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The market sensitivity of retirement and defined contribution pensions: Evidence from the public sector

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ABSTRACT

I provide evidence that defined contribution (DC) pensions make retirement more positively correlated with stock market returns as compared to defined benefits (DB) pensions. To identify the effect, I exploit the U.S. federal government's switch in 1984 from a DB pension system (CSRS) to a hybrid-DC pension system (FERS). I estimate that FERS exposes approximately 24% more pension wealth to the financial markets. Compared to untreated employees, employees treated with the hybrid-DC pension respond to a one standard deviation shock to quarterly market returns by adjusting their retirement date by approximately one month, approximately offsetting changes in DC pension wealth with labor income.

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1. Introduction

Between 1980 and 2008, the percentage of all employees covered by defined benefit (DB) pensions dropped from 38 to 20, while the percentage of all employees covered by defined contribution (DC) plans rose from 8 to 31 (Butrica et al., 2009). How will this large shift affect retirement patterns? This question is crucial for establishing optimal employee contracts and legislations. In this paper, I exploit a quasi-experimental policy change to examine how DC pensions affect the sensitivity of retirement to stock market returns.

Under Ando and Modigliani (1963)'s life-cycle hypothesis, which predicts that wealth shocks affect labor supply, DC pensions may increase the sensitivity of retirement to market returns if they make retirement wealth more positively correlated with stock market returns. For DC pensions to have this effect, DC employees must factor changes in stock market wealth into their retirement decision but not adjust their financial asset allocations to undo the increased market exposure of DC pensions. The literature suggests that such conditions may hold. For instance, there is ample evidence that DC employees do not rationally allocate retirement assets.[1] There is also evidence that exogenous wealth shocks affect labor supply.[2] Still, the existing literature has not answered the question of how DC pensions affect the market sensitivity of retirement.

There are several reasons why the literature has not satisfactorily studies this question. First, stock market performance is correlated with other aspects of the economy that influence retirement, such as labor market conditions (Coile and Levine, 2007, 2011a). Thus, one cannot infer the effect of market returns or DC pension on retirement from the large and mixed literature correlating asset returns and retirement timing.[3] Second, Hurd et al. (2009) discuss several potentially unobservable factors, such as job quality, that simultaneously influence stock market exposure, DC pension status, and expected retirement age. As a result, workers with DB pensions may not be comparable to workers with DC pensions. Finally, historically most employees have not had significant stock market wealth (Gustman et al., 2009, 2010), limiting the importance of stock returns on aggregate retirement patterns.

To overcome these challenges, I exploit the quasi-experimental reform triggered by the 1987 federal government decision to switch

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[1] Benartzi and Thaler (2001, 2009), Brown et al. (2007), Choi et al. (2002), Choi et al. (2011), and Tang et al. (2010) document biases in DC pension asset allocations that make it unlikely that most DC employees actively hedge against their increased market exposure. Chetty et al. (2014) find that default options affect total retirement savings.

[2] See Brown et al. (2010), Cesarini et al. (2015), Holtz-Eakin et al. (1993), and Imbens et al. (2001).

[3] Coile and Levine (2006), Crawford (2013), Goda et al. (2012), and Hurd et al. (2009) find no significant link, Coronado and Perozek (2003) find a positive link, but Cheng and French (2000) find the opposite. Sevak (2002) finds some evidence that such employees retired earlier in response to the 1990s bull market, whereas Goda et al. (2012) find little indication that DC pensions affected retirement during the 2008 crisis.

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retirement systems. All employees hired after January 1, 1984 were enrolled in the Federal Employees Retirement System (FERS), which is a hybrid plan containing both DB and DC pensions. This contrasts with earlier hirees, who were placed in the Civil Servants Retirement System (CSRS), which was a DB pension plan. To identify the effect of this quasi-exogenous DC pension exposure on retirement, I use a dataset of voluntary retirements by U.S. federal employees over the age of 60 between 2005 and 2011. I restrict the sample to employees hired during a four-year window straddling January 1, 1984 in order to minimize differences between these two populations. Since FERS and CSRS have similar employee contributions, government costs, and retirement incentives (Asch and Warner, 1998; Schreitmueller, 1988), the primary difference between the two plans is that FERS employees have an estimated 24% more of their pension wealth exposed to the financial markets via DC pensions. This variation in DC pension exposure among otherwise similar employees allows me to identify the effect of DC pensions on the market sensitivity of retirement timing, assuming that market conditions affect DC and DB employees similarly in ways other than retirement wealth.

I find strong evidence that DC plans make retirement timing more procyclical. Compared to CSRS employees, the quarterly retirement rate of FERS employees has a significantly more positive correlation with both the three-month stock market returns ending one month before the end of the quarter (i.e., current market returns) and the six-month returns ending one month before the beginning of the quarter (i.e., lagged market returns). A one standard deviation change in current (lagged) market returns predicts a 31.2% (17.3%) larger change in the quarterly retirement rate of FERS employees compared to their CSRS counterparts, whose retirement decision is not significantly related to market returns after controlling for other economic indicators. The magnitude of this effect suggests that a one standard deviation market return shock causes 1.5% of the retirement-aged FERS population to adjust the quarter of their retirement. Within the sample of would-be retirees, the average employee delays retirement by approximately one month, which is approximately enough time to offset changes in DC pension wealth with income.

In addition to contributing to the literatures on how pension structure affects retirement timing (Chalmers et al., 2014; Stock and Wise, 1990) and the consequences of DC pensions,[4] these results suggest that the link between exogenous wealth shocks and labor supply (Brown et al., 2010; Cesarini et al., 2015; Holtz-Eakin et al., 1993; Imbens et al., 2001) is important to understanding the retirement behavior of employees with DC pensions. As the popularity of DC pensions continues to grow, this has implications for aggregate retirement patterns. For example, when stock market returns are low, would-be retirees may crowd out unemployed workers by continuing to work longer.

2. Conceptual framework

The goal of this paper is to empirically identify how exposing pension wealth to the financial markets, via defined contribution (DC) pensions, affects the sensitivity of retirement to market returns. In this section, I provide a parsimonious model to motivate my analysis. Then I discuss the empirical implications and importance of the quantities generated from the model.

2.1. A simple model of retirement timing

Fig. 1 illustrates a timeline of events for a simple model of retirement timing. At time 0, non-pension wealth, $P_0 > 0$, and the market sensitivity

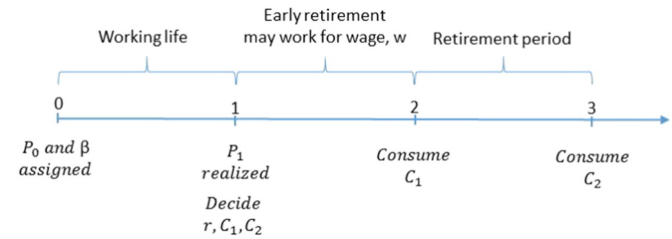

Fig. 1. Timeline for a simple model of retirement. This figure presents a timeline of events for the simple model of retirement timing discussed in Section 2. At time 0, non-pension wealth, P_0 and the market sensitivity of pension wealth, β_p, which are exogenous, are observed. The employee works from time 0 to time 1, at which point P_1 is realized. At time 1, the employee must decide whether or not to retire or work, for wage w, from time 1 to time 2. This decision is made jointly with the consumption decision. At time 2, the employee retires, consuming all remaining wealth by time 3.

of pension wealth, β, which are exogenous, are observed. A β of 0 means that pension wealth is unrelated to market returns as is common for DB pensions. An individual with a DC pension will have a β that is >0 if they invest their pension wealth in the financial markets. After working from time 0 to time 1, individuals realize P_1, defined as

$$P_1 = P_0 * (1 + \beta m), \tag{1}$$

where m equals the stock market returns between time 0 and time 1.

After realizing P_1, individuals simultaneously choose whether to retire early or work from time 1 to time 2, earning a wage, w, and how to allocate their remaining lifetime consumption. They make these choices to maximize their lifetime utility of

$$u(c_1) + u(c_2) - \lambda^*(1-r), \tag{2}$$

subject to the budget constraint

$$c_1 + c_2 \le P_1 + w\,(1-r), \tag{3}$$

where $u(c)$ is a smooth increasing concave function, r is zero if an individual works from time 1 to time 2 and one if they retire at time 1, and $\lambda > 0$ is the utility cost to the individual of working from time 1 to time 2.

Since $u(c)$ is concave and $u(c_2)$ is not discounted relative to $u(c_1)$, individuals will choose consumption so that $c_1 = c_2$.[5] Since working increases total wealth by w, individuals that work will consume more in each period. Specifically, individuals would consume $c_r = P_1/2$ each period if they were to retire at time 1 and $c_w = (P_1 + w)/2$ if were to decide to work. The difference between the lifetime utility of retirement and working represents the benefits of early retirement, denoted RB and may be written as

$$RB = 2(u(c_r) - u(c_w)) + \lambda. \tag{4}$$

The marginal loss of wages due to early retirement is captured by $2(u(c_r) - u(c_w))$, which is negative because $c_r < c_w$ and decreasing in the wage, w. The cost to the individual of work, λ, is positive and represents the marginal utility benefit of retiring instead of continuing to work. Because $u(c)$ is increasing and concave, the benefits to retirement are also increasing in P_1 – a higher P_1 reduces the benefit of working to earn w. Further, since P_1 is increasing in market returns (see Eq. (1)), and market returns are not related to λ or w, $\partial RB/\partial m \ge 0$. Thus, high market returns increase the benefits of early retirement, RB, making such retirement more attractive.

The primary goal of this paper is to understand how β, the market sensitivity of pension wealth, affects the sensitivity of retirement to

[4] Samwick and Skinner (2004) and Poterba et al. (2007) discuss how DC pensions affect employee wealth. From the employer's perspective, Bakke and Whited (2012), Campbell et al. (2012), Franzoni (2009), and Rauh (2006) all provide mechanisms through which pension type can affect corporate employers.

[5] The takeaways from the model are similar if $u(c_2)$ is discounted in Eq. (2) by a factor between 0 and 1.

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