role of this industry-level factor in shaping firm investment in human capital. The literature shows that competitive pressure can influence myriad corporate decisions and outcomes, including disclosure (X. Li, 2010; Lin & Wei, 2014), earnings management (Datta et al., 2013; Markarian & Santalo, 2014), capital structure and cash holdings (Chi & Su, 2016; Lyandres & Palazzo, 2016; Xu, 2012), investment in capital expenditure, R&D, innovation and corporate social responsibility (Akdoğu & MacKay, 2012; Flammer, 2015; Frésard & Valta, 2016; Jiang et al., 2015), firm performance and productivity (Dasgupta et al., 2018) and stock price crash risk (S. Li & Zhan, 2019). This paper shares a focus similar to studies that analyze the effect of competition on investment decisions. Nevertheless, we extend this line of research by documenting novel evidence of the impact of product market competition on labour investment decisions.

This study also informs an interesting and ongoing debate in the literature on the pros and cons of product market competition. Our finding that competitive threats distort labour investment efficiency provides empirical support for the 'dark side' view of competition. Indirectly, our evidence is consistent with the view that competition increases firm default risk and exposes firms to predation from rivals (Valta, 2012), which could, in turn, fundamentally affect their operating decisions (e.g., Akdoğu & MacKay, 2012; Frésard & Valta, 2016). We complement this strand of literature by showing that the risk-increasing effect of competitive pressure also has implications for labour investment decisions, over and above those for nonlabour investments.

Finally, we add to a growing strand of literature on the determinants of labour investment behaviour, much of which focuses on determining factors at the firm, investor and executive levels, including firm financial constraints (Benmelech et al., 2011), financial reporting quality (Jung et al., 2014), stock price informativeness (Ben-Nasr & Alshwer, 2016), ownership structure (Hall, 2016), political connections (Faccio & Hsu, 2017), CEO–director ties (Khedmati et al., 2019) and institutional investors (Ghaly et al., 2020). In focusing on the factors that influence labour decisions, prior research pays less attention to product market characteristics. We contribute to this stream of research by examining whether and how labour investment is influenced by an important industry-level factor, product market competition. To the best of our knowledge, the present study is the first to explicitly address this issue.

Our findings have important policy implications for practitioners and policymakers seeking to improve labour investment efficiency, which has become an increasingly prominent issue, particularly in the face of important recent events. For example, the onset of the COVID-19 pandemic has significantly affected firm employment decisions. Although this crisis has negatively affected many industries, it has strongly impacted the small- and medium-sized enterprise sector, an important driver of job creation in the U.S., employing nearly 50% of the U.S. labour force. Indeed, the pandemic has caused a dramatic surge in the unemployment rate, from 3.6% in January 2020 to 14.7% in April 2020, according to the U.S. Bureau of Labour Statistics. This situation is very harmful to companies where labour is a crucial factor of production. Bretscher et al. (2020) document evidence of a strong negative effect of the COVID-19 crisis on firm financial performance, particularly in labour-intensive industries. Our paper highlights one cause of the downward shift in labour demand, intensification of industry competitive pressure. Understanding the causes of the shift in labour investment decisions is important as it enables regulators to design and implement policies to limit the harm from labour market disruptions. Accordingly, our finding that labour investment efficiency is significantly affected by industry dynamics underscores an urgent need for appropriate policies to focus on human capital when economic crises and other external shocks have an industry-wide dimension.

Moreover, this paper provides a timely contribution to the debate on globalization, which has been gaining increasing attention, particularly due to uncertainty surrounding recent trade frictions among the United States, European Union, China and several Asia-Pacific countries (Charoenwong et al., 2020). Our results show that intensification of competition in U.S. product markets due to globalization of business activities (e.g., in the form of large reductions in import tariff rates) reduces labour investment efficiency by creating labour underinvestment. However, the severity of this underinvestment depends on several factors, including the vulnerability of companies to competitive threats, the magnitude of their LACs and their degrees of financial constraint and asymmetric information. In light of increased geopolitical tension and a potential trend of deglobalization in recent years, it is critically important that corporate managers make careful labour investment decisions on the basis of all relevant available information.

This paper proceeds as follows. Section 2 discusses the arguments that link product market competition to labour investment efficiency and develops our testable hypotheses. Section 3 describes the data and defines the variables used in the empirical analysis. Section 4 discusses the empirical evidence. Section 5 presents the results of robustness tests. Sections 6 and 7 report additional cross-sectional test results. Finally, Section 8 sets forth our conclusions.

2 | LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 | Bright and dark sides of product market competition

The literature describes both the pros and cons of product market competition. The 'bright side' view of competition suggests that competitive pressure can help alleviate agency conflicts arising from the separation of ownership and control (e.g., Hart, 1983; Schmidt, 1997).[6] To the extent that product market competition reduces firm profit margins, it compels managers to work more diligently by avoiding self-serving activities and opportunistic behaviour, thus aligning their interests with those of shareholders. Moreover, as firms facing higher competition are typically exposed to a greater threat of liquidation, they have fewer opportunities to engage in wasteful expenditure. This increased liquidation threat motivates managers to work more effectively and efficiently (Schmidt, 1997). The intuition behind this argument is that if managers do not keep costs down and improve operational efficiency, profit margins will decline due to intense competition and firms will find it difficult to survive the competitive struggle. A growing body of empirical literature supports this argument, showing that competition acts as an effective external governance mechanism in determining various firm financial policies (Ammann et al., 2013; Bharath & Hertzel, 2019; Boubaker et al., 2018; Chhaochharia et al., 2017; Giroud & Mueller, 2010; 2011; Knyazeva & Knyazeva, 2012; Sassi et al., 2019).

From a related perspective, the increased number of firms in a competitive industry provides managers and investors with additional information about rivals' performance. Such information can then serve as a benchmark to evaluate the ability and effort provided by managers through peer comparison (Holmström, 1982; Nalebuff & Stiglitz, 1983). Indeed, Fee and Hadlock (2000) provide evidence that competition increases chief executive officer turnover, especially when firms underperform their rivals. Dasgupta et al. (2018) show that firm performance and productivity improve after a forced turnover. Thus, there is evidence that the pressure effect of competition can help mitigate managerial inefficiency by prompting managers to reduce costs and improve quality (Baggs & de Bettignies, 2007), engage in corporate social responsibility (Flammer, 2015) and invest sooner to preempt rivals in a high-growth environment (Jiang et al., 2015).

However, the 'dark side' view of competition argues that competitive pressure in product markets is likely to jeopardize a firm's survival and exacerbate its default risk. As firms in competitive markets are constantly struggling for customers and market share, they face uncertainty about their future performance. Indeed, Tirole (2010) explores theoretically the 'profit destruction' effect of product market competition. According to Tirole's analytical model, competition reduces market power and drives down profit margins, which in turn shrinks pledgeable income and exacerbates the difficulty in raising external funds. The resulting limited access to external financing may hinder firms' ability to finance investment projects and lead them to lose investment opportunities to rivals. A related body of research shows that financially stronger firms can increase investment to gain market share at the expense of financially weaker rivals (i.e., those unable to finance investments with internally generated funds), thus driving them out of business (Bolton & Scharfstein, 1990; Campello, 2003, 2006; Chevalier, 1995). In a similar vein, Porter (1992) studies three broad determinants of investment: the macroeconomic environment, capital allocation mechanisms and project-specific conditions, with the

[6]Shleifer and Vishny (1997, p. 738) maintain that 'product market competition is probably the most powerful force towards economic efficiency in the world'.

latter related to payoffs from a new investment. Porter argues that these payoffs depend largely on the competitive position of the investing firm, suggesting that competition erodes investment gains. Overall, this strand of research shows that product market competition is likely to expose firms to higher risk of bankruptcy by lowering expected profits and increasing predatory threats from rivals. Empirical studies provide evidence in favour of the risk-increasing effect of competition, showing that intense competition exacerbates idiosyncratic fluctuations (e.g., Gaspar & Massa, 2006; Irvine & Pontiff, 2009), increases the cost of debt (Xu, 2012) and induces firms to adopt hedging strategies to reduce risk exposure (Haushalter et al., 2007).

The increased threat of bankruptcy arising from competition has important implications for managerial decision-making, as it pushes risk-averse managers to opt for more conservative financial decisions. Empirical studies support this argument. For instance, Xu (2012) finds that competitive pressure from foreign rivals leads firms to decrease leverage through greater equity issuance and asset sales. Similarly, MacKay and Phillips (2005) and Hoberg et al. (2014) document evidence of conservative capital structure and payout decisions in highly competitive industries. Frésard and Valta (2016) show that firms significantly decrease capital and R&D investment in response to increased entry threats. Lyandres and Palazzo (2016) find that firms tend to hold more cash when facing intense competition, in an attempt to invest more in innovation and deter rivals from making similar investments. Overall, such conservative financial strategies are likely to allow firms to escape the risk-increasing effect of competition.

2.2 | Hypotheses

On the basis of our review of the implications of product market competition for corporate behaviour, we develop two competing hypotheses regarding the impact of competitive threats on firm employment decisions. First, consistent with the 'bright side' view, we hypothesize that product market competition helps improve labour investment efficiency. To the extent that competition serves as an effective external governance mechanism, we expect it to reduce agency conflict associated with labour investment choices, which can arise from overinvestment or underinvestment. Previous research shows that opportunistic managers may engage in empire-building through overinvestment. In terms of labour decisions, such managers may engage in expansion activities that exceed their optimal employment levels by overhiring new workers (Williamson, 1963). Another example of labour overinvestment is the reluctance of self-interested managers to divest unprofitable investments, such as an unproductive workforce (i.e., underfiring), as such divestment decisions could damage their reputation (Boot, 1992; Jensen, 1986). Another form of agency problem is underinvestment in labour. This problem arises when entrenched managers are willing to pursue the 'quiet life' and avoid costly effort through underinvestment. Bertrand and Mullainathan (2003) argue that, in anticipation of substantial investment-related costs, managers tend to forgo profitable investment projects for the sake of private benefits. Accordingly, the underinvestment problem may result in managers downsizing their labour force through underhiring and overfiring to minimize labour investment costs.

Overall, following the 'bright side' view of competition, we predict that competitive pressure in the product market that acts as an external disciplinary tool will mitigate suboptimal labour investment decisions. Put differently, firms benefiting from the governance role of product market competition are expected to invest in labour in a more efficient manner. This argument is consistent with recent empirical evidence that inefficient labour investment decisions can be deterred through effective disciplinary mechanisms, such as loss reporting (Pinnuck & Lillis, 2007) and long-term institutional investor monitoring (Ghaly et al., 2020). In sum, this line of reasoning leads to the following hypothesis:

H1a: Product market competition improves firm labour investment efficiency.

In contrast, following the 'dark side' view of competition, our competing hypothesis is that product market competition lowers labour investment efficiency by impacting managerial investment incentives.[7] This view suggests that firms facing greater product market competition are more likely to underinvest or overinvest in labour, following two different mechanisms. First, unlike firms with strong market power, those facing competitive pressure are not endowed with the ability to pass on idiosyncratic shocks to their customers. Due to the aggressive pricing strategies adopted by financially stronger rivals (Bolton & Scharfstein, 1990), firms are forced to drive prices down to the level of their marginal costs, which, in turn, reduces their profits and exposes them to higher liquidation risk (Schmidt, 1997). If a firm is financially constrained and has limited funds to invest, it runs the risk of being driven out of the market by financially stronger rivals (Bolton & Scharfstein, 1990). Froot et al. (1993) refer to this risk as *predation risk* and argue that the more interdependent firms' investment opportunities are within an industry, the greater the predation risk. Overall, dynamic interaction among firms in competitive markets could expose firms to severe predatory threats from rivals, resulting in higher bankruptcy risk.

Labour investment decisions provide an important avenue for managers to avoid bankruptcy risks arising from product market competition. To the extent that the benefits of labour investment are seen only in the long term, one could argue that managers, who are concerned about short-term survival, are likely to forgo costly investment in employees, leading to underhiring and/or overfiring. This argument is consistent with the idea that managers may sacrifice long-term interests by postponing investments to boost current earnings (Porter, 1992; Stein, 1988). In addition, the significant costs associated with human capital investment, such as the costs of hiring, firing and training, are substantial and, to an extent, irreversible (e.g., Ghaly et al., 2020). Campello et al. (2018) show that firms facing high labour-related costs due to the role of organized labour incur higher bankruptcy costs, which are detrimental to other corporate stakeholders. We argue that, to avoid incurring such costs, managers have incentives to reduce investment in labour as a way to avoid adversely affecting current corporate performance.[8] Empirically, there is consistent evidence that labour-related costs are an important factor shaping firm employment policies (e.g., Blatter et al., 2012; Dube et al., 2010). Overall, this line of argument suggests that the risk of default arising from competitive pressure may lead to underinvestment in labour.

On the contrary, competition may create an overinvestment problem in labour, for two main reasons. First, faced with competitive pressure, managers with short-term incentive horizons are likely to be more concerned about reputational loss. The premise behind this idea is that, as competition exposes firms to severe predatory threats from rivals (Bolton & Scharfstein, 1990), it pushes managers to engage in activities that improve their reputation, which will, in turn, enable them to obtain external financing at better terms to fend off

[7]Beiner et al. (2011) provide evidence that beyond a particular level of competitive pressure, competition no longer acts as a substitute for managerial incentive schemes and rather lowers firm values.

[8]As another example, Shleifer (2004) shows that firms facing higher competitive pressure tend to rely on child labour, as this labour practice is much cheaper than hiring adults.

predation (Holmström, 1982; Nalebuff & Stiglitz, 1983).[9] From this perspective, one would expect that managers facing competitive pressure signal to external investors their commitment to maximizing stakeholder welfare by, for example, hiring an excessive number of employees.[10] Second, product market competitive pressure may exacerbate corporate misconduct by inducing short-termist managers to engage in unethical behaviour to protect their private benefits. The presence of a large number of firms in a competitive industry facilitates evaluation of managers compared to rivals (Holmström, 1982; Nalebuff & Stiglitz, 1983). Consequently, managers are likely to be blamed for bad performance more often than they would if their firm operated in a noncompetitive industry. Previous research suggests that managers react to such concerns by painting a rosier picture of firm financial performance through several unethical activities, including aggressive earnings management (Lee & Liu, 2016; Markarian & Santalo, 2014; Mitra et al., 2013), financial misreporting (Wang & Winton, 2012) and illegal tax-minimizing methods (Gokalp et al., 2017). Another unethical manager behaviour is to overinvest in labour and collude with employees to extract private benefits. Indeed, several previous studies argue that, when managers face potential termination risk, they may pursue more security and power by overinvesting in labour. Such overinvestment practices can take the form of retaining (underfiring) an unproductive workforce (e.g., Bertrand & Mullainathan, 2003) and offering long-term labour contracts and paying high wages (Pagano & Volpin, 2005).[11] Consequently, one would expect managers to adopt similar overinvestment practices in the presence of competitive pressure as a way to protect their private benefits.

The above arguments suggest that competitive pressure may lead to both underinvestment and overinvestment in labour. Our alternative hypothesis is thus formulated as follows.

H1b: Product market competition lowers firm labour investment efficiency.

3 | DATA AND VARIABLES

3.1 | Sample selection

We consider a large sample of U.S. listed firms over the period 1998–2017.[12] We begin with all firms in the Compustat database for that period and collect data on the number of employees and firm financial characteristics. We also obtain data on firm stock returns from the Center for Research in Security Prices. To retrieve information on product market

[9]Previous studies argue that although firm reputation cannot be directly captured by financial statement variables, it is considered important 'soft information' that is highly valuable to capital providers (Anginer et al., 2016; Armitage & Marston, 2008; Cao et al., 2015; Smith et al., 2010).

[10]Attig et al. (2013) shed light on the importance of corporate social performance, including employee relations, for firms' credit ratings, suggesting that firms that comply with what is desired by society benefit from higher ratings and, hence, lower financing costs.

[11]Pagano and Volpin (2005) show the importance of labour–management alliances against takeover threats. The authors argue that workers are likely to act as 'shark repellents' thanks to their long-term employment contracts that make it harder for the raider to renegotiate wages and as 'white squires' for the incumbent managers by fighting and voting against the takeover in an attempt to protect their high wages.

[12]The data on product market competition from the Hoberg and Phillips Data Library are available only from 1997 onward and, as we use lagged variables, our sample period begins in 1998.

competition, we draw on the Hoberg and Phillips Data Library, which provides data on industry classifications, competition intensity and industry concentration, starting from 1997 (Chi & Su, 2016; Hoberg et al., 2014; S. Li & Zhan, 2019).[13] After merging data from these sources, we drop firms with missing information on any of our key variables. These restrictions result in a final sample of 22,962 firm-year observations corresponding to 3139 unique firms over the period 1998–2017.

3.2 | Regression variables

3.2.1 | Estimation of labour investment efficiency

Our main dependent variable reflects inefficiency in firm labour investment and captures the deviation of a firm's actual level of labour investment from its optimal level. To obtain this measure, we first proxy for the actual level of labour investment using firm net hiring, defined as the percentage change in number of employees from year t−1 to year t (Benmelech et al., 2011; Ellul et al., 2018; Pinnuck & Lillis, 2007). We then follow the literature on both capital and labour investment and define investment inefficiency in labour as the absolute difference between the actual level of labour investment and its optimal level (Ben-Nasr & Alshwer, 2016; Biddle et al., 2009; Ghaly et al., 2020; Jung et al., 2014; Khedmati et al., 2019; Richardson, 2006; Stoughton et al., 2017).

To proxy for the optimal level of labour investment, we employ a well-established approach from prior economics, finance and accounting studies, which typically models the optimal level of firm investment as a function of economic fundamentals. This approach involves extending (reduced-form) models of long-run equilibrium labour demand in the economics literature (e.g., Hamermesh, 1989), mainly by including additional firm-specific factors that determine firm net hiring practices (e.g., Ellul et al., 2018; Giroud & Mueller, 2017). As in recent studies of labour investment (e.g., Ben-Nasr & Alshwer, 2016: Jung et al., 2014: Khedmati et al., 2019), we rely particularly on the Pinnuck and Lillis (2007) labour demand model, which predicts normal net hiring practices based on an extensive list of industry- and firm-level factors that capture underlying economic fundamentals. This model is specified as follows:

$$\begin{aligned}\text{NET\_HIRE}_{it} = {} & a_0 + a_1\text{SALES\_GROWTH}_{it} + a_2\text{SALES\_GROWTH}_{i,t-1} + a_3\Delta\text{ROA}_{it} \\ & + a_4\Delta\text{ROA}_{i,t-1} + a_5\text{ROA}_{it} + a_6\text{RETURN}_{it} + a_7\text{SIZE\_R}_{i,t-1} + a_8\text{QUICK}_{i,t-1} \\ & + a_9\Delta\text{QUICK}_{i,t-1} + a_{10}\Delta\text{QUICK}_{it} + a_{11}\text{LEV}_{i,t-1} + a_{12}\text{LOSSBIN1}_{i,t-1} \\ & + a_{13}\text{LOSSBIN2}_{i,t-1} + a_{14}\text{LOSSBIN3}_{i,t-1} + a_{15}\text{LOSSBIN4}_{i,t-1} \\ & + a_{16}\text{LOSSBIN5}_{i,t-1} + \text{Industry dummies} + \varepsilon_{it},\end{aligned} \tag{1}$$

where NET_HIRE is percentage change in number of employees; SALES_GROWTH is percentage change in firm total sales; ROA is firm profitability, defined as the ratio of net income

[13]The Hoberg and Phillips Data Library is available at http://hobergphillips.tuck.dartmouth.edu.

to total assets at the beginning of the year; RETURN is total stock return over the past 12 months; SIZE_R is percentile rank of firm size; QUICK is the ratio of cash and short-term investments plus receivables to current liabilities; LEV is the ratio of debt in current liabilities plus total long-term debt to total assets; LOSSBIN1 through LOSSBIN5 are five dummy variables that indicate losses ranging between zero and −0.025, where each variable refers to a specific loss interval of 0.005 (i.e., LOSSBIN1 equals 1 if ROA ranges between zero and −0.005, LOSSBIN2 equals 1 if ROA ranges between −0.005 and −0.010, etc.); and 'Industry dummies' are industry-fixed effects, intended to capture time-invariant (unobserved) industry-specific characteristics that could influence labour investment. Descriptive statistics of these variables are reported in Appendix Table S1.

We estimate Equation (1) and consider the resulting fitted values of NET_HIRE as the estimate of a firm's optimal level of firm labour investment, which we refer to as EXPECTED_NET_HIRE (see Appendix Table S2 for details on the results of this regression). We then calculate our main measure of labour investment inefficiency (|AB_NET_HIRE|) as the absolute difference between the actual and expected levels of labour investment. More specifically, we define |AB_NET_HIRE|as follows:

$$|AB\_NET\_HIRE| = |NET\_HIRE - EXPECTED\_NET\_HIRE|. \quad (2)$$

In sum, our measure of abnormal net hiring captures inefficiency in labour investment as it reflects the remaining amount of labour investment unexplained by the underlying economic factors in model (1). In Appendix Table S3, we further examine the relation of this measure with firm value and operating performance. The results indicate that firms with higher abnormal net hiring are likely to perform poorly, providing empirical support for the validity of our measure of labour investment inefficiency. To further reinforce the reliability of our inference, we conduct a battery of robustness checks by considering several modifications of the Pinnuck and Lillis (2007) model, as well as alternative proxies for the optimal level of net hiring.

3.2.2 | Product market competition measure

We use product market fluidity (FLUIDITY) as a proxy for the intensity of competition; this is a text-based measure developed by Hoberg et al. (2014) and is available online at the Hoberg and Phillips Data Library.[14] FLUIDITY reflects the competitive pressure the incumbent firm faces from rivals' product market threats. It, therefore, captures the extent to which a firm's product market space changes due to rivals' competitive behaviour. By making their products similar to an incumbent firm's own products by entering the latter's product mix, rivals can exert greater competitive pressure on the incumbent firm.

Hoberg et al. (2014) rely on 10-K filings to collect data on firm product descriptions. For each firm-year, these authors construct a vector of all the words a firm uses to describe its own products. They then compare this vector to another vector that identifies change in the overall use of vocabulary of all other rivals between year $t-1$ and year t. FLUIDITY is the result of this comparison; it is defined as the cosine similarity between a firm's own vector of words and the

[14]Data on product market competition are available at http://hobergphillips.tuck.dartmouth.edu.

change in rivals' vector of words. A higher value of FLUIDITY implies a greater change in rivals' words compared to words similar to the firm's own words. This change indicates that rivals are adopting aggressive competitive behaviour by either converging toward the incumbent firm's products or differentiating themselves for better product quality and better market opportunities. Overall, greater fluidity translates as a higher competitive threat and, thus, a higher intensity of product market competition.

The FLUIDITY measure offers a number of advantages for our empirical analysis of the impact of competition on labour investment efficiency. Unlike traditional industry concentration measures, which reflect intensity of competition at the industry level, FLUIDITY is an ex-ante measure that captures product market competitive threats at the firm level.[15] In addition, it is highly representative of rivals' competitive actions, which are relevant to incumbent firm decisions. Importantly, as this measure captures competitive threats related to the movements of rivals, it is likely to be exogenous to a firm's internal policies and decisions. Given these advantages, several recent studies use FLUIDITY to examine the impact of competition on corporate decisions (e.g., Chi & Su, 2016; Hoberg et al., 2014). We follow these studies by using FLUIDITY to investigate how product market competition influences firm labour investment decisions. Nevertheless, we also conduct robustness checks using alternative measures that capture different dimensions of product market competition, including industry concentration and market power.

3.2.3 | Control variables

Following the literature (e.g., Ben-Nasr & Alshwer, 2016; Biddle et al., 2009; Jung et al., 2014), we use a number of control variables shown to affect labour investment efficiency: (1) MTB, market value of common equity scaled by shareholder equity; (2) SIZE, natural logarithm of total assets; (3) QUICK, ratio of cash and short-term investments plus receivables to current liabilities; (4) LEVERAGE, ratio of debt in current liabilities plus total long-term debt to total assets; (5) DIVDUM, dummy variable that takes the value 1 if a firm pays common dividends and zero otherwise; (6) STD_CFO, standard deviation of firm cash flows from operations over the past 5 years; (7) STD_SALES, standard deviation of firm sales over the past 5 years; (8) TANGIBLE, ratio of net property, plant and equipment to total assets; (9) LOSS, dummy variable that takes the value 1 if the firm's ROA is negative and zero otherwise; (10) STD_NET_HIRE, standard deviation of firm net hiring over the past 5 years; (11) LABOR_INTENSITY, ratio of number of employees to total assets; and (12) |AB_INVEST_OTHER|, absolute value of the residual from the regression of other investments on sales growth. Appendix A provides detailed variable definitions and data sources.

[15] Hoberg and Phillips (2016) develop another measure of competition, namely, the total similarity score (TSIMM). However, while FLUIDITY is an ex-ante measure that captures the threats from a firm's product market rivals due to the change in their product descriptions, TSIMM is an ex-post measure that reflects existing competitive pressure through the similarity between a firm's product descriptions and those of its existing industry peers. Hence, we prefer to adopt FLUIDITY in our main analysis, although we also use TSIMM in robustness checks.

3.2.4 | Model specification

To investigate the impact of product market competition on firm labour investment efficiency, we estimate the following model:

$$
\begin{aligned}
|\text{AB\_NET\_HIRE}|_{it} = {} & \beta_0 + \beta_1 \text{FLUIDITY}_{i,t-1} + \beta_2 \text{MTB}_{i,t-1} + \beta_3 \text{SIZE}_{i,t-1} + \beta_4 \text{QUICK}_{i,t-1} \\
& + \beta_5 \text{LEV}_{i,t-1} + \beta_6 \text{DIVDUM}_{i,t-1} + \beta_7 \text{STD\_CFO}_{i,t-1} + \beta_8 \text{STD\_SALES}_{i,t-1} \\
& + \beta_9 \text{TANGIBLE}_{i,t-1} + \beta_{10} \text{LOSS}_{i,t-1} + \beta_{11} \text{STD\_NET\_HIRE}_{i,t-1} \\
& + \beta_{12} \text{LABOR\_INTENSITY}_{i,t-1} + \beta_{13} \mid \text{AB\_INVEST\_OTHER} \mid_{i,t-1} \\
& + \text{Industry dummies} + \text{Year dummies} + \varepsilon_{it},
\end{aligned} \tag{3}
$$

where subscripts i and t represent firm i and year t, respectively. As discussed in detail above, |AB_NET_HIRE| is our main proxy for labour investment inefficiency and captures the deviation of actual net hiring from its optimal level, while FLUIDITY is our main proxy for product market competitive threats. MTB, SIZE, QUICK, LEV, DIVDUM, STD_CFO, STD_SALES, TANGIBLE, LOSS, STD_NET_HIRE, LABOR_INTENSITY and |AB_INVEST_-OTHER|are firm-level characteristics, as described above. Throughout our empirical analysis, all variables are winsorized at the first and 99th percentiles to minimize the effect of outliers. Our model also includes industry- and year-fixed effects to control for the remaining variation in labour investment efficiency due to cross-industry and time differences. In particular, use of industry-fixed effects helps reduce time-invariant unobserved industry bias.

We do not include firm-fixed effects in our baseline model specification, as firm-fixed-effects regressions may fail to detect relationships in the data when the explanatory variable is persistent (e.g., Chi & Su, 2016; Hoberg et al., 2014; Kjenstad et al., 2018; Platt, 2020). Indeed, our independent variable (FLUIDITY) varies little over time for a given firm. Hoberg et al. (2014) provide evidence that firms are likely to remain in the same fluidity quintile over the 1-, 3- and 6-year horizons. The persistence of competition over time is supported by many studies investigating the impact of competitive pressure on firm-level outcomes, such as payout decisions (Hoberg et al., 2014), cash holding decisions (Chi & Su, 2016), financing decisions (Kjenstad et al., 2018) and cost of debt (Platt, 2020). In unreported analysis, we provide further empirical evidence of the persistence of FLUIDITY by performing a regression of FLUIDITY on lagged FLUIDITY while controlling for year- and industry-fixed effects. The results consistently show that the coefficient on lagged FLUIDITY is positive, statistically significant and quite close to 1, implying that fluidity is indeed persistent over time.

3.3 | Summary statistics

Table 1 presents descriptive statistics of all variables used in our main analysis. Overall, our variables are similar in magnitude to those in previous studies (e.g., Biddle et al., 2009; Hoberg et al., 2014; Jung et al., 2014). For example, the mean (median) of our dependent variable, abnormal net hiring, is 0.109 (0.074), indicating that the average actual change in number of employees tends to deviate from its optimal level by about 11%. Previous papers show that the average deviation of actual net hiring from its expected level ranges between 11% and 15%

TABLE 1 Summary statistics

This table reports summary statistics for the variables used in our regressions. The sample comprises 22,962 observations for the period spanning 1998 through 2017. The list of variable definitions and data sources is provided in Appendix A.

Variable	*N*	Mean	SD	25th percentile	50th percentile	75th percentile
|AB_NET_HIRE|	22,962	0.109	0.112	0.033	0.074	0.146
FLUIDITY	22,962	6.777	3.527	4.198	6.106	8.620
MTB	22,962	3.267	2.800	1.363	2.325	4.034
SIZE	22,962	5.616	1.746	4.276	5.528	6.883
QUICK	22,962	2.432	2.114	0.982	1.648	3.107
LEV	22,962	0.151	0.167	0.000	0.093	0.260
DIVDUM	22,962	0.247	0.431	0.000	0.000	0.000
STD_CFO	22,962	0.088	0.082	0.033	0.058	0.107
STD_SALES	22,962	0.181	0.137	0.078	0.138	0.242
TANGIBLE	22,962	0.200	0.166	0.070	0.148	0.284
LOSS	22,962	0.357	0.479	0.000	0.000	1.000
STD_NET_HIRE	22,962	0.209	0.186	0.080	0.145	0.262
LABOR_INTENSITY	22,962	0.006	0.006	0.002	0.004	0.008
|AB_INVEST_OTHER|	22,962	0.124	0.080	0.063	0.117	0.165

(Ben-Nasr & Alshwer, 2016; Jung et al., 2014). In terms of product market competition, our main independent variable (FLUIDITY) has an average value of 6.777, with a standard deviation of 3.527. These figures are largely in line with those of Hoberg et al. (2014), implying that firms in our sample face relatively high product market threats from rivals. As for the other control variables, we find that our sample firms exhibit similar characteristics as those in related investment studies. In Appendix Table S4, we report pairwise correlation coefficients among the variables included in our regression, showing that FLUIDITY is significantly and positively correlated with |AB_NET_HIRE|. This preliminary evidence is consistent with the 'dark side' view of product market competition.

4 | EMPIRICAL EVIDENCE

4.1 | Regression results

Table 2 presents our baseline regression results, obtained by estimating Equation (3), for the whole sample (column (1)), as well as the overinvestment and underinvestment subsamples (columns (2) and (3), respectively). Across all models, we report ordinary least squares regression results, with standard errors clustered at the firm level. In column (1), the coefficient on FLUIDITY is positive and statistically significant at the 1% level, suggesting that the

TABLE 2 The effect of product market competition on abnormal net hiring

This table reports the results of the ordinary least square regressions of abnormal net hiring on product market competition and other firm characteristics for three subsamples: whole sample, overinvestment subsample that comprises firms for which the actual level of net hiring exceeds its optimal level (positive abnormal net hiring) and underinvestment subsample that comprises firms for which the observed level of net hiring is lower than its optimal level (negative abnormal net hiring). The list of variable definitions and data sources is provided in Appendix A. All reported absolute *t* values in parentheses are based on robust standard errors adjusted for heteroskedasticity and clustered at the firm level. *, ** and *** refer to significance at the 10%, 5% and 1% levels, respectively.

Variables	Abnormal net hiring |AB_NET_HIRE|	Overinvestment in labour (positive abnormal net hiring)	Underinvestment in labour (negative abnormal net hiring)
$FLUIDITY_{t-1}$	0.002***	0.001	0.002***
	(5.03)	(1.14)	(7.06)
MTB_{t-1}	0.001***	0.002***	0.001*
	(3.35)	(3.44)	(1.87)
$SIZE_{t-1}$	−0.003***	−0.003***	−0.002***
	(4.18)	(3.03)	(2.89)
$QUICK_{t-1}$	0.005***	0.005***	0.005***
	(9.18)	(5.21)	(9.00)
LEV_{t-1}	−0.005	−0.020**	0.012**
	(0.88)	(2.17)	(1.99)
$DIVDUM_{t-1}$	−0.006***	−0.007*	−0.001
	(3.01)	(1.92)	(0.41)
STD_CFO_{t-1}	0.139***	0.086***	0.183***
	(8.61)	(3.19)	(10.91)
STD_SALES_{t-1}	−0.007	0.016	−0.026***
	(0.88)	(1.27)	(3.49)
$TANGIBLE_{t-1}$	0.006	0.007	−0.002
	(0.83)	(0.56)	(0.29)
$LOSS_{t-1}$	0.016***	0.014***	0.019***
	(8.91)	(4.12)	(9.69)
$STD\_NET\_HIRE_{t-1}$	0.074***	0.085***	0.067***
	(13.22)	(8.51)	(12.30)
$LABOR\_INTENSITY_{t-1}$	0.062	−1.189***	1.217***
	(0.27)	(2.99)	(5.70)
$\|AB\_INVEST\_OTHER\|_{t-1}$	0.206***	0.301***	0.065***
	(15.91)	(16.43)	(4.71)

(Continues)

TABLE 2 (Continued)

Variables	Abnormal net hiring |AB_NET_HIRE|	Overinvestment in labour (positive abnormal net hiring)	Underinvestment in labour (negative abnormal net hiring)
Intercept	0.057	0.053	0.077
	(1.59)	(1.64)	(1.43)
Year-fixed effects	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes
Observations	22,962	9,690	13,272
Adjusted R^2	0.152	0.136	0.198

deviation of actual net hiring from its optimal level is increasing in product market competition. Our results are not only statistically significant but also economically meaningful. For instance, deviation of labour investment from its optimal level increases by 8% when moving from the first to the third quartiles of FLUIDITY. To put these figures in context, if SIZE moves from the first to the third quartile of its distribution, the abnormal amount of net hiring would decrease by about 5%. In summary, our results are consistent with the 'dark side' view of product market competition, which predicts that, because competitive pressure exposes firms to higher bankruptcy risk, it increases managers' concerns about firm performance, leading them to forgo investment in labour that would adversely affect corporate earnings (Hypothesis 1b). This behaviour, thus, results in more suboptimal investment decisions, hence lowering labour investment efficiency.

As for the control variables, we find that labour investment efficiency exhibits several significant relations with firm characteristics. Larger firms (SIZE) and firms that pay dividends (DIVDUM) tend to make more efficient labour investment decisions. In addition, the coefficients on MTB, QUICK, STD_CFO, LOSS, STD_NET_HIRE and |AB_INVEST_OTHER| are all positive and statistically significant. These results suggest that suboptimal labour investment is more prevalent among firms with higher growth opportunities, higher liquidity ratios, higher operating risk, higher economic losses, higher volatility of labour investment and lower efficiency of nonlabour investment. These results are largely consistent with those of previous studies on labour investment efficiency (e.g., Ben-Nasr & Alshwer, 2016; Jung et al., 2014).

4.2 | Overinvestment versus underinvestment

To better understand the impact of product market competition on labour investment decisions, we next examine two specific forms of labour investment inefficiency, overinvestment and underinvestment. We create two subsamples of firms based on the sign of abnormal net hiring. The overinvesting group comprises firms whose actual level of net hiring exceeds the optimal level (positive abnormal net hiring). The underinvesting group includes firms whose observed level of net hiring is lower than the optimal level (negative abnormal net hiring). We re-estimate our baseline regression (3) for both subsamples and report the results in columns (2) and (3) of Table 2. We find that product market competition loads positively and significantly on abnormal net hiring only for the underinvesting subsample. This result suggests that competition distorts labour investment decisions by exacerbating underinvestment rather than overinvestment, consistent with the risk-increasing effect of competition.[16]

We extend our analysis by further decomposing the overinvesting and underinvesting subsamples based on the sign of the optimal level of net hiring, estimated based on model (1). Specifically, we split the overinvesting subsample into two groups: overhiring firms (i.e., firms that overinvest when their optimal net hiring is positive) and underfiring firms (i.e., firms that overinvest while their optimal net hiring is negative). We repeat this exercise for the underinvesting group by splitting it into underhiring firms (i.e., firms that underinvest when their optimal net hiring is positive) and overfiring firms (i.e., firms that underinvest when their optimal net hiring is negative). Columns (1) to (4) of Table 3 present the results of estimating model (3) for each of the four subsamples: overhiring, underfiring, underhiring and overfiring groups, respectively. Consistent with our previous results, we find that FLUIDITY has a positive and significant impact on abnormal net hiring only for the subsample of underinvesting firms and, more specifically, the underhiring and overfiring subsamples. This result bolsters the notion that firms facing intense competitive pressure tend to reduce their investment in labour through underhiring and overfiring. Overall, these findings provide additional evidence that product market competition exacerbates underinvestment, hence significantly lowering actual investment levels below those justified by economic fundamentals.

5 | ROBUSTNESS TESTS AND ENDOGENEITY

5.1 | Robustness tests

This section summarizes findings from a battery of robustness checks. For brevity, we report the results from these tests in the online Supporting Information Appendix. First, we demonstrate that our main conclusion remains qualitatively unchanged using alternative proxies for labour investment efficiency based on several improvements to the Pinnuck and Lillis (2007) model of optimal net hiring as well as alternative definitions of optimal labour investment not based on this model (Section 3 of the online Supporting Information Appendix). Second, we show that our main finding is insensitive to alternative measures of product market competition, such as Herfindahl–Hirschman index, natural logarithm of number of firms competing in an industry, Lerner index, excess price–cost margin and total similarity score (Section 4 of the online Supporting Information Appendix). Third, we document evidence that our baseline results persist after including firm-fixed effects and additional control variables, including those capturing information quality (Section 5 of the online Supporting Information Appendix). Finally, we show that our statistical inference is not driven by the impact of

[16]In untabulated results, we corroborate this finding using the non-absolute values of net hiring as an alternative measure of labour investment inefficiency. The results show a negative and significant impact of competition on non-absolute net hiring, suggesting that competitive pressure leads firms' actual level of labour investment to be significantly lower than its expected level.

TABLE 3 The effect of product market competition on overinvestment and underinvestment

This table reports the results of the ordinary least square regressions of abnormal net hiring on product market competition and other firm characteristics for four subsamples: overhiring firms (those that overinvest when their optimal net hiring is positive), underfiring firms (those that overinvest when their optimal net hiring is negative), underhiring firms (those that underinvest when their optimal net hiring is positive) and overfiring firms (those that underinvest when their optimal net hiring is negative). The list of variable definitions and data sources is provided in Appendix A. All reported absolute t values in parentheses are based on robust standard errors adjusted for heteroskedasticity and clustered at the firm level. *, ** and *** refer to significance at the 10%, 5% and 1% levels, respectively.

	Overinvestment		**Underinvestment**	
Variables	**Overhiring(1)**	**Underfiring(2)**	**Underhiring(3)**	**Overfiring(4)**
$FLUIDITY_{t-1}$	0.000	0.001	0.003***	0.002***
	(0.06)	(0.78)	(6.21)	(4.64)
MTB_{t-1}	0.001*	0.003***	−0.001***	0.000
	(1.84)	(2.65)	(3.48)	(0.15)
$SIZE_{t-1}$	−0.004***	−0.004*	−0.003***	0.002***
	(3.08)	(1.88)	(4.52)	(2.76)
$QUICK_{t-1}$	0.004***	0.004**	0.004***	0.004***
	(3.89)	(2.05)	(6.19)	(5.19)
LEV_{t-1}	−0.009	−0.025	0.021***	−0.012*
	(0.88)	(1.26)	(2.76)	(1.76)
$DIVDUM_{t-1}$	−0.005	−0.011	0.001	−0.000
	(1.27)	(1.38)	(0.29)	(0.17)
STD_CFO_{t-1}	0.033	0.223***	0.221***	0.040**
	(1.16)	(3.70)	(10.29)	(2.40)
STD_SALES_{t-1}	0.028**	−0.018	−0.028***	−0.009
	(2.20)	(0.56)	(3.14)	(0.98)
$TANGIBLE_{t-1}$	−0.001	0.031	−0.002	−0.009
	(0.08)	(1.16)	(0.21)	(1.03)
$LOSS_{t-1}$	0.025***	0.013**	0.027***	0.011***
	(5.81)	(1.97)	(10.15)	(4.42)
$STD\_NET\_HIRE_{t-1}$	0.080***	0.092***	0.081***	0.019***
	(7.26)	(4.31)	(12.00)	(3.17)
$LABOR\_INTENSITY_{t-1}$	−1.200***	−1.730**	0.995***	1.022***
	(2.85)	(1.98)	(3.98)	(3.24)
$\lvert AB\_INVEST\_OTHER\rvert_{t-1}$	0.319***	0.198***	0.067***	0.031*
	(16.58)	(4.01)	(4.10)	(1.80)

TABLE 3 (Continued)

	Overinvestment		Underinvestment	
Variables	**Overhiring(1)**	**Underfiring(2)**	**Underhiring(3)**	**Overfiring(4)**
Intercept	0.067	0.039	0.129**	0.016*
	(1.46)	(1.44)	(2.16)	(1.69)
Year-fixed effects	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes
Observations	7445	2245	10,299	2973
Adjusted R^2	0.133	0.175	0.241	0.115

nonlabour investments, such as R&D and capital expenditure (Section 6 of the online Supporting Information Appendix).

5.2 | Endogeneity

Although our results thus far lend strong support for a negative relation between product market competition and labour investment efficiency, they could suffer from endogeneity. As mentioned, omitted factors could simultaneously influence competitive pressure in the product market and the efficiency of labour investment, creating a spurious association between the two. Another possibility is that labour investment decisions are highly relevant to firms' competitive strategies, which, in turn, influences the intensity of competition in the product market. This particular situation creates a reverse causality problem.

By employing FLUIDITY as the main proxy for product market competitive threats, we are able to capture competitive pressure from moves made by rivals. This proxy is, thus, reasonably exogenous to firm characteristics (e.g., Hoberg et al., 2014) and its use helps mitigate, to some extent, endogeneity concerns. In addition, that our main results persist in tests controlling for additional variables suggests that our inference is not likely affected by omitted-variable bias. Nonetheless, we attempt to further address endogeneity and identify the causal effect of product market competition on labour investment efficiency in two distinct ways. First, we apply the PSM technique to ensure that our findings are not driven by confounding effects due to observable covariates. Second, we re-examine the impact of competition on labour investment efficiency in a quasi-natural experimental setting, using large import tariff reductions as an exogenous shock to product market competition.

5.2.1 | PSM

In our baseline model, we use a sample comprising both firms facing intense and firms facing weak competitive pressure. One potential concern with this approach is that these two types of firm could have fundamentally different characteristics. To address this issue, we utilize PSM to control for observable differences in characteristics between firms facing high competition and firms facing low competition. More precisely, we match each firm with above-median

FLUIDITY to a firm with below-median FLUIDITY, based on a propensity score obtained from a probit model that estimates the likelihood of a firm having above-median FLUIDITY. We use as predictors of this probit model all control variables in our baseline regression (3). After calibrating the probit model, we match, without replacement, each firm with above-median FLUIDITY (treated firm) to a firm with below-median FLUIDITY (control firm), using nearest-neighbour matching, common support and a maximum distance of 5%.[17] To evaluate our matching procedure, we study the characteristics of the treated and control firms before and after matching. Section 7 of the online Supporting Information Appendix shows that, as expected, the differences between the covariates of the treated and control groups are significantly reduced post-matching. This suggests that our PSM procedure is successful and thus appears to mimic the random assignment of subjects into treatment and control groups.

Panel (a) of Table 4 reports the PSM results. As expected, we find that firms facing intense competition show higher abnormal net hiring than (propensity score matched) firms facing weaker competition (0.116 vs. 0.102), with the difference (0.014) statistically significant at the 1% level. As in Table 2, we further examine the overinvestment and underinvestment subsamples. In particular, we perform the same matching procedure and investigate the difference in abnormal net hiring between firms with FLUIDITY values above and below the median for both subsamples. Consistent with our previous findings, there is a significant difference in abnormal net hiring between treated and control firms only for the underinvestment sample, suggesting that competition decreases labour investment efficiency by exacerbating underinvestment.

In Panel (b) of Table 4, we replicate our baseline regression (3) using only the treatment and matched samples described above. Again, we perform this regression for three sample compositions: (i) the whole sample (column (1)), (ii) the overinvestment subsample (column (2)) and (iii) the underinvestment subsample (column (3)). The results show that FLUIDITY has a positive and significant impact on abnormal net hiring for the whole sample. As expected, the results are insignificant for overinvesting firms. Overall, in line with our baseline findings, these results show that product market competition is associated with inefficient investment and, in particular, underinvestment in labour.

5.2.2 | Quasi-natural experiment

Following previous studies (e.g., Frésard, 2010; Valta, 2012), we take advantage of a quasi-natural experimental setting to carry out a causal assessment of the role of product market competition in reducing labour investment efficiency. More specifically, we examine the response of firm labour investment decisions to intensification of foreign competition following large reductions in import tariff rates.

Two of the most important economic forces that have strengthened competition in U.S. product markets are gradual removal of international trade barriers (e.g., tariff rates and transport costs) and globalization of business activity (Tybout, 2003). For example, the Canada–United States Free Trade Agreement of 1989 was intended to eliminate import and export tariffs as a way of opening up U.S. local product markets to Canadian competitors, leading to more intense competition. In fact, reductions in tariff rates reduce the cost of

[17]In this regression, we obtain bootstrapped standard errors as propensity scores are estimated rather than known.

TABLE 4 Propensity score matching analysis

(a) Differences in labour investment efficiency for matched samples

This table reports summary statistics used to test for differences in abnormal net hiring between firms with above-median FLUIDITY and matched firms with below-median FLUIDITY. We report the results for the whole sample, the overinvestment sample that comprises firms for which the actual level of net hiring exceeds its optimal level (positive abnormal net hiring) and the underinvestment sample that comprises firms for which the observed level of net hiring is lower than its optimal level (negative abnormal net hiring). The list of variable definitions and data sources is provided in Appendix A. *, ** and *** refer to significance at the 10%, 5% and 1% levels, respectively.

	Firms with above-median FLUIDITY	Firms with below-median FLUIDITY	Difference
Whole sample			
AB_NET_HIRE	0.116	0.102	0.014***
Observations	4889	4889	
Overinvestment sample			
AB_NET_HIRE	0.133	0.127	0.006
Observations	1936	1936	
Underinvestment sample			
AB_NET_HIRE	0.097	0.089	0.008***
Observations	2781	2781	

(b) Baseline regressions for matched samples

This table reports the results of the ordinary least square regressions of abnormal net hiring on FLUIDITY, and other firm characteristics for the matched samples with varying levels of competitive pressure. The results are reported for three subsamples: whole sample, overinvestment subsample, and underinvestment subsample. The list of variable definitions and data sources is provided in Appendix A. All reported absolute *t* values in parentheses are based on robust standard errors adjusted for heteroskedasticity and clustered at the firm level. *, **, and *** refer to significance at the 10%, 5%, and 1% levels, respectively.

Variables	Whole sample	Overinvestment sample	Underinvestment sample
$FLUIDITY_{t-1}$	0.002***	0.000	0.002***
	(3.77)	(0.22)	(3.48)
Intercept	0.188	0.095***	0.051
	(1.86)	(5.38)	(1.10)
Controls	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes
Observations	9778	3872	5562
Adjusted R^2	0.128	0.131	0.156

entering domestic product markets, which attracts more foreign rivals and increases import penetration. In addition, foreign rivals can adopt aggressive competitive strategies by modifying their products and undertaking more innovative activities. This particular situation causes disruption for domestic firms, which, in turn, leads them to react strategically by adjusting their investment decisions (e.g., Frésard & Valta, 2016). In the context of the present study, large tariff reductions offer an opportune setting to capture an exogenous shock to market competition. Our main measure of competition is product market fluidity, which captures the change in a firm's product market space due to moves by rivals (Hoberg et al., 2014). To the extent that tariff reductions lower the cost of entry to U.S. product markets, they facilitate penetration by foreign rivals that may supply cheaper and more competitive goods and services in domestic markets (Frésard & Valta, 2016). Consequently, the product spaces of firms and their domestic rivals become significantly threatened due to the competitive pressure imposed by foreign competitors. In response, both firms and their rivals are expected to adjust their products and services appropriately through product convergence and/or differentiation, leading to changes to product descriptions and ultimately the (cosine) similarity among those descriptions; this is the concept captured by FLUIDITY. Hence, reductions in import tariff rates are likely to affect firm product market competition.[18]

We use a difference-in-differences (DID) estimation approach to examine how labour investment decisions react to large tariff reductions. We first obtain tariff data using U.S. trade data available at the Harmonized System product level from *Schott's International Economics Resource Page*. Schott (2010) also provides *Trade Data and Concordance Tables*, which map each Harmonized System product code into SIC manufacturing industry codes. Using this mapping, we calculate the ad valorem import tariff rates for each three-digit SIC industry as the ratio of duties collected from that industry to the dutiable value of all imports.[19] Following Huang et al. (2017), we define large tariff reduction events as industry-year observations in which the decrease in tariff rates exceeds twice the industry mean tariff reduction. The above-described process yields a data set of 3041 firms operating in 112 three-digit SIC code manufacturing industries, 90 of which experienced a tariff reduction shock at least once between 1998 and 2017. The tariff reduction events among these industries are staggered, as they occurred at different times; this offers a better setting than single events, as they mitigate the concern that our findings are driven by other concurrent events (Huang et al., 2017).

We define firms that operate in industries affected by a competitive shock in a given year as the treated group. All firms operating in industries that did not experience a large tariff reduction event are included in the control group. To control for observable differences between the two groups of firms, we identify a sample of matched firms that exhibit similar characteristics as the treated group, except for the entry threats they face. Following Frésard and

[18]In an additional analysis, we consider a measure of foreign competitive pressure that is highly correlated with the exogenous shock based on large tariff rate reductions. More specifically, we re-estimate our baseline regression using the (industry-level) import penetration index (IMPORT_PENETRATION) as an alternative measure of competition. We calculate the IMPORT_PENETRATION for each industry as the percentage of total imports on the sum of imports and domestic production. Consistent with our main inference, we find that import competition exacerbates the underinvestment problem in labour. This finding suggests that our baseline findings are also driven by foreign competition, captured by a direct measure, IMPORT_PENETRATION. For the sake of brevity, these additional empirical results are not reported, but are available from the authors upon request.

[19]We first download tariff data from Schott's International Economics Resource Page (http://faculty.som.yale.edu/peterschott/sub_international.htm) up to 2005. We then update the data up to 2017 using import and export data, which are also available from Schott's website.

Valta (2016), we match each treated observation to its nearest-neighbour observation that is closest in terms of its probability of being affected by a competitive shock event. This probability is calculated based on a probit model that estimates the likelihood of a large tariff reduction event on the basis of firm size (SIZE), investment opportunities (MTB) and firm leverage (LEV) (Mattei & Platikanova, 2017). The matching procedure yields a sample of 15,232 firm-year observations equally distributed among firms operating in industries that experienced a tariff reduction event and those that did not.

Following Valta (2012) and Huang et al. (2017), we conduct a DID analysis by replicating our baseline regressions using the dummy variable SHOCK as our main proxy for product market competitive pressure. SHOCK takes the value 1 if there is a substantial decrease in tariff rates exceeding two times the industry mean tariff reduction and zero otherwise. Panel (a) of Table 5 displays the results of our DID estimations. The results from the specification without control variables (column (1)) show that tariff reduction shocks positively and significantly influence the abnormal level of net hiring. Column (3) shows that inclusion of the control variables decreases neither the statistical nor the economic significance of the result. As a robustness check, we further control for firm-fixed effects in our DID regressions. The results reported in columns (2) and (4) show that the positive impact of SHOCK on abnormal net hiring continues to hold, suggesting that our inference is unlikely to be affected by potential heterogeneity bias. Overall, these findings suggest that, following large tariff cuts, firms are likely to experience an increase in abnormal net hiring, which translates into inefficient labour investment decisions.

The key assumption for the validity of our DID analysis is the presence of parallel trends. The DID analysis requires that, in the pre-event period, the outcome variable (i.e., abnormal net hiring) for the treated and control groups follows parallel trends. If we were to observe a pretreatment trend of decreasing labour investment efficiency before the occurrence of the tariff reduction shock, there would be a reverse causality problem, which would cast doubt on the validity of our DID. To mitigate this concern, in Panel (b) of Table 5, we follow Bertrand and Mullainathan (2003) and conduct a parallel-trends test by examining the dynamics of abnormal net hiring surrounding tariff reduction shocks. In particular, we run a regression that explains abnormal net hiring in terms of different firm characteristics, along with four indicator variables that reflect four periods around the tariff reduction shock. These variables are denoted $Before^{2+}$, $Before^{1}$, $After^{1}$ and $After^{2+}$, which are equal to 1 if the firm operates in an industry that experiences a tariff reduction shock in at least 2 years, experiences a tariff reduction shock in 1 year, experienced a tariff reduction shock 1 year ago and experienced a tariff reduction shock at least 2 years ago, respectively. The results, reported in column (1) of Panel (b), Table 5, show that the coefficient estimates of $Before^{2+}$ and $Before^{1}$ are close to zero and statistically insignificant, indicating no pretreatment trend. However, the coefficients on $After^{1}$ and $After^{2+}$ are positive and significant, suggesting that the increase in abnormal net hiring occurs only after the tariff reduction shock. Overall, these results imply that the observed relationship between product market competition and labour investment efficiency is unlikely driven by reverse causality and that our matched sample meets the parallel trends assumption.

One additional concern about the DID setting is that the observed results could be interpreted as evidence that abnormal net hiring is driven by other concurrent events rather than by tariff reduction shocks. To mitigate the concern that our findings are confounded by such events, we perform a placebo analysis by simulating pseudocompetitive events. Specifically, we create a new dummy variable (PLACEBO) by randomly assigning falsified tariff reduction events to each three-digit SIC code industry. In so doing, we require the number of randomly assigned events to match the number of actual tariff reduction events used in the analysis. If the placebo dummy were to explain the variation in abnormal net hiring, it would raise doubts

TABLE 5 Addressing endogeneity: The quasi-natural experiment

(a) Difference-in-difference regressions

This table reports the results of the difference-in-difference analysis. The dependent variable is abnormal net hiring. The independent variable is SHOCK which is equal to one if the industry has experienced a large tariff reduction that is larger than two times the industry mean reduction and zero otherwise. The list of variable definitions and data sources is provided in Appendix A. All reported absolute *t* values in parentheses are based on robust standard errors adjusted for heteroskedasticity and clustered at the industry level. *, ** and *** refer to significance at the 10%, 5% and 1% levels, respectively.

Variables	(1) Tariff reduction for year *t*	(2) Tariff reduction for year *t*	(3) Tariff reduction for year *t*	(4) Tariff reduction for year *t*
$SHOCK_{t-1}$	0.019***	0.021***	0.019***	0.019**
	(3.28)	(2.79)	(3.22)	(2.55)
Controls	No	No	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes
Firm-fixed effects	No	Yes	No	Yes
Observations	15,232	15,232	15,232	15,232
Adjusted R^2	0.069	0.195	0.124	0.221

(b) Validity of difference-in-difference analysis

This table reports the results on the validity of the difference-in-difference regressions. In column (1), we perform the parallel trends assumption test. $Before^{2+}$, $Before^{1}$, $After^{1}$, and $After^{2+}$ are dummy variables that are equal to one if the firm operates in an industry that will experience a tariff reduction shock in 2 or more years, will experience a tariff reduction shock in 1 year, experienced a tariff reduction shock 1 year ago, and experienced a tariff reduction shock 2 or more years ago, respectively, and zero otherwise. In column (2), we conduct a placebo test where the independent variable is a falsified dummy that randomly assigns the tariff reduction events to each three-digit SIC industry. The list of variable definitions and data sources is provided in Appendix A. All reported absolute *t* values in parentheses are based on robust standard errors adjusted for heteroskedasticity and clustered at the industry level. *, **, and *** refer to significance at the 10%, 5% and 1% levels, respectively.

Variables	(1) Parallel trends test	(2) Placebo test
$Before^{2+}$	−0.001	
	(0.24)	
$Before^{1}$	0.007	
	(1.32)	
$After^{1}$	0.006*	
	(1.72)	

TABLE 5 (Continued)

(b) Validity of difference-in-difference analysis

This table reports the results on the validity of the difference-in-difference regressions. In column (1), we perform the parallel trends assumption test. $Before^{2+}$, $Before^{1}$, $After^{1}$, and $After^{2+}$ are dummy variables that are equal to one if the firm operates in an industry that will experience a tariff reduction shock in 2 or more years, will experience a tariff reduction shock in 1 year, experienced a tariff reduction shock 1 year ago, and experienced a tariff reduction shock 2 or more years ago, respectively, and zero otherwise. In column (2), we conduct a placebo test where the independent variable is a falsified dummy that randomly assigns the tariff reduction events to each three-digit SIC industry. The list of variable definitions and data sources is provided in Appendix A. All reported absolute *t* values in parentheses are based on robust standard errors adjusted for heteroskedasticity and clustered at the industry level. *, **, and *** refer to significance at the 10%, 5% and 1% levels, respectively.

	(1)	**(2)**
Variables	**Parallel trends test**	**Placebo test**
$After^{2+}$	0.010**	
	(2.53)	
$PLACEBO_{t-1}$		0.003
		(0.50)
Controls	Yes	Yes
Year-fixed effects	Yes	Yes
Industry-fixed effects	Yes	Yes
Observations	15,232	15,232
Adjusted R^2	0.209	0.122

about the role of competitive shocks in driving labour investment decisions. Column (2) of Panel (b), Table 5 shows that the coefficient on PLACEBO is insignificant. Thus, we find no evidence that our results are driven by concurrent unobserved events other than the tariff reduction shocks. Overall, the results of our quasi-natural experiment corroborate our inference that product market competition leads firms to make less efficient labour investment decisions.[20]

Taken together, the results from our identification strategies consistently show that, after addressing potential endogeneity in the relation between product market competition and employment decisions, competitive pressure remains negatively associated with labour investment efficiency. While it is impossible to completely rule out endogeneity concerns, our main inferences are not likely driven by such problems.

[20] In untabulated regressions, we also perform an instrumental variable analysis using a plausibly exogenous instrument of product market competition, that is, import tariff rates. Our results remain qualitatively the same, further suggesting that our previous findings are unlikely to be affected by endogeneity concerns.

6 | CROSS-SECTIONAL HETEROGENEITY

This section delves more deeply into the observed negative relation between competition and labour investment efficiency by examining how it varies in the cross-section. In so doing, our analysis attempts not only to shed light on the channels through which our documented relation operates, but also to strengthen identification, because similar patterns are unlikely to arise if product market competition captures simply the effect of unobserved economic forces. We expect the negative impact of competition on labour investment efficiency to be particularly strong in the presence of factors that exacerbate the risk-increasing effect of competition. We specifically test the role of three factors: exposure to competitive pressure, financial constraints and LACs.

TABLE 6 The role of exposure to competition

This table reports regression results on the impact of exposure to competition on the relation between product market competition and labour investment inefficiency. MARKET_SHARE is firm-level market share, defined as firm sales divided by industry sales. DIVERSIFIED is a dummy variable that takes one if a firm has more than one business segment and zero otherwise. All reported absolute t values in parentheses are based on robust standard errors adjusted for heteroskedasticity and clustered at the firm level. The list of variables definitions and data sources is provided in Appendix A. *, ** and *** refer to significance at the 10%, 5% and 1% levels, respectively.

Variables	Market share (1)	Business diversification (2)
FLUIDITY$_{t-1}$	0.001***	0.005***
	(3.52)	(5.22)
MARKET_SHARE	0.225	
	(1.38)	
FLUIDITY$_{t-1}$ × MARKET_SHARE	−0.014**	
	(2.26)	
DIVERSIFIED		0.011
		(1.57)
FLUIDITY$_{t-1}$ × DIVERSIFIED		−0.002**
		(1.99)
Intercept	0.043***	0.071***
	(6.98)	(9.15)
Controls	Yes	Yes
Year-fixed effects	Yes	Yes
Industry-fixed effects	Yes	Yes
Observations	22,957	22,957
Adjusted R^2	0.154	0.138

6.1 | Role of exposure to competitive pressure

First, we examine whether the impact of competition on labour investment decisions is influenced by the extent to which firms are exposed to competitive threats. Intuitively, firms with stronger market power are less likely to be threatened by competition, as they have sustainable moats. However, firms in a disadvantaged market position could be more vulnerable to competition due to their inability to handle competitive threats. Accordingly, we expect firms that are more exposed to competitive pressure to be more sensitive to the risk-increasing effect of competition, which creates a more severe labour underinvestment problem.

We consider the effects of two main features that characterize exposure to competitive threats. We begin with firm competitive position, as firms with a weaker position in the product market face more intense competition. To proxy for this, we use a firm-level measure, MARKET_SHARE, calculated as the fraction of firm sales in total industry sales (Valta, 2012). We then consider the degree of firm diversification, as conglomerate firms have the advantage of spreading risk across many industry segments, thus overcoming problems occurring in any particular segment (e.g., Dasgupta et al., 2018). To capture the degree to which a firm is diversified, we code a dummy variable for business diversification (DIVERSIFIED), which is drawn from Compustat's business segment files. DIVERSIFIED takes the value 1 if the firm has more than 1 business segment for a particular year and zero otherwise.

Table 6 reports findings from estimating two regression models; additionally, it includes MARKET_SHARE and DIVERSIFIED along with their interaction terms with FLUIDITY. The results provide consistent support for our prediction. Specifically, we find that the positive impact of competition on abnormal net hiring is more pronounced for firms with a weaker market position (column (1)), in line with the argument that such firms are more vulnerable to the risk-increasing effect of competition. Additionally, the competition–labour investment relationship is more significant for undiversified firms (column (2)), consistent with the prediction that standalone firms are more subject to competitive pressure. Overall, our findings corroborate the notion that firm reactions to intensification of product market competition increase with their exposure to competitive pressure.

6.2 | Role of financial constraints

As suggested by Lyandres and Palazzo (2016), financial constraints are crucial in determining firms' strategic choices under intense competition. We, therefore, investigate whether and how financial constraints influence the role of the risk-increasing effect of competition in shaping labour investment decisions. According to Bolton and Scharfstein (1990), when firms have binding financial constraints, they are more vulnerable to the aggressive predatory behaviour of financially stronger rivals. This particular situation could discourage managerial investment incentives, hence creating an underinvestment problem. Additionally, to the extent that financial constraints limit access to external financing, they are likely to hamper firms' ability to fund investment projects (Campello, 2006), such as labour investment. Consequently, one would anticipate the risk-increasing effect of competition to play a larger role in inducing financially constrained firms to spend less on labour investment. Overall, we expect the negative impact of competition on labour investment efficiency to be more pronounced for financially constrained firms than for their unconstrained counterparts.

We follow the literature and use four firm-specific measures of financial constraints. First, we rely on firm size (SIZE), as larger firms are likely to enjoy privileged access to external financing and hence are less financially constrained. Second, we employ firm leverage (LEV), as highly levered firms are more likely to face tight financial covenant restrictions and hence greater financial constraints. Third, we use the Whited–Wu index (WW), which captures smaller firms with higher leverage, higher growth rates and lower cash flows (Whited & Wu, 2006). Higher values of WW indicate tighter financial constraints. Fourth, we proxy for financial constraints using the Hadlock and Pierce (2010) size and age index (HP). Similar to the WW index, higher values of the HP index indicate more severe financial constraints.

TABLE 7 The role of financial constraints

This table reports regression results on the impact of financial constraints on the relation between product market competition and labour investment efficiency. WW is the Whited and Wu (2006) financial constraint index. HP is the Hadlock and Pierce (2010) financial constraint index. All reported absolute *t* values in parentheses are based on robust standard errors adjusted for heteroskedasticity and clustered at the firm level. The list of variables definitions and data sources is provided in Appendix A. *, ** and *** refer to significance at the 10%, 5% and 1% levels, respectively.

Variables	Firm size (1)	Firm leverage (2)	Whited–Wu index (3)	HP index (4)
$FLUIDITY_{t-1}$	0.004***	0.002***	0.003***	0.002***
	(5.35)	(4.27)	(8.03)	(5.14)
$FLUIDITY_{t-1} \times SIZE_{t-1}$	−0.001*			
	(1.68)			
$FLUIDITY_{t-1} \times LEV_{t-1}$		0.002**		
		(2.10)		
WW_{t-1}			−0.024**	
			(2.02)	
$FLUIDITY_{t-1} \times WW_{t-1}$			0.001**	
			(2.00)	
HP_{t-1}				0.005*
				(1.96)
$FLUIDITY_{t-1} \times HP_{t-1}$				0.001*
				(1.66)
Intercept	0.079***	0.049***	0.077***	0.013
	(14.35)	(8.95)	(15.82)	(0.98)
Controls	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes
Observations	22,957	22,961	20,461	21,010
Adjusted R^2	0.139	0.152	0.142	0.146

To investigate how the effects of competitive pressure vary across firms with different degrees of financial constraint, we include the interaction terms between each of the measures discussed above and FLUIDITY. As shown in Table 7, we find evidence consistent with our prediction. In particular, the efficiency of labour investment is significantly lower for firms with more binding financial constraints, namely, smaller firms, highly leveraged firms and firms with higher values of WW and HP indices. Overall, this evidence suggests that financially constrained firms react more strongly to intensified competitive pressure by reducing their labour investment.

6.3 | Role of information asymmetry

Our results thus far suggest that the risk-increasing effect of product market competitive pressure has a negative and significant impact on labour investment efficiency. However, this effect may depend on the extent of information asymmetry between a firm and its investors, because firms suffering from more severe asymmetry information problems are more vulnerable to aggressive predation threats from rivals. For example, Bolton and Scharfstein (1990) stress that stringent debt covenants arising from information asymmetry between a firm and its investors can hinder the firm's ability to fight competition, thus prompting financially stronger rivals to pursue predatory market strategies. Consistent with this suggestion, Billett et al. (2017) show that asymmetric information in financial markets negatively affects market share outcomes in product markets. We, therefore, argue that information asymmetry may impose a greater competitive risk on incumbent firms and, consequently, increase their sensitivity to the risk-increasing effect of product market competition.[21] Accordingly, we expect information asymmetry problems to exacerbate the role of product market competition in distorting labour investment efficiency.

In our cross-sectional analysis, we consider three proxies for information asymmetry. First, we employ analyst coverage (ANALYST) as a measure of the quality of the information environment (Lang & Lundholm, 1996), as analysts can help improve the flow of information to financial markets through their screening activities. We define ANALYST as the number of financial analysts following a firm as reported by I/B/E/S. For ease of interpretation, we multiply ANALYST by (−1) so that higher values indicate higher information asymmetry. Second, we use analyst forecast errors (FORECAST_ERROR) as a proxy for information opacity, as forecast errors reflect a lack of precise information that would help analysts provide accurate and less biased forecasts. We define FORECAST_ERROR as the absolute value of the difference between announced earnings and the mean of estimated earnings, scaled by the mean of analyst forecasts. The higher the forecast error, the higher the information opacity. Third, we rely on earnings volatility (EARNING_VOL) as another measure of information opacity, as highly volatile earnings are likely to reflect discretionary reporting choices made by managers to smooth earnings. The higher the earnings volatility, the higher the asymmetry of information between insiders and outsiders (Minton & Schrand, 1999). We calculate EARNING_VOL as the ratio of the standard deviation of earnings to average book asset size over the past eight quarters.

[21]Another strand of literature focuses on the direct impact of information asymmetry on corporate investment efficiency, suggesting that moral hazard and adverse selection problems can hamper efficient investment in environments where informational asymmetries are exacerbated (e.g., Biddle & Hilary, 2006; Biddle et al., 2009; Jung et al., 2014).

TABLE 8 The role of information asymmetry

This table reports regression results on the impact of information asymmetry on the relation between product market competition and labour investment efficiency. ANALYST is the number of financial analysts following a firm. FORECAST_ERROR is the absolute value of the difference between the announced earnings and mean of estimated earnings scaled by the mean of analyst forecasts. EARNING_VOL is the ratio of the standard deviation of the past eight earnings to the average book asset size over the past eight quarters. All reported absolute t values in parentheses are based on robust standard errors adjusted for heteroskedasticity and clustered at the firm level. The list of variables definitions and data sources is provided in Appendix A. *, ** and *** refer to significance at the 10%, 5% and 1% levels, respectively.

Variables	Analyst following (1)	Analyst forecast errors (2)	Earnings volatility (3)
$FLUIDITY_{t-1}$	0.002***	0.001***	0.002***
	(3.08)	(2.97)	(5.17)
ANALYST	−0.000		
	(0.27)		
$FLUIDITY_{t-1} \times$ ANALYST	0.001**		
	(1.98)		
FORECAST_ERROR		−0.001***	
		(8.00)	
$FLUIDITY_{t-1} \times$ FORECAST_ERROR		0.001***	
		(7.59)	
EARNING_VOL			−0.129***
			(4.63)
$FLUIDITY_{t-1} \times$ EARNING_VOL			0.010***
			(5.06)
Intercept	0.121	0.088*	0.160***
	(1.50)	(1.86)	(3.35)
Controls	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes
Observations	15,159	18,141	12,636
Adjusted R^2	0.157	0.169	0.155

Table 8 reports the results of the impact of information asymmetry on the relation between product market competition and labour investment efficiency. Consistent with the arguments described above, we find, in column (1), that the positive impact of product market fluidity on abnormal net hiring is more pronounced for firms followed by fewer analysts. More specifically, the coefficient on the interaction term $FLUIDITY_{t-1} \times$ ANALYST is positive and statistically significant, suggesting that the abnormal investment in labour arising from the risk-increasing effect of competition is stronger when firms suffer greater information asymmetry. We reach similar conclusions using analyst forecast error and earnings volatility as proxies for information asymmetry (columns (2) and (3), respectively). Overall, these findings confirm that labour investment distortions are more likely to arise in low-quality information environments.

7 | ADDITIONAL ANALYSIS

7.1 | LACs

As briefly discussed in Sections 1 and 2, labour investment is associated with high labour costs, including the costs of searching, selection, hiring, training, firing and wages (e.g., Dixit, 1997). These costs vary among firms (e.g., Blatter et al., 2012; Dube et al., 2010) and can hinder managers' efficient employment decisions by discouraging them from investing in labour. Accordingly, when LACs are high, we expect the risk-increasing effect of competition to play a larger role in exacerbating labour investment inefficiency.

Our first proxy for LACs is labour unionization. Labour unions are likely to represent an important obstacle to reallocation of resources, which could, in turn, have a bearing on labour investment decisions and labour investment efficiency. Chen et al. (2011) argue that labour unions could reduce firm operating flexibility, as they increase the costs of labour adjustments. For example, union bargaining power makes wages sticky, thereby increasing the costs associated with retaining existing workers and hiring new ones. This situation can distort firm hiring decisions and lead to lower investment efficiency. Following previous work (e.g., Ben-Nasr & Alshwer, 2016; Jung et al., 2014), we proxy for industry-level labour union coverage using data from the Union Membership and Coverage Database developed by Hirsch and Macpherson (2003).[22] On the basis of information collected from the monthly Current Population Survey conducted by the Bureau of Labour Statistics, this database provides data on labour union membership and coverage for both the public and private sectors at the Census Industry Classification (CIC) industry level. After mapping CIC codes to NAICS and SIC codes from Compustat, we measure labour force unionization (LABOR_UNION) as the proportion of employees in a given firm's industry covered by unions in collective bargaining with employers. The higher the industry unionization rate, the more bargaining power employees have and the higher the LACs firms incur.[23]

In addition, we use measures of human capital intensity as additional proxies for LACs. The cost of adjusting labour is likely to be higher for human-capital-intensive industries that rely more on talented employees. The idea here is that human-capital-intensive firms face serious challenges in attracting and 'star' employees, who are a key resource for firm competitive advantage and long-term organizational performance (Blatter et al., 2012; Dube et al., 2010; Pfeffer, 1994). These challenges make such firms highly exposed to labour market frictions,

[22]These data are available at www.unionstats.com.

[23]Using the labour unionization rate at the industry level, rather than at the firm level, has the advantage of including the unionization spillover effect, which accounts for the possibility that the strength of a labour union is not confined to its own firm, but rather threatens other firms in the same industry (Rosen, 1969). This spillover effect is important in large-scale studies like ours, in which firm-level unionization data cannot be collected, as firms are not compelled to disclose employee union membership.

thus increasing their LACs. For example, Chang and Jo (2019) document that firms operating in competitive and innovative industries that rely on talented human resources invest more in employee-friendly practices to retain talented employees and achieve greater innovation success. Accordingly, as human capital intensity increases LACs, we expect it to exacerbate the role of competition in hindering firms' ability to efficiently invest in labour.

To proxy for human capital intensity, we first use the degree of firm reliance on skilled labour (e.g., Belo et al., 2017; Dixit, 1997; Ghaly et al., 2017), as skilled workers are often seen as an important determinant of firm success, hence requiring greater financial commitment than does unskilled labour. For example, Ghaly et al. (2017) provide evidence that firms relying on a greater share of skilled labour face higher LACs and hence tend to hold more cash reserves as a precautionary measure. Following Belo et al. (2017) and Ghaly et al. (2017), we collect information on Job Zones from the Occupational Information Network (O*NET). We also retrieve data on number of employees by occupation from the Occupational Employment Statistics of the Bureau of Labour Statistics. We then calculate the industry-specific index of reliance on labour skills (LABOR_SKILL) as the weighted average number of employees working in different occupations per industry, where the weight is the U.S. Department of Labor's O*NET program classification of occupations based on worker skill levels.[24] More specifically, the degree of reliance on skilled labour for a particular industry i is calculated as follows:

$$\text{LABOR\_SKILL}_i = \sum_{j=1}^{O} \left(\frac{E_{ji}}{E_i} \times Z_j \right),$$

where E_{ji} is number of employees working in industry i for particular occupation j, E_{i} is total employees in industry i, O is number of occupations in industry i and Z_j is skill level of occupation j determined by the U.S. Department of Labor's O*NET program classification of occupations.

In addition to labour skills, we use two other measures of human capital intensity as proxies for LACs. First, we use the ratio of R&D-to-sales (R&D), as R&D and innovation activities increase demand for talented workers to create additional value. We also note that firms with high R&D spending and more talent are likely to have substantial human and knowledge capital, an important intangible asset (Klasa et al., 2018). Hence, we follow recent finance research (Eisfeldt & Papanikolaou, 2013; Falato et al., 2021) and use a more encompassing measure of human capital intensity than labour skills and R&D spending, namely a measure of intangible capital (INTANGIBLE) developed by Peters and Taylor (2017), who consider two types of intangible capital, internally created intangible capital and externally purchased intangible capital. Externally purchased intangible capital is measured using the balance sheet item 'Intangible Assets', while internally created intangible capital is the sum of knowledge capital (i.e., accumulated past R&D spending) and organizational capital (i.e., accumulated past SG&A expenses). Firms with more R&D spending and intangible capital are expected to have a greater degree of human capital intensity and thus face higher LACs.

To gauge the impact of LACs on the relation between competition and labour investment efficiency, we re-estimate our baseline model, including the interaction terms between

[24]The O*NET skill level is determined through the education, work experience and training that an employee would need to perform a specific job with a specific level of competence.

TABLE 9 The role of labour and capital adjustment costs

This table reports regression results on the role of labour and capital adjustment costs (LACs and CACs). In columns (1), (2), (3) and (4), we report results on the impact of LACs on the relation between product market competition and labour investment efficiency, where LACs are measured as the industry labour force unionization (column 1), firms' reliance on skilled labour (column (2)), firms' R&D spending (column 3), and firms' intangible capital (column (4)). LABOR_UNION is the percentage of employees covered by labour unions. LABOR_SKILL is the industry weighted average number of employees working in different occupations where the weight is the O*NET program classification of occupations based on skill level. R&D is the ratio of R&D expenditure to total sales. INTANGIBLE is calculated as the sum of externally purchased intangible capital measured using the balance sheet item 'Intangible Assets', and internally created intangible capital, which is the sum of knowledge capital (i.e., cumulated past R&D spending) and organizational capital (i.e., cumulated past SG&A expenses). In column (5), we report results on the impact of differences between LACs and CACs on the relation between product market competition and labour investment efficiency. We proxy for CACs using firms' asset redeployability (Kim & Kung, 2017). All absolute reported t values in parentheses are based on robust standard errors adjusted for heteroskedasticity and clustered at the firm level. The list of variables definitions and data sources is provided in Appendix A. *, ** and *** refer to significance at the 10%, 5% and 1% levels, respectively.

Variables	Labour unionization (1)	Labour skills (2)	R&D spending (3)	Intangible Capital (4)	Difference between LACs and CACs (5)
$FLUIDITY_{t-1}$	0.001*	0.001**	0.001**	0.001***	0.002***
	(1.79)	(2.33)	(2.39)	(2.77)	(3.12)
LABOR_UNION	−0.001				
	(1.45)				
$FLUIDITY_{t-1}$ × LABOR_UNION	0.001*				
	(1.77)				
LABOR_SKILL		−0.003			
		(1.01)			
$FLUIDITY_{t-1}$ × LABOR_SKILL		0.001***			
		(3.71)			
R&D			0.000*		
			(1.91)		
$FLUIDITY_{t-1}$ × R&D			0.003***		
			(2.74)		
INTANGIBLE				−0.008**	
				(2.48)	
$FLUIDITY_{t-1}$ × INTANGIBLE				0.001**	
				(2.20)	
LACs/CACs					−2.073***
					(3.76)

(Continues)

TABLE 9 (Continued)

Variables	Labour unionization (1)	Labour skills (2)	R&D spending (3)	Intangible Capital (4)	Difference between LACs and CACs (5)
$FLUIDITY_{t-1} \times$ LACs/CACs					0.253***
					(4.14)
Intercept	0.044***	0.088***	0.062	0.067*	0.094***
	(8.00)	(9.78)	(1.64)	(1.82)	(15.33)
Controls	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	18,309	19,418	22,902	22,123	18,763
Adjusted R^2	0.153	0.139	0.151	0.151	0.140

FLUIDITY and our four proxies for LACs (i.e., LABOR_UNION, LABOR_SKILL, R&D and INTANGIBLE). Table 9 presents the regression results. In column (1), the coefficient on the interaction term FLUIDITY × LABOR_UNION is positive and statistically significant, indicating that the positive relation between competitive pressure and labour investment inefficiency is more pronounced for firms in highly unionized industries, which hence have higher LACs. We reach similar conclusions for human-capital-intensive firms, which are also likely to face higher LACs. Specifically, columns (2), (3) and (4) show that the role of competition in exacerbating labour investment inefficiency is stronger for firms with greater reliance on skilled labour (LABOR_SKILL), higher R&D spending (R&D and higher intangible capital (INTANGIBLE), respectively. Overall, these results support our prediction that LACs aggravate distortions in labour investment inefficiency created by the risk-increasing effect of competition.

7.2 | Difference between CACs and LACs

One relevant question that arises from the literature is whether evidence on the relation between competition and nonlabour investment is applicable to labour investment. In previous tests (Sections 4.1 and 5.1), we show that the effect of competition on labour investment is not driven by its correlation with nonlabour investment. To further address this concern, we follow Ghaly et al. (2020) and conduct an additional analysis to exploit the differences between LACs and CACs. This analysis shows that these differences can impact the relation between competition and labour investment efficiency.[25] More importantly, this test shows that the risk-increasing effect of competition and the resulting underinvestment problem are not uniform

[25]CACs arise due to installation costs and the irreversibility of capital investments.

across all types of investment and that they are more pronounced for the investment type with higher adjustment costs.

A major difference between labour and nonlabour investment is factor adjustment costs.[26] To the extent that the magnitude of such costs determines firm investment strategies, one would expect that the more different LACs are from CACs, the greater the difference between the impact of competition on labour investment compared to capital investment. On the basis of the idea that LACs are generally lower than CACs (Bloom, 2009; Shapiro, 1986),[27] two alternative views may be proposed regarding the expected role of the difference between LACs and CACs in driving the relation between product market competition and labour investment efficiency. First, the effect of competitive pressure could be weaker for capital investment and more pronounced for labour investment if firms faced with relatively higher CACs than LACs already have stronger incentives to maintain capital investment efficiency to avoid the relatively high adjustment costs. Second, and in contrast, when CACs are relatively higher than LACs, firms may find it more difficult to adjust to the optimal level of capital investment, leading to a higher degree of capital investment inefficiency; this argument suggests that the risk-increasing effect of competition could be more pronounced for capital investment than for labour investment. Overall, despite their conflicting predictions, these arguments suggest that the effect of competition on labour investment efficiency is likely to differ from that on capital investment efficiency and to vary with the difference between LACs and CACs.

The results (columns (1)–(4)) in Table 9 show that the role of competition in exacerbating the underinvestment problem in labour is more pronounced when LACs are higher. On the basis of this finding and our reasoning above, one would expect that when LACs are relatively higher than CACs (i.e., when the LAC-to-CAC ratio is higher), the role of competition in reducing investment in labour becomes more important than that of discouraging investment in capital and vice versa. To test this prediction, we add to our baseline model an additional interaction term between FLUIDITY and the LAC-to-CAC ratio. We proxy for LACs using firm reliance on skilled labour, as described above. For CACs, we rely on a firm-level measure of asset redeployability (Kim & Kung, 2017), which reflects the possibility that a firm's underlying assets could have alternative uses across and within industries. This measure is constructed using the 1997 Bureau of Economic Analysis (BEA) capital flow table, which breaks down expenditures on new equipment, software and structures by 180 assets for 123 industries. It is measured as the weighted average of industry-level redeployability indexes across a firm's business segments. In particular, the redeployability measure of a given industry j is calculated as follows:

$$\text{Redeployability}_j = \sum_{a=1}^{180} w_{j,a} \times \text{Redeployabilityscore}_a,$$

[26]Matsa (2018) also shows that financing labour is different than financing capital, due to labour market frictions. Unlike capital, employees have the option to quit their jobs, which makes employers more sensitive to their needs. Moreover, labour markets are characterized by potential unemployment costs and powerful labour unions that protect employees against loss of pay and negotiate improved working conditions.

[27]Bloom (2009) provides evidence that LACs differ significantly from CACs. The author shows that the estimated CACs arising from resale loss are 34% on capital, while the estimated LACs arising from hiring and firing decisions are rather limited and represent 1.8% of annual wages. Similar statistics provided by Shapiro (1986) and Merz and Yashiv (2007) also show that the quadratic adjustment costs of capital investment are relatively higher than the quadratic adjustment costs of hiring/firing.

where $w_{j,a}$ is industry j's expenditure on asset a divided by its total capital expenditures from the BEA table and $\text{Redeployabilityscore}_a$ is the ratio of the number of industries that use given asset a to the total number of industries in the BEA table (see Kim & Kung, 2017 for more details). Because redeployable assets have high liquidation value, higher values in redeployability indexes indicate higher CACs.

The results presented in Table 9 (column (5)) show that product market competitive pressure continues to significantly distort labour investment efficiency. More importantly, we find that the coefficient on the interaction term FLUIDITY × LACs/CACs is positive and statistically significant, suggesting that the positive impact of competition on abnormal net hiring becomes stronger for firms where the LAC-to-CAC ratio is higher and adjusting labour is relatively more important than adjusting capital. This finding implies that the difference between labour investment and capital investment, particularly the difference in their costs of adjustment, affects the relation between competition and labour investment efficiency. In sum, these results confirm that the impact of competition is not homogeneous across all types of investment and further highlight the importance of extending the literature on the link between competition, capital investment and labour investment.

7.3 | State-level labour laws

As employment practices strongly depend on state-level labour laws (Fairhurst et al., 2020), we hypothesize that the documented relation between product market competition and labour investment efficiency varies in the cross-section due to such laws. To further explore this point, we first take advantage of the enactment of state-level right-to-work (RTW) laws, which weaken unions' bargaining power. RTW laws prohibit unions from mandating payment of union fees by unionized workers and from compelling union membership as a condition of employment. This allows a large number of non-unionized employees to benefit from union coverage without paying dues, hence reducing union resources and limiting their ability to bargain collectively (Ellwood & Fine, 1987; Klasa et al., 2009). Accordingly, we expect RTW laws, which are more business-friendly, to decrease LACs for firms and to enhance efficiency in labour investment decisions. These laws should weaken the relationship between product market competition and labour investment inefficiency.

In addition, we exploit variation in unemployment insurance (UI) benefits across states and over time. The UI system is common throughout the US in that all eligible unemployed workers receive weekly benefit payments. However, there are substantial differences in the amount and duration of these payments across states, as they are determined by worker employment history. Agrawal and Matsa (2013) suggest that the generosity of UI benefits in each state is measured through the maximum benefit amount and the maximum duration allowed. The higher the generosity of UI benefits, the lower workers' cost of unemployment. These benefits make unemployment less costly for both workers and firms, as the former are less likely to contest a dismissal decision and litigate against the latter. To the extent that UI benefits lower the costs of labour adjustment for firms, we expect them to lessen the impact of competitive pressure on labour investment inefficiency.[28]

[28]In this analysis, we do not examine the role of Wrongful Discharge Laws (WDLs) as all U.S. states adopted these laws before the start of our sample period.

TABLE 10 The role of labour laws

This table reports regression results on the impact of labour laws on the relation between product market competition and labour investment efficiency. RTW is an indicator variable that equals one for all years after each firm's historical home state has passed a Right-To-Work (RTW) law and zero otherwise. UI_Benefits is the state-level unemployment insurance benefits calculated as the product of the maximum benefit amount and the maximum duration allowed. All reported absolute *t* values in parentheses are based on robust standard errors adjusted for heteroskedasticity and clustered at the firm level. The list of variables definitions and data sources is provided in Appendix A. *, ** and *** refer to significance at the 10%, 5% and 1% levels, respectively.

Variables	Right-to-work Laws (1)	UI benefits (2)
$FLUIDITY_{t-1}$	0.002***	0.025**
	(4.42)	(2.13)
RTW	0.015	
	(1.28)	
$FLUIDITY_{t-1} \times RTW$	−0.002**	
	(2.11)	
UI_Benefits		0.007
		(0.44)
$FLUIDITY_{t-1} \times$ UI_Benefits		−0.002*
		(1.90)
Intercept	0.055	−0.083
	(1.29)	(0.52)
Controls	Yes	Yes
Year-fixed effects	Yes	Yes
Industry-fixed effects	Yes	Yes
State-fixed effects	Yes	Yes
Observations	17,481	11,960
Adjusted R^2	0.163	0.135

To test the role of labour-related laws across states, we begin by identifying the historical states of headquarters locations for all firms included in our sample, as Compustat reports only the most recent data. We retrieve data on historical business headquarters from the Software Repository for Accounting and Finance (SRAF) website of Bill McDonald.[29,30] We next identify the year in which each state enacted an RTW law based on Chava et al. (2020). We define *RTW* as an indicator variable that equals 1 for all years after each firm's historical home state has passed an RTW law and zero otherwise. We then collect information on UI benefits from the U.S. Department of Labor's 'Significant Provisions of State UI Laws'. We follow Agrawal and

[29] https://sraf.nd.edu/data/augmented-10-x-header-data/
[30] We drop from our sample observations with missing historical business headquarters locations.

Matsa (2013) and measure the generosity of UI benefits (UI_Benefits) as the product of the (weekly) maximum benefit amount and the maximum duration allowed at the state level.

The results reported in Table 10 show that abnormal investment in labour arising from product market competition is heterogeneous and varies across states. In column (1), we find that the coefficient on $\text{FLUIDITY}_{t-1} \times \text{RTW}$ is negative and statistically significant, suggesting that the role of competition in increasing abnormal labour investment is less pronounced in states with RTW laws. Similarly, in column (2), the coefficient on $\text{FLUIDITY}_{t-1} \times \text{UI\_Benefits}$ is negative and statistically significant, providing evidence that the positive impact of competition on abnormal net hiring is weaker in states with more generous UI benefits. Overall, these results are consistent with our conjecture that as RTW laws and UI benefits lower LACs, they help mitigate labour investment distortions arising from competitive pressure.

8 | CONCLUSION

This paper examines the impact of product market competition on firm investment in employees, particularly the efficiency of labour investment decisions. On the basis of previous theoretical and empirical research on the implications of product market competition, we develop two competing hypotheses. On the one hand, consistent with the 'bright side' of competition, we expect competitive pressure to be positively associated with labour investment efficiency. Because competition acts as an external governance mechanism, it limits the diversion of corporate resources and imposes discipline on the decision-making process. This mechanism likely pushes managers to make more efficient decisions that maximize shareholder wealth, leading to improved labour investment efficiency. On the other hand, an opposing argument related to the 'dark side' of competition suggests a negative relation between competitive pressure and labour investment efficiency. Product market competition may result in underinvestment in labour because it exposes firms to higher bankruptcy risk, which leads managers to forgo investments that could distort current performance, resulting in suboptimal labour investment. Alternatively, competitive pressure may alter managerial incentives, encouraging management to improve the welfare of stakeholders, including employees, to boost firm reputation and hence access to external capital. Moreover, product market competition may induce myopic managers to protect their private benefits through collusion with employees. These incentive problems may result in overinvestment in labour.

Using a large sample of US firms over the period 1998–2017, we show that intense product market competition is associated with lower labour investment efficiency; that is, higher deviation of labour investment from its optimal level justified by economic fundamentals. Via additional analysis, we find that these results are observed mainly among underinvesting firms. This finding is consistent with the 'dark side' view of competition, in particular, the risk-increasing effect of competition, which is likely to discourage manager investment incentives, hence creating an underinvestment problem. Our results hold for a battery of robustness checks. Specifically, our evidence persists after addressing endogeneity concerns, using alternative proxies for the dependent and independent variables, examining the role of other nonlabour investments and controlling for the potential confounding effects of other firm- and industry-level characteristics. In cross-sectional analysis, we also show that the negative impact of competition on labour investment efficiency is stronger for firms with higher exposure to competition, tighter financial constraints, greater information asymmetry and higher LACs, providing further empirical support for the economic mechanism driving our results.

This paper makes important contributions to the literature. Specifically, we extend the line of research that examines the impact of competitive pressure on corporate decisions by focusing on firm investment in human capital, a major factor of production hitherto underexplored in previous research. This study also enhances the current understanding of the determinants of labour investment decisions, by looking beyond firm-level determinants and exploring product market characteristics, specifically, product market competition. Finally, our findings hold important policy implications for businesses and policymakers as they take decisions to improve labour investment efficiency, especially in the face of significant labour market disruptions due to increasing deglobalization, geopolitical disputes and global challenges.

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APPENDIX A: Variable definitions and data sources

Variable	Definition	Source
Labour investment variables		
NET_HIRE	The percentage change in the number of employees from year t–1 to year t.	Authors' calculation based on Compustat data.
EXPECTED_NET_HIRE	The predicted value of the percentage change in the number of employees is estimated based on Pinnuck and Lillis (2007) model.	As above
|AB_NET_HIRE|	Abnormal net hiring defined as the absolute difference between the actual and the predicted labour investment.	As above
Overinvestment	The positive difference between the actual and the predicted labour investment.	As above
Underinvestment	The negative difference between the actual and the predicted labour investment.	As above
Overhiring	Overinvestment when the predicted labour investment is positive.	As above
Underfiring	Overinvestment when the predicted labour investment is negative.	As above
Underhiring	Underinvestment when the predicted labour investment is positive.	As above
Overfiring	Underinvestment when the predicted labour investment is negative.	As above
Competition variables		
FLUIDITY	Cosine similarity between a firm's own words vector and the change in rivals' words vector.	Hoberg and Philips Data Library
TNIC_HHI	The Herfindahl-Index calculated as the sum of the squared market shares using firm sales, based on TNIC industry classification of Hoberg and Phillips.	As above
SIC_HHI	The Herfindahl-Hirschman Index calculated as the sum of the squared market shares using firm assets.	Authors' calculation based on Compustat data
TNIC_LI	Lerner Index measured as 1 minus the average profit-to-sales ratio of all firms operating in each TNIC industry.	Authors' calculation based on Hoberg and Philips Data Library
EPCM	The excess price-cost margin or industry-adjusted price–cost margin calculated as the profit-to-sale ratio minus the sales-weighted price–cost margin of all firms operating in the same industry.	Authors' calculation based on Compustat data

(Continues)

Variable	Definition	Source
TSIMM	The sum of pairwise similarity scores between a firm and its industry peers based on TNIC industry classification.	Hoberg and Philips Data Library
LOG_NUM_FIRMS	The number of firms operating in each firm's industry, based on TNIC industry classification of Hoberg and Phillips.	Authors' calculation based on Hoberg and Phillips Data Library
Firm characteristics		
SALES_GROWTH	The percentage change in firm total sales.	Authors' calculations based on Compustat data.
ROA	Firm profitability defined as the ratio of net income to the beginning-of-year total assets.	As above
ΔROA	The percentage change in firm profitability.	As above
RETURN	The compound stock return over the last 12 months.	Authors' calculations based on CRSP data.
SIZE	Firm size measured as the natural logarithm of total assets.	Authors' calculations based on Compustat data.
QUICK	Quick ratio defined as the ratio of cash and short-term investments plus receivables to current liabilities.	As above
ΔQUICK	The percentage change in quick ratio.	As above
LEV	The ratio of debt in current liabilities plus total long-term debt to total assets.	As above
LOSSBINX	Five loss dummy variables indicating each an interval of loss of 0.005. For example, LOSSBIN1 takes one if ROA ranges between 0 and –0.005, LOSSBIN2 takes one if ROA ranges between –0.005 and –0.010, and so forth.	As above
MTB	Market-to-book ratio defined as the market value of common equity scaled by shareholders' equity.	As above
DIVDUM	Dummy variable that takes one if a firm pays common dividends.	As above
STD_CFO	Cash flow volatility defined as the standard deviation of a firm's cash flows from operations over the last 5 years.	As above
STD_SALES	Sales volatility defined as the standard deviation of a firm's sales over the last 5 years.	As above
TANGIBLE	Asset tangibility calculated as the ratio of net property, plant and equipment to total assets.	As above

(Continues)

Variable	Definition	Source
LOSS	Dummy variables that takes one if a firm's ROA is negative.	As above
STD_NET_HIRE	Net hiring volatility defined as the standard deviation of a firm's net hiring over the last 5 years.	As above
LABOR_INTENSITY	The ratio of the number of employees divided by the total assets.	As above
|AB_INVEST_OTHER|	The abnormal nonlabour investments (other investment) defined as the absolute value of the residual from the regression of other investment on sales growth (Other investment are calculated as the sum of capital expenditure, acquisition expenditure, research and development expenditure, less cash receipts from the sale of property plant and equipment, all divided by lagged total assets.	As above
Variables used in robustness tests		
SHOCK	Dummy variable that takes one if an industry has experienced a large tariff reduction that is larger than two times the mean reduction and 0 otherwise.	Schott's International Economics Resource Page
TARIFF_RATE	The ad valorem tariff rate calculated as the ratio of the duties collected from each industry to the dutiable value of imports using the three-digit SIC industry classification.	As above
ANALYST	The I/B/E/S number of financial analysts following a firm.	I/B/E/S
DISC_ACC	Accruals quality calculated based on the modified Jones accrual estimation model developed by Jones (1991) and modified by Dechow et al. (1995).	Authors' calculation based on Compustat data.
MARKET_SHARE	Firm market share defined as firm sales divided by industry sales.	Authors' calculation based on Compustat data
DIVERSIFIED	Dummy variable that takes one if a firm has more than one business segment for a particular year.	Compustat's business segment files
WW	Whited and Wu (2006) financial constraint index calculated as follows: $-0.091 \times \text{CashFlow} - 0.062 \times \text{Dummy-Dividend} + 0.021 \times \text{Leverag} - 0.044 \times \log(\text{Assets}) + 0.102\text{IndustrySalesGrowth} + 0.035 \times \text{FirmSalesGrowth}$	Authors' calculation based on Compustat data
HP	Hadlock and Pierce (2010) financial constraint index calculated as follows: $-0.737 \times \text{size} + 0.043 \times \text{size}^2 - 0.04 \times \text{age}$	Authors' calculation based on Compustat data
FORECAST_ERROR		I/B/E/S

(Continues)

Variable	Definition	Source
	The absolute value of the difference between the announced earnings and mean of estimated earnings scaled by the mean of analyst forecasts.	
EARNING_VOL	The ratio of the standard deviation of the past eight earnings to the average book asset size over the past eight quarters	Compustat
LABOR_UNION	The percentage of employees covered by labour unions.	Authors' calculation based on Union Membership and Coverage database
LABOR_SKILL	The reliance on skilled employees calculated as the weighted average number of employees working in different occupations *j* per industry *i*, where the weight is the U.S. Department of Labor's O*NET program classification of occupations based on skill level.	Authors' calculation based on Occupational Information Network (O*NET) and Occupational Employment Statistics from the Bureau of Labour Statistics
R&D	R&D spending calculated as the ratio of RD expenditure to total sales.	Compustat
INTANGIBLE	Intangible Capital calculated as the sum of externally purchased intangible capital measured using the balance sheet item 'Intangible Assets' and internally created intangible capital which is the sum of knowledge capital (i.e., cumulated past R&D spending) and organizational capital (i.e., cumulated past SG&A expenses).	Peters and Taylor (2017)
CACs	Capital adjustment costs measured as the value-weighted averages of industry-level redeployability indices across business segments for Compustat firms, based on Kim and Kung (2017).	
RTW	An indicator variable that equals one for all years after each firm's historical home state has passed a Right-To-Work (RTW) law and zero otherwise.	Chava et al. (2020)
UI_Benefits	State-level Unemployment Insurance (UI) benefits calculated as the product of the maximum benefit amount and the maximum duration allowed.	U.S. Department of Labor