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Labour Unemployment Insurance and Pension Asset Allocations

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This paper examines the effect of unemployment risk on pension investment decisions of defined benefit pension plans. In particular, we examine whether unemployment insurance benefits affect pension investment risk. Using fixed-effects and difference-in-difference analyses, we find evidence that firms take higher pension investment risk by investing more heavily in equities after unemployment insurance benefit increases. These results are consistent with the notion that firms undertake more risk when the costs of unemployment decrease. The findings are robust to a number of sensitivity tests, including a falsification test to examine the timing of the relationship between the riskiness of the pension portfolio and unemployment insurance benefits, a 3-year window, alternative matching methods and removing firms that operate in geographically dispersed industries. Additional analyses suggests that the findings are more pronounced for firms with skilled labour and high labour intensity, while they are less pronounced when the risk of layoffs is high, in less competitive industries and highly unionized firms.

Introduction

Employees are central to process innovation and quality improvements (Zingales, 2000). They are a vital asset of any organization (Rind *et al.*, 2021). Most studies focus on the effects of corporate policies or training on employment within the organization (Johan and Valenzuela, 2021; Kuvandikov, Pendleton and Goergen, 2022), yet little is known about the effects of employee job security and wage demands on the corporation itself. In this paper, we address this question and ask if unemployment insecurity has an effect on corporate risk-taking by looking at managerial decisions about pension plans.

Managerial decisions about defined benefit (DB) pension plans comprise an integral part of corporate financial policy. According to US Department of Labor (DoL) statistics, DB plans had more than 3 million dollars in pension assets in 2017, a record high over the last 40 years (US Department of Labor, 2019). Previous literature indicates that pension investment strategies are affected by the funded status of pension plans, firm credit ratings and economic conditions (Bartram, 2018; Rauh, 2009), choice of actuarial assumptions (Bergstresser, Desai and Rauh, 2006), board composition (Li and Al-Najjar, 2022), corporate governance (Phan and Hegde, 2013) and changes in accounting standards (Anantharaman and Chuk, 2018; Barthelme, Kiosse and Sellhorn, 2019). Yet, Rauh (2009) suggests that additional factors affecting pension asset investment strategies need to be identified as a large percentage of firm-level variation still remains unexplained.

Whilst previous research has examined various plan and firm-level determinants of pension asset allocation, no study has yet explored whether and how pension investment strategies may be affected by implicit contracts between firms and their rank-and-file employees. In this context, we examine the role of labour unemployment risk on pension investment decisions. This is an important research question as it allows us to shed light on the impact of employee perceptions of unemployment risk on real outcomes by providing evidence that unemployment risk may affect managerial decisions about pension asset allocation of DB plans. This, in turn, contributes to uncovering some of the factors that influence the funding and returns of such plans. Examining the impact of unemployment insurance (UI) benefits on pension asset allocation may also have repercussions for the Pension Benefit Guaranty Corporation (PBGC), which is required to provide pension benefits if the sponsoring firm terminates the plan or if a company files for bankruptcy. In addition, documenting an effect of unemployment benefits on the riskiness of the pension portfolio may have consequences for employee beneficiaries, who may not receive the full pension benefits if the sponsoring firm terminates the plan or goes bankrupt.

Employees demand compensation for the costs of potential unemployment (Smith, 1979). The threat of redundancy changes in the work attachments of long-service managers (Hallier and Lyon, 1996). When employees become involuntarily unemployed, they bear significant costs, including potentially lengthy job searches, layoff discouragement effects, limited job opportunities and significant wage cuts after returning to work (Agrawal and Matsa, 2013; Farber, 2005; Mortensen and Pissarides, 1994). These costs heighten employee concerns about unemployment risk, and employees may require compensation in the form of higher wage differentials if they have to bear a higher risk of unemployment. Indeed, prior literature has shown that these can be substantial. The above suggest that employees' perceived unemployment risk can have a significant impact on firm financing and other decisions (Agrawal and Matsa, 2013; Ben-Nasr, 2019; Chen *et al.*, 2020; Devos and Rahman, 2018; Dou, Khan and Zou, 2016; Graham *et al.*, 2023), and thus firms will have a vested interest to alleviate the costs associated with unemployment risk. Firms may manage employee perceptions of unemployment risk (lower UI benefits) by reducing the riskiness of the pension portfolio.[1] The Employee Retirement Income Security Act of 1974 (ERISA) requires pension plans to provide information to participants about the plan, including its features and funding, on a regular basis. Employees should therefore be informed about the riskiness of the firm's pension portfolio (US Department of Labor, 2019); indeed, employees have a vested interest to keep informed about the type of assets included in the pension portfolio and the overall riskiness, given that they have a personal stake in the firm's pension plan. Hence, we expect that an increase in UI benefits will affect pension asset allocations through their impact on workers' exposure to unemployment risk.

As documented in prior literature, firms try to influence employee perceptions of unemployment risk. In doing so, firms would not be keen to pursue a costly strategy such as changing the amount of benefits paid. A less costly option is for firms to change the riskiness of the pension portfolio. Hence, as UI benefits increase, employees are relatively less concerned about the potential adverse impact of unemployment and firms increase the riskiness of the pension portfolio by undertaking more risky investments. In addition, it is important to emphasize that we aim to shed light on how firms try to influence employee perceptions of unemployment risk and, in this context, we examine the impact of changes in UI benefits on pension investment decisions. Documenting any effects of UI benefits on pension asset allocation is important for sponsoring firms, their managers and plan fiduciaries more generally, as they have a responsibility to administer the plan in the best interest of participants and ensure they can pay the pension benefits promised to its members. In addition, providing evidence of unemployment risk on pension investment decisions may also be relevant in the context of designing unemployment benefit policies.

Previous studies have shown that to ease perceptions of unemployment risk and foster job security, firms tend to choose more conservative policies. All else equal, more generous UI benefits reduce the wage differential that employees may require for bearing high unemployment risk and the costs of potential layoffs. Using changes in state UI benefits, Agrawal and Matsa (2013) find that higher UI benefits result in increased corporate leverage. Similarly, Devos and Rahman (2018) document a decrease in cash holdings following increases in UI benefits. An alternative view posits that an increase in UI benefits may be linked to actions that may reduce firm risk. For example, Dou, Khan and Zou (2016) document a reduction in earnings management and Ng *et al.* (2019) show that firms engage in less income smoothing following increases in UI benefits. In addition, Ji and Tan (2016) find that firms provide more bad news forecasts when the risk of unemployment is low and Shen (2022) documents that the cost of bank loans is lower for firms in states with higher UI benefits. Further, Devon and Rahman (2022) find that total firm risk decreases following increases in UI benefits.

In this paper, we examine whether and how pension asset allocation is influenced by employees' perceptions of unemployment risk. On the one hand, we expect a significant increase in equity investments after an increase in unemployment benefits (i.e. lower unemployment risk). This is because employees are not likely to be very concerned about the increased riskiness of the pension portfolio when unemployment benefits are more generous due to the lower cost of unemployment. On

[1] It is important to note that we do not make any assertions about the optimal pension asset allocation or whether changes in pension asset allocation would be in the best interest of employees. Rather, the focus of this paper is on firm actions designed to influence employee perceptions of unemployment risk. It is also important to acknowledge that firms could have chosen other actions, such as changing the amount of pension benefits provided to employees as opposed to altering the riskiness of the pension portfolio. However, making changes to the pension benefits provided would be a more costly option compared to making changes to the pension asset allocation strategy. In addition, changing the amount of benefits paid would be more complicated as it would require the approval of various stakeholders.

the other hand, it is possible that firms may opt not to undertake more risk by investing a greater percentage of pension assets in equities, even in light of increases in unemployment benefits, given that increased pension risk-taking may potentially have adverse consequences for firms and employees alike.

State UI benefits are likely to be a good proxy for unemployment risk, as exogenously determined increases in UI benefits will reduce the unemployment costs incurred by employees. Hence, using changes in state UI benefits to capture unemployment risk, we examine the relationship between UI benefits and pension asset allocation of US firms from 1990 to 2017. To test how an increase in UI affects pension asset allocation, we use both a fixed-effects model and a difference-in-differences (DiD) model. The DiD model compares pension asset allocations before and after an exogenous increase in UI benefits for treatment and control firms. Following prior literature (e.g. Devos and Rahman, 2018; Dou, Khan and Zou, 2016), treatment firms are those headquartered in states with a large increase (>10%) in maximum benefits and control firms are those headquartered in states without a large increase (>10%) in benefits. In addition, we employ two matching techniques, namely entropy balance matching (EBM) and propensity score matching (PSM), to balance the covariance of the treatment and control firms. We find that firms take greater pension risks by investing more pension assets in equities after an increase in UI benefits, consistent with the stream of literature documenting that firms increase leverage and maintain lower cash holdings following increases in UI benefits (Agrawal and Matsa, 2013; Devos and Rahman, 2018). The results are economically significant, suggesting that a one standard deviation increase in UI benefit increases mean investments in risky assets from 27.69% to 35.02%. In addition, we find a stronger relation between UI generosity and risky pension asset allocation among firms that face higher financial constraints.

Moreover, we carry out a number of sensitivity tests to examine the robustness of the main findings. First, we use a falsification test and include lagged, contemporaneous and forward values of UI benefits in order to examine the timing between pension asset allocation and UI benefits. The results suggest that it is only the contemporaneous value of benefit that is significant, thereby alleviating any concerns that benefit captures unobserved correlated economic conditions. Second, we use a 3-year window to examine the longer-term impact of UI benefits on pension asset allocation and find that firms undertake higher pension investment risk even 3 years after an increase in UI benefits. Third, we use alternative matching methods, including a neighbouring state match filter following Dou, Khan and Zou (2016), when matching treatment and control firms. Fourth, following previous studies (e.g. Agrawal and Matsa, 2013), we remove firms that operate in geographically dispersed industries. The findings of the above robustness tests are overall consistent with those reported in the main analysis.

In additional analysis, we show that firms sponsoring smaller pension plans are more likely to undertake higher pension investment risk. We also carry out cross-sectional tests examining the role of skilled labour, labour intensity, layoff rate, industry competition and unionization on the relation between UI benefit increases and pension asset allocation. We find that firms with skilled labour and high labour intensity are more likely to take higher pension investment risks, whereas firms with high layoff rates, less industry competition and high union power are less likely to invest a higher percentage of pension assets in equities after UI benefit increases.

This paper makes several contributions to the existing literature. First, it extends prior literature on labour UI (e.g. Agrawal and Matsa, 2013; Devos and Rahman, 2022; Dou, Khan and Zou, 2016) by examining how UI benefits influence pension investment decisions. This is important as the pension risk has significant implications for firms, employees, retirees, the PBGC and other stakeholders. In addition, it contributes to the labour economics literature documenting an increase in firm risk (e.g. Agrawal and Matsa, 2013; Ben-Nasr, 2019; Devos and Rahman, 2018) and other studies finding a reduction in firm risk (Dou, Khan and Zou, 2016; Ng *et al.*, 2019) following increases in UI benefits by showing that firms sponsoring DB pension plans undertake higher pension risk when UI benefits increase. Second, Li and Al-Najjar (2022) conclude that larger and more independent boards will likely lead to lower pension investment risk. We complement this line of research by documenting the role of UI benefits on pension risk-taking and find that firms sponsoring DB plans increase pension investment risk following increases in UI benefits. Further, we provide evidence that additional factors – including skilled labour, labour intensity, layoff rates, industry competition and union power – affect pension risk-taking. Third, it responds to calls in the prior literature to identify other factors that influence pension asset allocation decisions (Rauh, 2009). Moreover, it contributes to previous research on pensions documenting the real effects of policy changes (Anantharaman and Chuk, 2018; Beaudoin, Chandar and Werner, 2010) by showing that firms increase the riskiness of the pension portfolio following increases in UI benefits. Lastly, the findings may be of interest to policymakers designing UI benefits. Overall, the results suggest that employee perceptions of unemployment risk are an important determinant of firms' pension asset allocation strategies and they have practical relevance for managers, regulatory bodies, investment advisers, policymakers as well as firms and employees.

Background, related literature and hypothesis development

Unemployment risk and UI benefits

According to the labour economics literature, during labour contract negotiations, a firm's optimal risk-taking level depends on the trade-off between the benefits of corporate leverage and the costs of human capital (Blaug, 1976). If contract agreements are breached, employees may require more compensation. Previous literature suggests that employees require compensation for unemployment risk, in the form of higher wages, additional benefits and improved working conditions (Agrawal and Matsa, 2013; Burdett and Mortensen, 1998; Cotton, 1988; Gibbons and Katz, 1991; Mortensen and Pissarides, 1994). These payments are usually referred to as compensating wage differentials (Chen *et al.*, 2020; Smith, 1979). Abowd and Ashenfelter (1981) document inter-industry variation in the size of wage differentials and note that these can be up to 14% of total wages, while Hamermesh and Wolfe (1990) find that variation in unemployment risk can explain between 14% and 41% of total inter-industry wage differentials. Hence, the above highlight the significance of wage differentials and suggest that firms have incentives to influence these.

Employees are exposed to high unemployment risk when firms are financially distressed because they may be forced to lay off employees to meet outstanding debt obligations (Asquith, Gertner and Scharfstein, 1994; Ofek, 1993). Therefore, when firms face higher financial leverage, their employees will have less job security and the compensating wage differentials will be higher.[2] Agrawal and Matsa (2013) find that firms are inclined to choose conservative financial policies in order to decrease the risk of financial distress, which offsets employees' need for a compensation premium.

In the United States, employees who are involuntarily unemployed and actively seeking new jobs are eligible to claim UI benefits. American UI is comprised of a two-tier joint federal and state system. The federal government and the states interact and complement each other in providing UI. The basic framework is common across all states, but individual states have a certain amount of autonomy over programme parameters. In essence, each state runs an independent UI programme following federal guidelines and in this context each state establishes its own UI benefit laws to determine eligibility, maximum benefit amounts and the maximum duration of the benefit. UI programmes generally provide temporary financial assistance to eligible employees who are unemployed through no fault of their own. The purpose of the programme is to mitigate the loss of income during the unemployment period. The amount provided by each state is determined based on wage benefit formulas that are set by state law. The formula calculates the highest earnings realized by a worker over the most recent 52-week period and then aims to cover approximately 50% of those earnings through weekly benefit payments. The amount is subject to minimum and maximum bounds set by individual states each year, and the maximum weekly benefit is subject to change. Thus, UI benefits can mitigate unemployment risk by reducing the costs borne by employees, and hence changes in UI benefits can result in meaningful shocks to unemployment-related costs.

Firms typically maintain their optimal risk levels until they experience exogenous events that change employees' risk-aversion levels, such as changes in UI. Topel (1984) finds that UI can significantly reduce compensating wage differentials. The empirical evidence on the effects of UI benefit increases on risk-taking is mixed. For example, Agrawal and Matsa (2013) conclude that an increase in UI decreases unemployment costs and risk-aversion levels and subsequently firm leverage increases. In addition, Devos and Rahman (2018) find that firm cash holdings are lower after UI benefits increase. The above indicate that firms seem to take on more risk after employees' perceived unemployment risk decreases. The reduced wage premiums required by employees essentially allow firms to increase their leverage and benefit from debt financing. An alternative view suggests that firm risk decreases following increases in UI benefits. For example, Dou, Khan and Zou (2016) and Ng *et al.* (2019) find evidence consistent with less earnings management and less income smoothing, respectively, when UI benefits increase. Further, Ji and Tan (2016) show that firms issue more bad news forecasts when unemployment risk is low and Devon and Rahman (2022) document that increases in UI benefits lead to a reduction in total firm risk.

Hypothesis development

Many factors affect firms' pension investment strategies and levels of risk (Bergstresser, Desai and Rauh, 2006; Bodie, Light and Morck, 1987; Rauh, 2009). Sharpe (1976) suggests that from a firm perspective, sponsoring a DB pension plan is similar to holding a put option on the pension assets. An increase in pension risk increases the value of the option. In addition, the risk-shifting hypothesis suggests that an increase in pension risk is actually value-maximizing for shareholders, since it can transfer wealth from employees to shareholders (Sharpe, 1976; Treynor, 1977).

One way that pension risk can be increased is by allocating pension assets in risky investments (e.g. Balachandran, Duong and Vu, 2019; Bonsall, Comprix and

[2]See the Online Appendix 1 for a discussion of pension assets and liabilities, the role of PBGC and potential impact on wage differentials.

Muller, 2019). The risky investment strategies could increase pension assets' fair value if the returns are high and the firm can benefit from potential reductions in future contributions. However, risky investments also increase the volatility of pension investment returns and could lead to higher required contributions if the risky investment fails. As discussed in Online Appendix 1, the PBGC guarantees minimum pension benefits to participants in the event of firm bankruptcy or plan termination. This provides more incentives for firms to shift risk, since firms can essentially shift unfunded pension obligations to the PBGC (Broeders and Chen, 2013).

From an employee perspective, pension assets resemble debt-like characteristics (Anantharaman and Lee, 2014; Boon, Brière and Rigot, 2018; Mohan and Zhang, 2014). The employee beneficiaries hold claims on the firm's pension assets, similar to the firm's debt holders. If the firm goes bankrupt and the pension plan becomes underfunded, employee beneficiaries will receive a reduced payout from the assets left in the plan or will be compensated by the PBGC up to the maximum coverage. This illustrates how pension investment risk can be shifted from shareholders to both the PBGC and employees. Thus, while the increase in risk in pension assets may be beneficial for shareholders, it may simultaneously increase the risk that pension beneficiaries will not receive full pension benefits.

If the firm increases pension investment risk by investing in riskier securities such as equity, it increases the volatility of pension investment returns. If a firm goes bankrupt from such investments, employees could lose both their jobs and part of their pensions. If a firm does not go bankrupt or terminate its pension plan, but faces severe underfunding caused by taking on overly high pension investment risks, it must continue to fund the plan by using its own resources (Rauh, 2009). Because of the minimum funding level mandated by ERISA, firms cannot make capital expenditures, project investments, or dividend payments if their pension funding level is below the minimum (Comprix and Muller, 2011). Thus, their other obligations' default risk will increase because the pension contributions may reduce firms' liquidity. This further contributes to firms' financial distress and probability of bankruptcy. It can increase both employees' unemployment risk and wage differentials, because of the difference between PBGC coverage and total pension benefits.

Previous literature has found that in order to avoid large contributions, firms are inclined to allocate more pension funds to safe securities and to take on less investment risk if their pension plan is underfunded or if they are in financial distress (Rauh, 2009). In addition, less risky pension investments can help firms minimize employees' perceived unemployment risk and therefore reduce wage differentials. An increase in UI benefits can reduce compensating wage differentials. If UI benefits increase, the cost of unemployment is reduced and the unemployment risk perceived by employees decreases. This, in turn, decreases costs for the firm, since wage differentials are reduced (Agrawal and Matsa, 2013). Firms may thus be encouraged to take more risks with pension plan asset investments, consistent with their overall financial policy. This could motivate them to invest a higher proportion of pension assets in equity and potentially obtain higher returns on pension assets. However, it is also possible that firms may decide not to undertake higher pension risk, given that undertaking high investment risk may increase the volatility of asset returns, which may have adverse consequences for firms and employees. For example, if the pension plan is underfunded as per limits set by law, required pension contributions may increase and the firm may also not be in a position to pay pension benefits. The above suggest that the relationship between UI benefits and pension investments is not clear, and this is ultimately an empirical question on which we aim to shed light.

Sample selection, variable definitions and research design

Sample selection and variable definitions

Sample selection. We use publicly available UI benefits data from the US DoL website, financial statement data are retrieved from Compustat and state-level data are hand-collected from the US DoL website. We create a treatment group (74 state-years) and a control group (824 state-years) from 1990 through 2017. Our treatment group includes state-year observations with a large increase in the maximum total UI benefits of more than 10% relative to the previous year, but with no large increase in the prior year. We identify pre- and post-years based on the event year. Our control group includes state-year observations with no large increase in both pre-event and event year. We match firms in the treatment and control groups using EBM and PSM.[3] For each firm operating in the event state, we use EBM and

[3]EBM is used to pre-process the sample data and achieve a covariate balance between the treatment and control groups by means of a reweighting scheme (Hainmueller, 2012). It directly incorporates covariate balance into the weight function by using a set of balance constraints. The treatment and control groups in the pre-processed data match exactly on all pre-specified constraints. This provides a ranking for the balance constraints and helps retain valuable information by keeping all the observations (e.g. Hirano, Imbens and Ridder, 2003; Ho *et al.,* 2007). PSM uses a different technique than EBM. In particular, it provides a scalar propensity score to the control observations; in this paper, we conduct one-to-one nearest-neighbour matching. The control units with the lowest propensity scores are then excluded from the sample set. This method drops numerous observations from the control group, especially in this setting where we have multiple control states matched to each treatment state

PSM to choose another firm in the specific control state in the same year with the same firm size, pension size and industry constraints. Online Appendix 2 provides detailed information about the sample selection process.

Labour unemployment risk measure. We record information on weekly UI benefit amounts and the duration of covered weeks. Following Agrawal and Matsa (2013), we select the highest reported figures for weekly benefits and the duration for each state-year and use them to measure the level of each state's UI benefit. We define our proxy for labour unemployment risk, Benefit, as the natural logarithm of the maximum number of weeks times the maximum weekly benefit amount. Benefit is a proxy for the total UI benefits that a UI claimant can receive in a given year.

Pension asset allocation data. The pension asset allocation data are collected from IRS Form 5500 filings from the US DoL from 1990 through 2017. In particular, we obtain Form 5500 data for 1990–1998 from the Center for Retirement Research at Boston College and from 1999 onwards we obtain these data from the US DoL website. Form 5500 provides asset class information at the plan level for the following asset categories: interest-bearing cash, US government securities, corporate debt instruments and corporate stocks. Following Jin, Merton and Bodie (2006), we aggregate Form 5500 plan-level data at the company level. We use the percentage of pension assets invested in equities (%Equity) as a proxy to measure firms' pension investment risk-taking levels, consistent with prior literature (Anantharaman and Chuk, 2018). %Equity is defined as the sum of common stock, preferred stock, joint ventures, employer securities and interests in registered investment companies divided by the fair value of total pension assets.[4]

Control variables. We control for factors shown in the previous literature to affect firms' pension asset allocations (Amir, Guan and Oswald, 2010; Anantharaman and Chuk, 2018). In particular, we control for %LEquity (lagged value of the dependent variable), Fund (funding status of pension plans), Fund2 (square term of fund), Maturity (plan maturity), Leverage, Divp (dividend payout), Tax, Assets, Market_return, ROA (return on assets), Union (states' labour union power), Recession (economic cycle), GDP (gross domestic product), Unemp_rate (unemployment rate), Election and Democrat.[5] We winsorize the firm-level continuous variables at the 1% and 99% levels. Detailed variable definitions are provided in Appendix 1.

(King *et al.,* 2011), and does not balance firm characteristics but rather only propensity scores.

[4]Form 5500 includes information about opaque pension investment categories such as registered investment companies and it is difficult to infer their risk. Following Rauh (2009), we run a sensitivity test by removing observations that invest more than 5% of pension assets in registered investment companies. This results in a sample that is more skewed towards small to medium-sized firms. As expected, the results are consistent, but less pronounced compared to the results of our main tests, since large firms are more likely to invest in registered investment companies. In addition, the elimination of firms with more than 5% investments in the registered investment company asset class reduces the sample size by 40%, which lowers the power of the tests.

Research design

We use a panel regression analysis to examine the relationship between UI level and pension asset allocation policy at the firm-year level. Following prior literature (e.g. Anantharaman and Chuk, 2018), we estimate the following regression equation, which we expand to control for macroeconomic and political conditions:[6]

$$\%\text{Equity}_{i,t+1} = \beta_0 + \beta_1 \text{Benefit}_{i,t} + \text{Controls} + \text{FEs} + \varepsilon_{i,t+1} \quad (1)$$

The dependent variable in Equation (1) is %Equity and the main variable of interest is Benefit. We also include a set of controls described earlier and firm, industry × year and year fixed effects. The standard errors are clustered by state and year. Subsequently, we estimate the model using the DiD specification as follows:

$$\%\text{Equity}_{i,t+1} = \beta_0 + \beta_1 \text{Treat}_{i,t} + \beta_2 \text{Post}_{i,t} + \beta_3 \text{Treat}_{i,t} \times \text{Post}_{i,t} + \text{Controls} + \text{FEs} + \varepsilon_{i,t+1} \quad (2)$$

where Treat is an indicator variable that equals 1 for treatment firms, and 0 otherwise. Post is an indicator variable that equals 1 in the year following the increase in unemployment benefits, and 0 otherwise. The main independent variable of interest is Treat × Post, which captures the impact of unemployment benefit increases on the treatment group. We also include a set of control variables and fixed effects, as discussed previously. In the main analysis, we examine firms' pension asset allocation decisions 1 year after UI benefits increase.

Descriptive statistics

Table 1 presents descriptive statistics for our sample. %Equity has a mean (median) value of 0.2769 (0.0195) in a 1-year window, which indicates that firms invest

[5]Online Appendix 3 provides more detailed information about the selection of control variables.

[6]State-year t is the year the state experienced a large increase in unemployment benefits. State-year t+1 is the year after the large increase.

Table 1. Descriptive statistics

	N	Mean	SD	p25	p50	p75
%Equity	91,552	0.2769	0.3364	0	0.0195	0.5617
Benefit	91,552	9.0696	0.3212	8.8749	9.0388	9.2912
%LEquity	91,552	0.2684	0.3305	0	0.0129	0.5418
Fund	91,552	1.0452	0.6729	0.6793	0.9213	1.2325
Fund2	91,552	1.5452	2.6670	0.4614	0.8488	1.5190
Maturity	91,552	3.5252	0.8168	3.0429	3.4624	3.8960
Leverage	91,552	0.2836	0.1947	0.1499	0.2640	0.3790
Divp	91,552	0.0795	0.2416	0	0.0355	0.0864
Tax	91,552	0.1979	0.4568	0.1371	0.2525	0.3304
Assets	91,552	7.2758	1.8605	5.9434	7.2685	8.5293
Market_return	91,552	0.0613	0.1804	−0.0154	0.0706	0.2345
ROA	91,552	0.0821	0.0665	0.0433	0.0783	0.1175
Union	91,552	0.5036	0.5000	0	1	1
Recession	91,552	0.1925	0.3943	0	0	0
GDP	91,552	0.0045	0.0026	0.0034	0.0044	0.0060
Unemp_rate	91,552	6.1729	1.7566	4.9500	5.8333	7.1583
Election	91,552	0.2385	0.4262	0	0	0
Democrat	91,552	0.6298	0.4829	0	1	1

This table provides summary statistics for the variables used in estimating the model where the dependent variable is pension asset allocation, %Equity. %Equity is the percentage of pension assets invested in equity in the year after the unemployment benefit increase. Benefit is the natural logarithm of the maximum number of weeks times the maximum weekly wage benefit amount given to employees in state-year t. %LEquity is the lagged value of %Equity. Fund is the fair value of pension assets divided by projected benefit obligations (PBO). Fund2 is Fund's square term. Maturity is pension plan maturity, which is defined as the natural logarithm of the ratio of PBO to current service costs. Leverage is debt in current liabilities plus long-term debt divided by total assets. Divp is dividends per share divided by retained earnings per share. Tax is total tax expense divided by pre-tax income. Assets is the natural logarithm of total assets. Market_return is 12-month returns to the S&P 500 index for equities. ROA is return on assets. Union is an indicator variable that is equal to 1 if the union coverage rate is above the median value in year t, and 0 otherwise. Recession is an indicator variable equal to 1 if there is economic recession in year t, and 0 otherwise. GDP is the state GDP growth rate. Unemp_rate is the state unemployment rate. Election is an indicator variable that is equal to 1 if there is a presidential election in year t, and 0 otherwise. Democrat is an indicator variable that is equal to 1 if the Democrat presidential candidate received more votes, and 0 otherwise. Detailed variable definitions are provided in Appendix 1.

an average (median) of 27.69% (1.95%) of their pension assets in equities. The mean (median) of Benefit is 9.0696 (9.0388). The mean (median) of Fund is 1.0452 (0.9213), which indicates that half of the firms have underfunded pension plans, where plan assets are less than pension liabilities. In addition, the mean (median) of Maturity is 3.5252 (3.4624). Further, the average (median) Leverage is 0.2836 (0.2640), the average (median) Divp is 0.0795 (0.0355) and the average (median) Tax is 0.1979 (0.2525). The average (median) Assets is 7.2758 (7.2685), the average (median) Market_return is 0.0613 (0.0706) and the average (median) ROA is 0.0821 (0.0783). The average Union and Recession are 0.5036 and 0.1925. The average GDP and Unemp_rate are 4.5% and 6.17%. 23.85% of the state-years had presidential elections and 62.98% of the state-years had more votes to Democrat presidential candidates.

Appendix 2 shows the pairwise Pearson (in the lower diagonal) and Spearman correlations (in the upper diagonal) for 1-year windows. There is a positive correlation between Benefit and %Equity (coefficient 0.056), which is significant at the 1% level, as expected. Overall, the correlation coefficients between the variables are modest, which indicates that multicollinearity is not a concern.

Results

Main tests

We first present univariate analysis of the treatment and control samples. We analyse macro and firm-level variables in both the event and pre-event year in order to shed light on whether differences in the underlying conditions have an effect on the outcome of interest. Panel A of Appendix 3 shows the differences in means of both samples and the test of difference-in-differences for state-level variables. As reported in the last column, the state-level conditions are significantly different in both the event and the pre-event year between the two groups. The differences in UI benefits from the pre-event year to the event year are 0.1503 for the treatment sample and 0.019 for the control sample. Overall, the macroeconomic variables in the treatment sample are significantly different between event and pre-event year. Panel B of Appendix 3 shows the univariate results for all the control variables on a firm-year basis. All the variables, except for Tax, Assets, Market_return and ROA, are similar in event and pre-event years in both the treatment and control samples. In order to address these differences in treatment and control samples, we use two matching techniques (EBM and PSM) as discussed in

Table 2. Pension asset allocation and UI benefit

	FE			DiD		
	State-year	EBM	PSM	State-year	EBM	PSM
%Equity	1	2	3	4	5	6
$Benefit_t$	**0.0725***** **(5.2213)**	**0.0272***** **(3.5140)**	**0.1009***** **(7.3255)**			
$Treat_t$				−0.0107* (−1.7809)	−0.0107* (−1.7492)	−0.0082 (−1.1468)
$Post_t$				0.0487 (1.4446)	0.0005 (0.0123)	−0.0593** (−2.3155)
$Treat_t \times Post_t$				**0.0130*** **(1.7995)**	**0.0127*** **(1.8292)**	**0.0819***** **(4.5806)**
$\%LEquity_{t+1}$	0.6299*** (56.8805)	0.8840*** (110.1171)	0.6284*** (49.3830)	0.6338*** (59.5347)	0.6396*** (37.6775)	0.6330*** (50.7932)
$Fund_{t+1}$	0.0088 (0.6444)	0.0086 (1.2022)	0.0082 (0.5596)	0.0070 (0.5037)	0.0075 (0.4288)	0.0058 (0.3998)
$Fund2_{t+1}$	−0.0004 (−0.1410)	−0.0013 (−0.7918)	−0.0006 (−0.2041)	0.0001 (0.0501)	−0.0002 (−0.0656)	0.0001 (0.0475)
$Maturity_{t+1}$	0.0086** (2.2053)	−0.0066** (−2.4769)	0.0088* (1.9656)	0.0162*** (4.3367)	0.0133*** (2.9127)	0.0196*** (4.6294)
$Leverage_{t+1}$	−0.0038 (−0.1724)	−0.0186* (−1.8593)	−0.0133 (−0.5496)	−0.0069 (−0.2995)	−0.0116 (−0.3938)	−0.0181 (−0.7101)
$Divp_{t+1}$	0.0024 (0.4671)	0.0001 (0.0070)	−0.0002 (−0.0232)	0.0005 (0.1062)	0.0055 (0.6668)	−0.0025 (−0.2939)
Tax_{t+1}	−0.0001 (−0.0290)	0.0020 (0.6457)	0.0021 (0.6090)	−0.0009 (−0.3151)	0.0060* (1.7434)	0.0012 (0.3496)
$Assets_{t+1}$	−0.0131*** (−4.0321)	−0.0068*** (−7.8335)	−0.0145*** (−3.9189)	0.0011 (0.3619)	0.0076 (1.3068)	0.0053 (1.5104)
$Market\_return_{t+1}$	−0.0023 (−0.2434)	0.0302* (1.8966)	−0.0258** (−2.6381)	−0.0038 (−0.3651)	0.0242 (1.5713)	−0.0304*** (−2.7683)
ROA_{t+1}	−0.0062 (−0.1275)	−0.0315 (−0.8724)	−0.0047 (−0.0883)	−0.0107 (−0.2178)	−0.0115 (−0.2365)	−0.0090 (−0.1670)
$Union_{t+1}$	0.0123** (2.1063)	0.0071* (1.8275)	0.0083 (1.3756)	0.0114* (1.8586)	0.0127 (1.2612)	0.0062 (0.9210)
$Recession_{t+1}$	0.0024 (0.4772)	−0.0085 (−1.4696)	0.0238*** (4.8301)	−0.0005 (−0.0910)	−0.0114* (−1.9395)	0.0210*** (3.9443)
GDP_{t+1}	−0.8405 (−0.9989)	−2.1803*** (−2.8739)	0.6422 (0.7074)	−1.5673 (−1.6745)	−2.5138*** (−3.3785)	−0.4153 (−0.3927)
$Unemp\_rate_{t+1}$	−0.0014 (−1.2039)	0.0003 (0.1938)	−0.0017 (−1.4793)	−0.0011 (−0.8516)	−0.0034* (−1.7314)	−0.0014 (−0.9084)
$Election_{t+1}$	0.0099** (2.4718)	0.0098** (2.2279)	0.0153*** (4.0191)	0.0085** (2.0285)	0.0049 (1.1817)	0.0127*** (2.9493)
$Democrat_{t+1}$	0.0067 (0.8500)	−0.0052 (−0.9985)	0.0055 (0.6931)	0.0092 (0.9742)	0.0045 (0.5113)	0.0093 (0.9386)
Constant	−0.5097*** (−4.1470)	−0.1308* (−1.7671)	−0.7408*** (−6.4660)	0.0232 (0.6051)	0.0228 (0.4474)	−0.0040 (−0.1091)
Observations	91,552	91,550	44,599	91,552	91,550	44,599
Adjusted R-squared	0.8144	0.7740	0.8237	0.8137	0.8401	0.8224
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes

This table presents coefficient estimates and t-statistics in parentheses below from pooled regressions where the dependent variable is %Equity. The fixed-effect model and DiD model are in columns 1–3 and columns 4–6, respectively. Columns 1 and 4 report the results using the state-year matched sample; columns 2 and 5 report the results using the EBM matched sample; columns 3 and 6 report the results using the PSM matched sample. %Equity is the percentage of pension assets invested in equity in the year after the unemployment benefit increase. Benefit is the natural logarithm of the maximum number of weeks times the maximum weekly wage benefit amount given to employees in state-year t. Treat is an indicator variable that is equal to 1 for firm-years in the treatment sample, and 0 otherwise. Post is an indicator variable that is equal to 1 for the period after an increase in unemployment benefits, and 0 otherwise. Detailed variable definitions are provided in Appendix 1. Standard errors are clustered by state. *, ** and *** denote two-tailed statistical significance at the 10%, 5% and 1% levels, respectively.

Table 3. Cross-sectional tests: Importance of financial constraints

%Equity	1	2	3
$Benefit_t$	0.0455***	0.0416**	0.0465**
	(3.1072)	(2.5607)	(2.2294)
$Dividends_t$	−0.5729***		
	(−4.6126)		
$Benefit_t$ × $Dividends_t$	**0.0630*** **		
	(4.6449)		
$Cash\_flow_t$		−0.6477***	
		(−5.2707)	
$Benefit_t$ × $Cash\_flow_t$		**0.0709*** **	
		(5.1624)	
SA_index_t			−0.5032**
			(−2.3675)
$Benefit_t$ × SA_index_t			**0.0531** **
			(2.2003)
Observations	91,407	88,235	74,105
Controls	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes
Industry × year fixed effects	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes

This table presents the results from firm-panel regressions of firms' pension asset allocations on the natural logarithm of the maximum total potential benefit available under states' UI systems and a set of financial controls. %Equity is the percentage of pension assets invested in equity in the year after the unemployment benefit increase. Benefit is the natural logarithm of the maximum number of weeks times the maximum weekly wage benefit amount given to employees in state-year t. Dividends is equal to 1 if a firm issues below-median dividends, and 0 otherwise. Cash_flow is equal to 1 if a firm reports below-median operating cash flows, and 0 otherwise. The SA index is an indicator variable that is equal to 1 if a firm has above-median SA index, and 0 otherwise. All controls included (%LEquity, Fund, Fund2, Maturity, Leverage, Divp, Tax, Assets, Market_return, ROA, Union, Recession, GDP, Unemp_rate, Election, Democrat). Detailed variable definitions are provided in Appendix 1. Standard errors are clustered by state. *, ** and *** denote two-tailed statistical significance at the 10%, 5% and 1% levels, respectively.

Table 4. Falsification tests

%Equity	1
$Benefit_{t-1}$	−0.0669
	(−1.1421)
$Benefit_{t-2}$	0.0701
	(1.3843)
$Benefit_t$	**0.1191*** **
	(3.2404)
$Benefit_{t+1}$	−0.0186
	(−0.4394)
$Benefit_{t+2}$	−0.0366
	(−1.4183)
Observations	91,550
Controls	Yes
Firm fixed effect	Yes
Industry × year fixed effects	Yes
Year fixed effect	Yes

This table presents coefficient estimates and t-statistics in parentheses below each coefficient from pooled regressions of %Equity on $Benefit_{t-1}$ and $Benefit_{t-2}$; $Benefit_t$, $Benefit_{t+1}$ and $Benefit_{t+2}$. %Equity is the percentage of pension assets invested in equity in the year after the benefit increase. Benefit is the natural logarithm of the maximum number of weeks times the maximum weekly wage benefit amount given to employees in state-year t. All controls included (%LEquity, Fund, Fund2, Maturity, Leverage, Divp, Tax, Assets, Market_return, ROA, Union, Recession, GDP, Unemp_rate, Election, Democrat). Detailed variable definitions are provided in Appendix 1. Standard errors are clustered by state. *, ** and *** denote two-tailed statistical significance at the 10%, 5% and 1% levels, respectively.

the previous section to match the treatment and control sample at the firm level. We also include the above variables as controls in order to control their potential effects in our empirical analyses.

Next, we estimate our baseline regression to test the association between pension asset allocation and UI benefits. Table 2 presents the coefficient estimates, with t-statistics in parentheses, from a pooled regression estimation of Equation (1) in columns 1–3 and Equation (2) in columns 4–6. Column 1 reports the results of the fixed-effect model using the state-year matched sample, column 2 reports the results using the EBM matched sample and column 3 reports the results using the PSM matched sample for the 1-year window. Columns 4–6 report the results of the DiD model using the state-year matched sample, EBM matched sample and PSM matched sample, respectively.

The main independent variable of interest in the fixed-effect model, Benefit, has a positive and significant coefficient across all models, which ranges from 0.0272 to 0.1009. The Benefit coefficient of 0.0272 (0.1009) indicates that a 100-log point increase in the maximum total unemployment benefit is associated with a 2.72% (10.09%) increase in pension assets invested in equities. Overall, these results suggest that an increase in Benefit can explain economically significant changes in %Equity. These findings suggest that firms increase pension investment risk after an increase in UI, thereby showing that firms consider employees' exposure to unemployment risk when determining pension investment strategies.

Columns 4–6 show results using a DiD specification presented in Equation (2). The variable of interest, Treat × Post, has positive and significant coefficients across all different specifications. Overall, these results suggest that firms take more risks with pension asset allocations after an increase in unemployment benefits. The coefficients range from 0.0127 ($p < 0.1$) to 0.0819 ($p < 0.01$) and indicate that firms increase pension assets invested in equity by 1.3–8.19% after a UI increase. These results are consistent with those of the fixed-effects model in columns 1–3. The control variable %LEquity has a positive and significant coefficient across all different specifications, suggesting that pension asset allocation decisions in the prior year are an important determinant of the magnitude of the current year's %Equity.

Taken together, the results in Table 2 show a positive and significant effect of a UI benefit increase on firms'

Table 5. Pension asset allocation and UI benefit: 3-year window

	FE			DID		
%Equity	State-year 1	EBM 2	PSM 3	State-year 4	EBM 5	PSM 6
$\mathbf{Benefit_t}$	**0.0690*****	**0.0565*****	**0.1004*****			
	(5.1056)	**(3.5790)**	**(7.4213)**			
$Treat_t$				−0.0111*	−0.0116*	−0.0084
				(−1.8304)	(-1.8783)	(-1.1815)
$Post_t$				0.0449*	0.0808***	−0.0860***
				(1.7516)	(11.2160)	(-4.9127)
$\mathbf{Treat_t \times Post_t}$				**0.0161****	**0.0148****	**0.0814*****
				(2.2324)	**(2.2079)**	**(4.2012)**
Observations	92,072	92,056	44,790	92,072	92,056	44,790
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes

This table presents coefficient estimates and t-statistics in parentheses below from pooled regressions where the dependent variable is %Equity using a 3-year window. The fixed-effect model and DiD model are in columns 1–3 and columns 4–6. Columns 1 and 4 report the results using the state-year matched sample; columns 2 and 5 report the results using the EBM matched sample; columns 3 and 6 report the results using the PSM matched sample. %Equity is the percentage of pension assets invested in equity in the year after the unemployment benefit increase. Benefit is the natural logarithm of the maximum number of weeks times the maximum weekly wage benefit amount given to employees in state-year t. Treat is an indicator variable that is equal to 1 for firm-years in the treatment sample, and 0 otherwise. Post is an indicator variable that is equal to 1 for the period after an increase in unemployment benefits, and 0 otherwise. All controls included (%LEquity, Fund, Fund2, Maturity, Leverage, Divp, Tax, Assets, Market_return, ROA, Union, Recession, GDP, Unemp_rate, Election, Democrat). Detailed variable definitions are provided in Appendix 1. Standard errors are clustered by state. *, ** and *** denote two-tailed statistical significance at the 10%, 5% and 1% levels, respectively.

pension asset allocations. Firms tend to increase equity investments when employees become eligible to receive higher UI benefits from state governments. These empirical findings are consistent with the notion that firms take more pension plan risks when employees' perceptions of unemployment risk are reduced and are consistent with the stream of prior literature showing that firms take more risk following increases in unemployment benefits (e.g. Agrawal and Matsa, 2013; Ben-Nasr, 2019; Devos and Rahman, 2018). Overall, these results indicate that UI benefits can have an economically significant impact on pension investment decisions.

Importance of firm financial constraints

Previous literature suggests that employees' perceived unemployment risk is higher when firms are financially constrained (Agrawal and Matsa, 2013). Agrawal and Matsa (2013) suggest that firms face more pressure to maintain conservative financial policies when they are constrained. All else equal, the increase in UI benefits can reduce this pressure. In the context of evidence in the prior literature that financially constrained firms are inclined to take less risk when investing their pension assets (Rauh, 2009), we examine the impact of an increase in UI benefits on pension asset allocation.

We classify firms based on a number of financial constraint indicators such as dividend policy, cash flows and the SA index.[7] Agrawal and Matsa (2013) note that firms which do not issue dividends are more likely to be financially constrained. In addition, firms with low operating cash flows are likely to have difficulty raising external financing (Agrawal and Matsa, 2013; Kaplan and Zingales, 1991). Further, firm size and age are strongly correlated with financial constraints. Hadlock and Pierce (2010) examine the traditional financial constraint measures and find that firm age and size effectively capture the likelihood of a firm being financially constrained. They developed the SA index to measure firms' financial constraints, which we employ in the empirical analysis. Using the above measures, we explore the relation between UI benefits and pension assets invested in equity conditional on financial constraints.

We examine the impact of UI benefits on pension asset allocation for firms with below/above-median measures for the three financial constraint indicators. Dividends is equal to 1 if a firm issues below-median dividends, and 0 otherwise. Cash_flow is equal to 1 if a firm has below-median cash flows, and 0 otherwise. The SA_index is equal to 1 if a firm has above-median SA index, and 0 otherwise. The results are reported in Table 3. The coefficients for the interaction terms Benefit × Dividends reported in column 1, Benefit

[7]The SA index is calculated as $(-0.737 \times Size) + (0.043 \times Size^2) - (0.040 \times Age)$, where Size equals the log of inflation-adjusted book assets and Age is the number of years the firm is listed with a non-missing stock price in Compustat.

Table 6. Robustness test: Pension asset allocation and UI benefit

	FE			DID		
%Equity	State-year 1	EBM 2	PSM 3	State-year 4	EBM 5	PSM 6
Benefit$_t$	**0.0693****	**0.0556****	**0.0985*****			
	(2.3278)	**(2.1519)**	**(3.1208)**			
Treat$_t$				−0.0072	−0.0055	−0.0026
				(−0.6451)	(−0.5282)	(−0.2155)
Post$_t$				−0.0596	0.0847***	0.0591
				(−1.0467)	(4.2744)	(0.9920)
Treat$_t$ × Post$_t$				**0.0115**	**0.0097**	**0.0155**
				(0.8965)	**(0.8980)**	**(0.8215)**
Observations	8395	8395	5255	8395	8395	5255
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes

This table presents coefficients and t-statistics in parentheses from pooled regressions of %Equity. The control samples are constructed with the adjacent state filter, they do not have a large increase in UI benefits in the event year and the previous year. The fixed-effect model and DiD model are in columns 1–3 and columns 4–6. Columns 1 and 4 report the results using the state-year matched sample; columns 2 and 5 report the results using the EBM matched sample; columns 3 and 6 report the results using the PSM matched sample. %Equity is the percentage of pension assets invested in equity in the year after the unemployment benefit increase. Benefit is the natural logarithm of the maximum number of weeks times the maximum weekly wage benefit amount given to employees in state-year t. Treat is an indicator variable that is equal to 1 for firm-years in the treatment sample, and 0 otherwise. Post is an indicator variable that is equal to 1 for the period after an increase in unemployment benefits, and 0 otherwise. All controls included (%LEquity, Fund, Fund2, Maturity, Leverage, Divp, Tax, Assets, Market_return, ROA, Union, Recession, GDP, Unemp_rate, Election, Democrat). Detailed variable definitions are provided in Appendix 1. Standard errors are clustered by state. *, ** and *** denote two-tailed statistical significance at the 10%, 5% and 1% levels, respectively.

× Cash_flow reported in column 2 and Benefit × SA_index reported in column 3 are all positively significant. Overall, the findings indicate that the relation between UI benefit levels and pension asset allocations is stronger for financially constrained firms.

Taken together, these findings suggest that when determining pension investment risk, firms are more likely to consider employee unemployment costs when they face stronger financial constraints; they show that firms undertake more risky pension investment strategies after UI benefits increase, when they are more financially constrained. These findings are consistent with previous literature (Agrawal and Matsa, 2013).

Sensitivity tests and additional analysis

In this section, we carry out a number of sensitivity tests including a falsification test, extend the window to 3 years, use a matched sample with adjacent state filter, address the issue regarding geographically dispersed industries and use PSM at the state level. In addition, we carry out analysis to examine the role of pension fund size. The results of these analyses are reported in Tables 4–9 and discussed in detail in Online Appendix 4. Overall, the results of these analyses confirm that it is unlikely that Benefit$_t$ captures unobserved correlated economic conditions rather than pension asset allocation strategies. In addition, the results of the extended 3-year window and the matched sample with adjacent state filter are similar to those reported in the main analysis and suggest that firms undertake higher pension investment risk after an increase in UI benefits. The findings of the analysis – excluding geographically dispersed industries – are also consistent with our main findings. Further, the results using PSM matching at the state level are similar to the findings reported in the main analysis and suggest that the relationship between UI benefit and pension asset allocation is robust and not affected by unobserved state and regional economic conditions. Finally, firms with small pension plans are more likely to take higher pension investment risk by allocating a greater percentage of pension assets to equities after a UI increase.

Cross-sectional tests

We argued that increases in UI benefits will affect pension asset allocation decisions through their impact on employee exposure to unemployment risk. Given that employees have to bear significant costs in the event of unemployment, they require a wage differential to compensate for the potential risk of unemployment; the wage differential required by employees will be lower if firms opt for conservative policies that decrease the unemployment risk. In this context, it is interesting to examine the relation between UI benefits and pension

Table 7. Additional test: Pension asset allocation and UI benefit excluding dispersed industries

%Equity	1	2
Benefit$_t$	**0.0721*** (5.0868)**	
Treat$_t$		−0.0121* (−1.8600)
Post$_t$		−0.0546*** (−18.3621)
Treat$_t$ × Post$_t$		**0.0150** (2.0411)**
Observations	81,357	81,357
Controls	Yes	Yes
Firm fixed effect	Yes	Yes
Industry × year fixed effects	Yes	Yes
Year fixed effect	Yes	Yes

This table presents coefficients and t-statistics in parentheses from pooled regressions of %Equity, excluding industries in which a large percentage of the workforce is likely to be geographically dispersed, including retail, wholesale and transport. Column 1 presents the results for the fixed-effects specifications and column 2 presents results for the DiD specifications. %Equity is the percentage of pension assets invested in equity in the year after the unemployment benefit increase. Benefit is the natural log of the maximum number of weeks times the maximum weekly wage benefit amount given to employees in state-year t. Treat is an indicator variable that is equal to 1 for firm-years in the treatment sample, and 0 otherwise. Post is an indicator variable that is equal to 1 for the period after an increase in unemployment benefits, and 0 otherwise. All controls included (%LEquity, Fund, Fund2, Maturity, Leverage, Divp, Tax, Assets, Market_return, ROA, Union, Recession, GDP, Unemp_rate, Election, Democrat). Detailed variable definitions are provided in Appendix 1. Standard errors are clustered by state. *, ** and *** denote two-tailed statistical significance at the 10%, 5% and 1% levels, respectively.

Table 8. Pension asset allocation and UI benefit: PSM state match

%Equity	FE 1	DID 2
Benefit$_t$	**0.1008*** (6.5064)**	
Treat$_t$		−0.0062 (−0.6720)
Post$_t$		−0.1900*** (−4.6493)
Treat$_t$ × Post$_t$		**0.1482*** (3.8594)**
Observations	41,601	41,601
Controls	Yes	Yes
Firm fixed effect	Yes	Yes
Industry × year fixed effects	Yes	Yes
Year fixed effect	Yes	Yes

This table presents coefficients and t-statistics in parentheses from pooled regressions of %Equity. The control states that do not have a large increase in UI in the event year and the previous year are matched to treatment states using macro variables including GDP, unemployment rate, unionization rate and election. The results of the fixed-effect model and DiD model are reported in columns 1–3 and columns 4–6, respectively. Columns 1 and 4 report the results using the state-year matched sample; columns 2 and 5 report the results using the EBM matched sample; columns 3 and 6 report the results using the PSM matched sample. %Equity is the percentage of pension assets invested in equity in the year after the unemployment benefit increase. Benefit is the natural logarithm of the maximum number of weeks times the maximum weekly wage benefit amount given to employees in state-year t. Treat is an indicator variable that is equal to 1 for firm-years in the treatment sample, and 0 otherwise. Post is an indicator variable that is equal to 1 for the period after an increase in unemployment benefits, and 0 otherwise. All controls included (%LEquity, Fund, Fund2, Maturity, Leverage, Divp, Tax, Assets, Market_return, ROA, Union, Recession, GDP, Unemp_rate, Election, Democrat). Detailed variable definitions are provided in Appendix 1. Standard errors are clustered by state. *, ** and *** denote two-tailed statistical significance at the 10%, 5% and 1% levels, respectively.

investment risk in settings where the risk of unemployment is likely to be more prevalent. In doing so, we consider skilled labour, labour intensity, layoff rate, industry competition and union power, thereby shedding light on the mechanism through which UI benefits influence pension asset allocation decisions.

We first carry out some analyses conditional on industry labour intensity. All else equal, more labour-intensive firms are more likely to incur greater labour costs. If unemployment risk increases, employees are more likely to require a higher wage differential, which will have an upward impact on firms' labour costs. Hence, labour-intensive firms are likely to have stronger incentives to reduce employees' perceived unemployment risks and hence labour costs compared to less labour-intensive firms (e.g. Agrawal and Matsa, 2013). We adopt two proxies to measure labour intensity: (a) the degree of reliance on skilled labour and (b) the sales to employees ratio. We use the industry average number of employees working in occupations with a JobZones index equal to 4 or 5 as a proxy for the degree of reliance on skilled labour (Ben-Nar and Alshwer, 2016). Skilled_labour is equal to 1 if a firm's percentage of skilled labour is above the 20th percentile, and 0 otherwise. When firms use more skilled labour, they are more labour intensive (Ben-Nar and Alshwer, 2016). In addition, we use the Intensity_ratio in the model; this is equal to 1 if a firm's sales to number of employees is above the 20th percentile, and 0 otherwise.

Moreover, the relationship between UI benefit increases and a firm's pension asset allocation can be affected by layoff propensity. All else equal, given that employees' perceived unemployment risk is high when firms operate in industries with high layoff propensity rates, they are likely to require higher wage differentials to compensate for bearing high unemployment risk (Agrawal and Matsa, 2013; Ben-Nasr, 2019). Firms that operate in industries with high layoff propensity are more sensitive to employees' perceived unemployment risk and this likely affects their pension investment decisions. To examine this empirically, we carry out cross-sectional analyses conditional on the layoff rate, which is calculated as the ratio of number of employees

Table 9. Additional test: Importance of pension plan size

%Equity	High 1	Low 2
Benefit$_t$	**0.0342***	**0.0827*****
	(1.7480)	**(3.8892)**
Observations	45,772	45,768
Controls	Yes	Yes
Firm fixed effect	Yes	Yes
Industry × year fixed effects	Yes	Yes
Year fixed effect	Yes	Yes

This table presents coefficients and t-statistics in parentheses from pooled regressions of %Equity. Column 1 presents the results for firms with above-median pension plan size and column 2 presents the results for firms with below-median pension plan size. Pension plan size is measured as the fair value of pension assets divided by total assets. %Equity is the percentage of pension assets invested in equity in the year after the unemployment benefit increase. Benefit is the natural logarithm of the maximum number of weeks times the maximum weekly wage benefit amount given to employees in state-year t. All controls included (%LEquity, Fund, Fund2, Maturity, Leverage, Divp, Tax, Assets, Market_return, ROA, Union, Recession, GDP, Unemp_rate, Election, Democrat). Detailed variable definitions are provided in Appendix 1. Standard errors are clustered by state. *, ** and *** denote two-tailed statistical significance at the 10%, 5% and 1% levels, respectively.

affected by mass layoffs to the total number of employees in the industry based on three-digit NAICS codes, following Agrawal and Matsa (2013). Layoff_rate is equal to 1 if a firm's layoff rate is above the 20th percentile, and 0 otherwise.

Further, the impact of UI benefit increases can be affected by differing levels of industry competition. More specifically, when firms face high industry competition, they are more likely to consider employees' perceived unemployment risk in order to control labour cost. Industry competition is measured using the Herfindahl–Hirschman index. HHI is equal to 1 if a firm's Herfindahl–Hirschman index is above the median, and 0 otherwise.[8]

Finally, firms belonging in industries with high union power are more likely to consider employees' unemployment risk. Prior literature suggests that unions prefer less risk than shareholders or managers (e.g. Chen, Kacperczyk and Ortiz-Molina, 2012; Chyz *et al.*, 2013) and that they favour a low-risk and safe working environment for employees (Devos and Rahman, 2022). In the context of real activities, previous literature finds that unions can restrict corporate risk-taking and that they prefer firms to take lower and fewer risks given that they can only have a fixed claim on corporate assets (Chen, Kacperczyk and Ortiz-Molina, 2011; Kim, Zhang and Zhong, 2021). Hence, unions can put pressure on firms and reduce pension investment risk-taking in our setting. When firms take excessive risks by investing a high percentage of pension assets in equities, asset returns will be volatile and there is a risk that the funding position of the pension plan may deteriorate. If firms are unable to fund their pension plans, employees may not receive the full benefits they are entitled to and they may only receive the capped benefits set by law under the PBGC's insurance programme (PBGC, 2017). The above suggests that unions representing the interests of employees have a vested interest to curb the pension risk undertaken by firms sponsoring DB plans. Thus, we examine the impact of union power on firms' pension asset allocation. Union is measured using the state-level percentage of employees who are covered by a collective bargaining agreement and is equal to 1 if the union coverage rate is above the median of all the states in the particular year, and 0 otherwise. Union coverage data are obtained from the Unionstats database maintained by Hirsch, Macpherson and Even (2023).

Table 10, columns 1 and 2 present the results for two measures of firms' labour intensity: reliance on skilled labour and sales to employees ratio. The coefficients for Benefit × Skilled_labour and Benefit × Intensity_ratio are positive and marginally significant. Hence, we find some evidence that firms with skilled labour and high labour intensity are more likely to take high pension investment risk after UI benefit increases given that the compensating wage differential required by employees will be lower following the decrease in unemployment risk. These findings are consistent with previous literature (Agrawal and Matsa, 2013). The negatively significant coefficients for Benefit × Layoff_rate, Benefit × HHI and Benefit × Union in columns 3, 4 and 5 suggest that firms with high layoff rates, less industry competition and high union power are less likely to take high pension investment risk after UI benefit increases.[9] These results suggest that the impact of UI benefit increases on firms' pension asset investment is less pronounced when employees face higher layoff rates. In particular, when the risk of layoffs is high, firms are more likely to provide their employees with more job security by adopting low-risk pension asset investment strategies even after a UI increase. In addition, the finding about industry competition indicates that when firms operate in less competitive industries, their need to reduce labour costs is low and hence they are not inclined to reduce their pension investment risk. Stated otherwise, this finding suggests that firms are more willing to increase their pension investment risk after UI benefits increase when they face more industry

[8]The Herfindahl–Hirschman index (HHI) is measured by squaring the market share of each firm competing in the market and then summing the resulting numbers. The HHI is calculated based on total sales per two-digit SIC code industry and fiscal year.

[9]The Skilled_labour, Layoff_rate and Union variables are measured at the industry level and are thus subsumed by the Industry × Year fixed effects included in the regressions.

Table 10. Cross-sectional tests: Industry factors

%Equity	1	2	3	4	5
$Benefit_t$	0.0649***	0.0714**	0.0770***	0.0804***	0.0886***
	(3.9175)	(2.2318)	(5.1382)	(5.9542)	(5.8167)
$Benefit_t$ × $Skilled\_labour_t$	**0.0448***				
	(2.0085)				
$Intensity\_ratio_t$		−0.8301**			
		(−2.4196)			
$Benefit_t$ × $Intensity\_ratio_t$		**0.0830***			
		(1.8561)			
$Benefit_t$ × $Layoff\_rate_t$			**−0.0363***		
			(−1.9708)		
HHI_t				2.0803**	
				(2.2608)	
$Benefit_t$ × HHI_t				**−0.2538****	
				(−2.5579)	
$Benefit_t$ × $Union_t$					**−0.0277***
					(−1.7757)
Observations	83,634	34,846	80,427	91,386	91,552
Controls	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes
Industry × year fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes

This table presents regression results of the impact on UI benefits on the sensitivity of skilled labour, labour intensity, layoff rate, industry competition and unionization to pension asset allocation %Equity. Columns 1 and 2 present the results for firms' labour intensity and columns 3–5 present the results for firms' layoff rate, industry competition and unionization. %Equity is the percentage of pension assets invested in equity in the year after the unemployment benefit increase. Column 1 Skilled_labour is measured as the percentage of high-skilled labour employed. Skilled_labour is equal to 1 if a firm's percentage of skilled labour is above the 20th percentile, and 0 otherwise. Column 2 Intensity_ratio is measured as the ratio of sales divided by the number of employees. Intensity_ratio is equal to 1 if a firm's labour intensity is above the 20th percentile, and 0 otherwise. Column 3 Layoff_rate is measured as the ratio of employees affected by mass layoffs to the total number of employees in the industry based on three-digit NAICS codes. Layoff_rate is equal to 1 if a firm's layoff rate is above the 20th percentile, and 0 otherwise. Column 4 HHI measures industry competition. HHI is equal to 1 if a firm's Herfindahl–Hirschman index is above the median, and 0 otherwise. Column 5 Union is an indicator variable that is equal to 1 if the union coverage rate is above the median in year t, and 0 otherwise. Benefit is the natural logarithm of the maximum number of weeks times the maximum weekly wage benefit amount given to employees in state-year t. All controls included (%LEquity, Fund, Fund2, Maturity, Leverage, Divp, Tax, Assets, Market_return, ROA, Union, Recession, GDP, Unemp_rate, Election, Democrat). Detailed variable definitions are provided in Appendix 1. Standard errors are clustered by state. *, ** and *** denote two-tailed statistical significance at the 10%, 5% and 1% levels, respectively.

competition. Finally, the result in relation to labour union power implies that an increase in UI benefits may provide unions with more bargaining power (Devos and Rahman, 2022), thereby putting pressure on firms to not undertake higher pension risk by investing a higher percentage of pension plan assets in equities. This illustrates the role of labour bargaining power on the relation between pension risk and UI benefits. Taken together, these findings document that skilled labour, labour intensity, layoff rates, industry competition and unionization influence the relation between pension asset investments and UI benefits.

Conclusion

The labour economics literature posits that employees are concerned about unemployment risk as they will likely bear substantial costs in the event of involuntary unemployment. In this paper, we examine how UI benefits affect pension asset allocations. On the one hand, firms may increase the riskiness of the pension portfolio following increases in UI benefits as this reduces the unemployment risk borne by employees. On the other hand, firms may opt not to increase the percentage of pension assets invested in equities following increases in UI benefits given the potentially adverse consequences for firms and employees if the plan becomes severely underfunded and if the firm is unable to pay pension benefits. Thus, the impact of UI increases on pension investments is not clear and this is an empirical question on which we aim to shed light.

Using the percentage invested in equities as a measure of pension investment risk and the unemployment insurance benefits as a proxy for unemployment risk, we find evidence – using both a fixed-effect model and a DiD model – suggesting that firms increase pension asset investment risk after a UI benefit increase by investing a higher percentage of pension assets in equities when using a 1-year event window. This finding is more pronounced for financially constrained firms. The findings are robust to several sensitivity tests, including alternative matching methods, a falsification test to examine the timing of the relationship between the riskiness of the pension portfolio and UI benefits, a 3-year window and removing firms that operate in geographically dispersed industries. Overall, the findings are consistent with our hypothesized relation that firms increase the percentage of pension assets allocated to equities, following increases in UI benefits.

Further, we carried out additional tests to examine the role of skilled labour, labour intensity, layoff rate, industry competition and unionization on firms' pension asset allocation. The results suggest that firms with skilled labour and high labour intensity are more willing to take higher pension investment risk after a UI benefit increase; however, firms with high layoff rates, less industry competition and high unionization are less likely to invest a high percentage of pension assets in equities. The findings have implications for managers, sponsoring firms, employees, the PBGC and policymakers. Future research could examine the relationship between unemployment benefits and other pension-related decisions as well as earnings management.

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