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Participant Investment Behavior and Investment Performance in Defined Contribution Plans: Evidence from Small Firms in South Korea

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ABSTRACT

Purpose: We investigate participant behaviors and the investment performance of defined contribution (DC) plans. **Design/methodology/approach:** Using unique data of 420,839 participants in 47,442 workplace pension schemes for small firms in South Korea, we examine participant investment behavior and the investment performance of DC plans.

Findings: We find that participants exhibit extreme risk avoidance in their pension management, leading to lower investment returns. Additionally, most participants choose few investment products and initiate no trades. Finally, the pension service provider's DC investment menu affects participants' investment performance.

Research limitations/implications: Given that our sample only covers the DC plans of firms with less than 30 employees, our findings may not be generalized to larger firms. However, the findings of this paper suggest that corporate pension schemes require careful design to account for participants' behavioral biases and their impact on retirement security, as well as the importance of plan design.

Originality/value: This study contributes to corporate pension research by documenting the unique features of Korean DC plans in small-scale firms. Further this research presents the need for a pension policy for sustainable retirement income by showing the irrational investment behavior of employees in small-scale firms.

Keywords: Defined Contribution Plan, Participant Investment Behaviors, Personal Rate of Return

I. Introduction

South Korea ("Korea" henceforth) is the fastest aging country among the members of the Organization for Economic Cooperation and Development (OECD). Its old-age dependency ratio¹⁾ is projected to increase from 20 percent in 2015 to 72 percent in 2050 (OECD 2017). Further, Korea stands out as having the highest

old-age (aged 65 and over) poverty rate. This is largely attributable to weakened filial norms, in which children should be responsible for caring for their aging parents, as well as increasing lifespans. Although the national pension scheme (NPS) represents the mainstay of the country's old age income security system in Korea, it does not cover many older people due to its relatively short history (set up in 1988). The expected replacement rate after 40 years of contributions is currently 45 percent, and is decreasing by 0.5 percentage points every year from 2008 until it reaches 40 percent in 2028. Moreover, the NPS

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fund is expected to be completely depleted by 2060. Accordingly, NPS benefit alone seems insufficient to ensure a stable post-retirement life. As such, strengthening the role of corporate pension schemes is unavoidable.

Korea has two co-existing corporate pension schemes. Until recently, the severance pay system was the main mandatory pension scheme for firms with five or more employees. The voluntary corporate pension system was introduced in 2005 based on the Employee Retirement Security Act. The participation rate in corporate pension plans is 26.9 percent based on the workplace. This varies considerably depending on firm size, according to the National Statistics. While 88.1 percent of large companies with 300 or more employees introduced corporate pension plans in lieu of the severance pay system, only 23.5 percent of small firms with less than 30 employees have corporate pension plans. This is mainly because small business owners have difficulty setting up corporate pension plans and managing them due to the time and cost involved. Under contract-based governance, employers and service providers (financial institutions) set contracts to establish corporate pension plans. Small-scale firms are not of interest to pension providers due to the low profit margin, which results in market failure.

As part of the effort to increase participation in corporate pension plans among employees in small firms, the Department of Employment and Labor in 2010 mandated that the Korea Workers' Compensation & Welfare Service (KCOMWEL) should enter the defined contribution (DC) market as a pension service provider along with private financial institutions²⁾. Since 2010, KCOMWEL has offered management

and administration-related services to small firms, and entrusts the asset management related services to two private financial institutions. KCOMWEL charges a relatively low management fee of ten basis points (bps) compared to other pension service providers (that charge 30 bps), reducing the costs of adopting corporate pension plans. The market share of KCOMWEL in DC plans was 18.1 percent by the end of 2017.

In this study, we investigate participant behavior and the investment performance of DC plans in small firms with less than 30 employees. To do so, we analyze a unique data set consisting of participants' corporate pension accounts managed by KCOMWEL over a five-year period from 2012 to 2017. The data is an unbalanced panel associated with 420,839 participants in 47,442 firms and includes both firm (sponsor-level) characteristics and employee (participant-level) characteristics. KCOMWEL provides management and administration service only for corporate pensions, and therefore, employers need to choose one of two asset management service providers.³⁾ Since both providers offer the same investment options for all employers serviced by KCOMWEL, firms choosing the same provider have the same investment menu.

Several interesting patterns emerge from the descriptive statistics. First, participants with relatively low incomes and low wealth exhibit extreme risk avoidance in their pension management. Surprisingly, more than 99 percent of assets are invested in products that guarantee principal and interest, such as deposits and guaranteed income contracts (GICs).⁴⁾ Given that the proportion of the total corporate pension reserve invested in principal-guaranteed products was 88.9

1) The old-age dependency ratio is the ratio of the number of elderly people (aged 65 and over) to the number of working-aged individuals (aged 15 to 64).

2) KCOMWEL is a public organization affiliated to the Ministry of Employment and Labor (Supervisory Department of Corporate Pension Scheme) and is responsible for various services, such as registrations for Workers' Compensation Insurance and Employment Insurance, workers' compensation and rehabilitation services, medical services, employee assistance services, and so on.

3) We call them Provider A (an insurance company) and Provider B (a bank) in this paper.

4) The director of the investment service of Korea at Towers Watson stated, "This conservative allocation is largely influenced by corporate sponsors' cash-reserve mentality, which is rooted in legacy severance schemes and the fierce competition among service providers offering attractive or inflated rates for new clients. As a result, there is also an inappropriate focus on capital preservation rather than on income or return generation, which would be more suitable given that allocations should be focused on the ability to pay pensions in the longer term."

percent by the end of 2017, the sample participants have a greater tendency to avoid investment risk. This is consistent with evidence that income and wealth are negatively related to risk aversion (Riley and Chow 1992). The greater conservatism in corporate pension investment among low-income employees results in lower income replacement.

Another pattern we find is that participants working for small firms choose two investment options (from a menu of 8–14) on average. This is consistent with Huberman and Jiang (2006), who show that the majority of 401(k) participants tend to choose a small number of investment options. The last pattern we find is that over 97.5 percent of participants initiate no trades, exhibiting a high level of inertia. Along these lines, Agnew, Balduzzi, and Sunden (2003) and Mitchell, Mottola, Utkus, and Yamaguchi (2006) also document the profound inertia of 401(k) participants.

Financial literacy (or its lack thereof) can partially explain the irrational economic behavior we find in our study. For example, using comprehensive Swedish data, Calvet, Campbell, and Sodini (2007, 2009) argue that more educated and financially sophisticated households invest not only more efficiently, and but also more aggressively. In particular, they show that households with more income and wealth, and higher education levels, are less likely to make financial mistakes. Similarly, Rooij, Lusardi, and Alessie (2011) provide evidence that individuals with higher financial literacy are more likely to participate in stock markets and invest in stocks.

The ordinary least squares (OLS) regression tests employed in this study examine the factors that determine participants' investment performance. First, we show that the investment menu affects investment performance. In particular, we find that participants working for sponsors who select asset management service Provider A have higher returns than do those working for employers who select asset management service Provider B, all other things being equal. The results are consistent with prior studies showing that DC plan investment performance depends on not only the construction of the investment menu, but

also participants' investment choices (Elton, Gruber, and Blake 2006; Tang, Mitchell, Mottola, and Utkus 2010).

Our findings contribute to a growing area of research on DC plans. Even though it is evident that participants should be more responsible for their own retirement income security, a large body of literature on behavioral economics provides evidence that plan participants have difficulty making the optimal investment choices. This is due to choice and information overload (Benartzi and Thaler 2001; Iyengar, Huberman, and Jiang 2004; Iyengar and Kamencia 2006), undefined preferences and investment menu design (Benartzi and Thaler 2001, 2002; Elton et al. 2006), and procrastination and inertia (Benartzi and Thaler 2002; Choi, Laibson, Madrian, and Metrick 2002).

This study also contributes to corporate pension research by documenting the unique features of Korean DC plans in small-scale firms. Our finding that 99 percent of corporate pension assets in the sample are allocated to capital preservation products deviates completely from the diversification rule in finance. Extremely conservative allocations can be partially explained by the negative relationship between risky assets and income that Riley and Chow (1992) document. The authors argue that this is not because individuals with low income are risk averse, but because they have little flexibility in their budget. However, an inappropriate focus on principal-guaranteed vehicles are mainly influenced by the special features of the corporate pension market in Korea—such as the cash conservation mentality of sponsor firms and fierce competition among service providers, that even take reverse margins.

The paper is organized as follows. The next section discusses the corporate pension system in Korea. The following two sections describe the sample data, descriptive statistics and empirical results. The final section concludes the paper.

II. The Corporate Pension System in Korea

A. The three pillar system and the development of corporate pensions

Korea has a three-pillar income security system, as in Figure 1. Starting with the public pension systems, the national pension service (introduced in 1988) covers 22.2 million members as of December 2019. The other public pension scheme, the basic old age pension (started in 2008), provides means-tested benefits to 70 percent of the elderly population aged 65 and over (about 4.8 million persons). Meanwhile, civil servants, private school teachers, and military personnel are under the public occupational pensions, incorporating 1.8 million participants as of December 2019. Turning to private pension schemes, the corporate pension scheme (started in 2005), covers 6.3 million employees as of December 2019. The third pillar, the personal pension scheme, was introduced in 1994 and its membership is about 7.0 million as of December 2019. Due to a fast-aging population, coupled with a low birth-rate and slow economic growth, strengthening Korea's current pension system is one of the country's most urgent policy issues. The NPS is a partially funded, mandatory defined benefit system. Employers and employees each contribute 4.5 percent of an individual's wage. The benefit formula consists of basic and earnings-related portions. The system's progressive benefits are paid mainly in the form of an annuity indexed to consumer prices, with the full pension available at age 60 (the full vesting age will rise to 65 by 2033). Unfortunately, the future of Korea's national pension service is bleak due to the low contributions and high benefits. Hence, the role of corporate pension plans is significantly important.

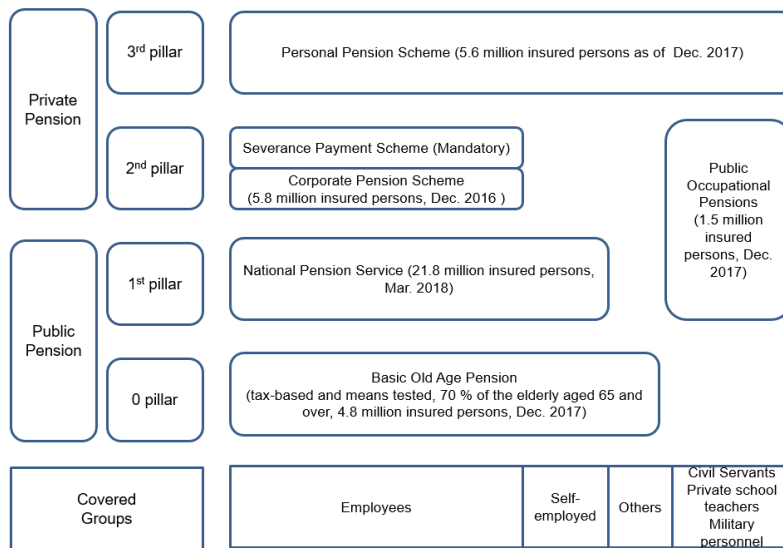
Under Korea's Labor Law, all workers with more than one continuous year of service are entitled to receive, upon retirement, a mandatory lump sum payment of retirement allowance. This is commonly known as the severance payment scheme, in which payments are equivalent to one month of the base salary for each year of service. The severance payment

scheme, which started in 1961, is considered post-paid wages and employers have legal obligations to pay employees, regardless of the reason for the termination of employment. However, employers have difficulty predicting the actual retirement liability, leading to increases in their cost burden and threats to employees' entitlements. Further, employees use this lump sum payment for living expenses rather than saving it for generating additional income after retirement. To compensate for these shortcomings, the corporate pension scheme based on the "Employee Retirement Benefit Security Act (ERBSA)" was adopted in 2005. Under this act, labor and management can choose a retirement pension system instead of the severance payment scheme. Despite efforts by Korea's government (changing the regulations under which employers and employees that convert to corporate pensions receive more tax benefits), the rate of participation is still low, particularly in small firms.

A unique feature of corporate pensions in Korea is the governance structure. As Figure 2 shows, pension plans are set by contract between employers and financial institutions such as banks, insurance companies, or security companies without legal personality and capacity.⁵⁾ Under ERBSA, a firm establishing a corporate pension plan makes a contract for the management and administration (providing investment options and related information, designing pension plans, and recordkeeping), and a separate contract for asset management work (account setup and management, storage and management of contributions, and payment of retirement income). Although it was intended that pension management and administration service providers to oversee asset management providers, most pension plans make a contract with single service provider to do both.

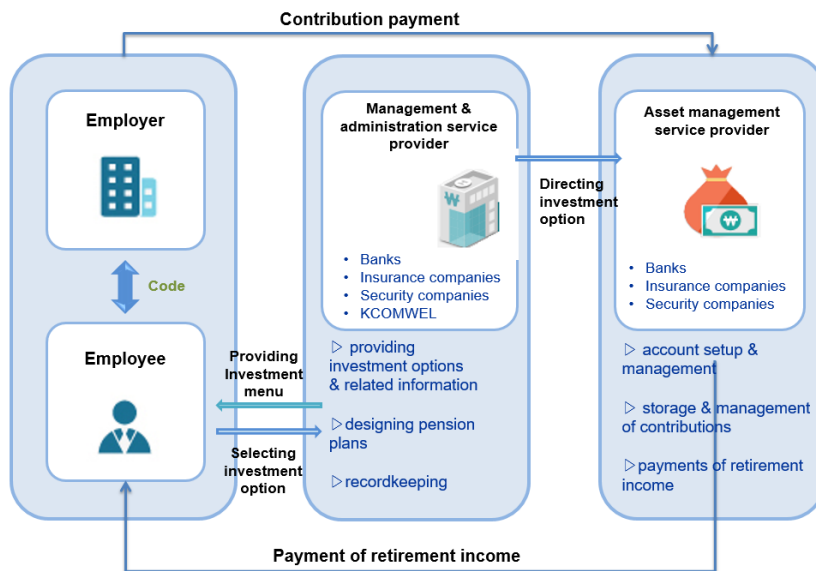
There are four types of corporate pension plans in Korea: defined benefit (DB), defined contribution (DC), individual retirement pension (Personal IRP),

5) Pension funds in most European countries have independent entities with legal personality and capacity, and hence have its own internal governing board. Pension plans in Anglo-Saxon countries have trustees who legally own the pension fund assets and must act in the best interest of the plan participants.



Sources: Collected from the statistics for each scheme.

Figure 1. Overview of income security systems in Korea

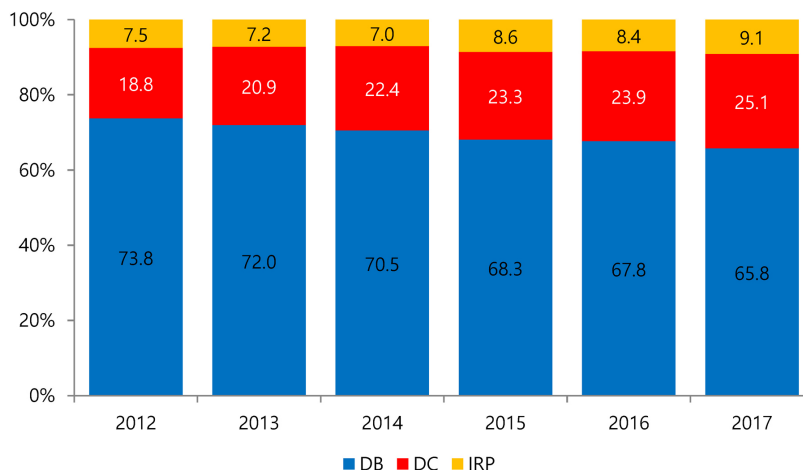


Sources: Financial Supervisory Service.

Figure 2. Governance structure of corporate pension schemes in Korea

and corporate individual retirement pension (Corporate IRP). Under DC plans, an employer contributes a predetermined amount of money (1/12 of the annual total wages of a worker) to the worker’s individual account with the pension service. An employee makes all decisions on how the contributions are invested,

and so has the responsibility for investment outcomes. A firm with less than ten employees is recognized as having an established corporate pension plan if all workers consent to subscribe to a corporate IRP. Corporate IRPs operate similar to DC plans, but are not subject to ERBSA regulation.



Sources: Financial Supervisory Service.

Figure 3. Proportion of assets by pension scheme type by year

B. The corporate pension scheme

As of December 31, 2016, the corporate pension scheme covers 5.83 million workers (61.2 percent of the total 11.57 million workers) with more than one continuous year of service, while it covers 340 thousand corporations (15.3 percent of all 1.8 million).⁶⁾ The lower rate of coverage of firms that participate in corporate pension plans is mainly driven by the fact that only 17.3 percent of small firms with less than 30 employees provide corporate pension plans. The total contributions to corporate pension plans as of the end of December 2017 was KRW 169.4 trillion, up KRW 21.4 trillion from KRW 147.0 trillion at the end of December 2016. Figure 3 shows the distribution of assets by pension scheme type over six years. The proportion of assets invested in DB plans decreased, while the proportion invested in DC plans and IRPs increased. This is mainly because most large companies completed the shift from lump-sum severance payments to DB plans, and small/medium firms remain in the severance payment scheme. Further, this trend is expected to continue, as medium/small firms will become more likely to choose DC plans. The proportion of assets in IRPs will continue to increase as IRP membership targets extend to self-

employed workers, government workers, and private school teachers.

The pension service providers in Korea are banks, insurance companies, and security companies with a corporate pension plan license. Due to nationwide branch operations and sales forces, banks have half of the corporate pension market in Korea. Contributions to banks' plans was KRW 84.3 trillion, followed by life insurers (KRW 39.6 trillion), security companies (KRW 32.1 trillion), property and causality insurers (KRW 10.8 trillion), and KCOMWEL (KRW 1.7 trillion) as of the end of December 2017. Another reason banks are stronger players in the occupational pension market is banks can help other pension providers by connecting occupational pension businesses to firms for loans. Furthermore, employees cannot select a pension service provider; they can only choose an investment product from the employer-contracted provider's menu. As a pension service provider, banks stand out more in small-scale business. This is because owners in small firms lack the ability to select competent pension providers, and even so, these providers are not interested in small firms due to the low profit margin. In addition, to the extent that small-scale firms lack financial slack and so highly rely on banks loans, it is important to maintain a good relationship with the bank by designating it as the pension providers. In other words, the biggest problem with

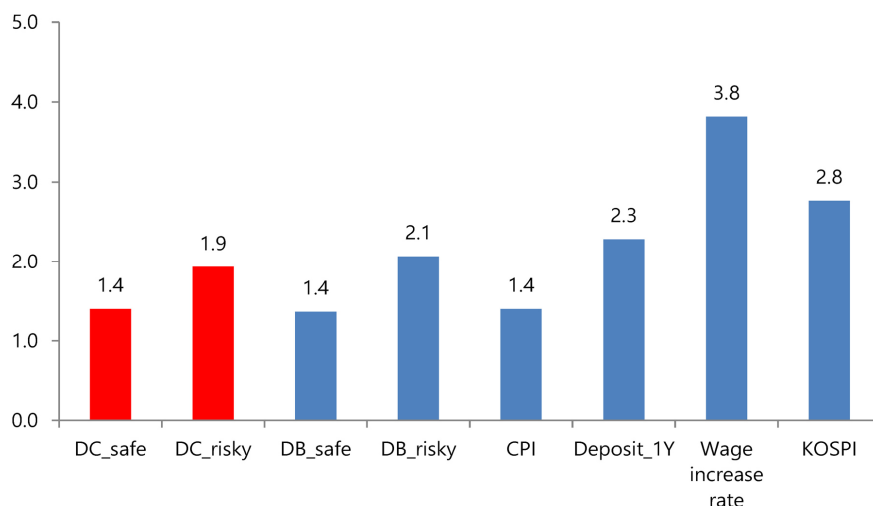
6) Data from the Korea Financial Supervisory Service.

contract-based occupational pensions is that there is no subject or device to represent the best interests of participants, such as the fact that participants have little involvement with selecting pension providers or the investment menus.

One of the peculiarities of the Korean corporate pension market is that 88.9 percent of the corporate pension reserve is invested in financial products that guarantee the principal and interest. Looking at the assets by type of pension scheme, the proportions of assets invested in financial products that guarantee the principal and interest in DB plans, DC plans, and IRPs are 94.6 percent, 78.7 percent, and 66.3 percent, respectively. The main driver of excessive investment in principal-protected products is an institutional setting in which money goes to deposits or GICs with 1-year maturity if participants do not make an investment decision. In other words, principal-guaranteed products are the default option in corporate pension schemes in Korea. Additionally, the conservative asset allocation is partly due to the strict investment regulation. Under the Enforcement Decree of the ERBSA, direct investment in equity is prohibited and indirect investment in equity is permitted up to 70 percent of contributions per participant. Moreover,

at least one principal-interest-guaranteed product should be included in the investment menus of corporate pension plans. This provides an avenue of investment for participants who do not make their own investment decisions. In addition to regulatory restrictions, other factors drive the disproportionately high concentration of investment in non-principal-protected products, such as the cash-averse mentality of sponsor firms and the lack of experience in corporate pension asset management. Service providers offer a high fixed interest rate with a negative margin to secure market share in the early stage of introducing corporate pension plans, which also contributes to extremely conservative allocations. Further, concerns about large-scale investment losses due to the financial crisis of 2008, poor financial literacy, and participants' indifference contribute to this phenomenon.

The investment return on corporate pension plan assets falls far short of expectations for life after retirement. As Figure 4 shows, the average annual returns on Korea's corporate pension after deducting total fees and expenses for the six years from 2012 to 2017 ranges only from 1.4 percent to 1.9 percent. Poor investment performance has a more direct impact on retirement income for employees in DC plans



Sources: Financial Supervisory Service, E-country Index, and Bloomberg.
 Note: Average annual returns and indicators are calculated by arithmetic means.

Figure 4. Average annual returns on Korea's corporate pension and economic indicators over 2012-2017

than for those in DB plans since the former have full responsibility for their investment choices. The average annual returns on both DB and DC principal-guaranteed vehicles are 1.4 percent. Considering that the average rate of salary increase is 3.8 percent, investment performance that is far below the wage increase rate endangers the retirement security for most workers under DC plans. Even more serious is that the interest rate of the Central Bank of Korea declined to 1.50 percent as of December 2017 and is expected to continue dropping for the foreseeable future, which leads to low returns on principal-guaranteed vehicles. Therefore, it is clear that pension policies or programs that induce efficient investment portfolio structures and offer highly efficient plan menus should be considered.

Unfortunately, investment performance in non-principal-protected vehicles in corporate pension assets is also lower than the return on the Korea Stock Exchange Composite (KOSPI). This is mainly because more than 50 percent of non-principal-guaranteed vehicles in corporate pension assets are hybrid-bond funds, and the maximum proportion of equity is less than 40 percent of total assets.

III. Data and Descriptive Statistics

A. Sample

We use a unique data set collected at the individual level from KCOMWEL, a non-profit government institute that began offering a retirement pension service in December 2010. KCOMWEL provided data on participants in DC-type plans (DC plans and corporate IRPs) for six years between 2012 and 2017 and who were employed in workplaces with under 30 employees. The data consists of two levels: sponsors (plans) and participants (employees or individuals). For each sponsor (plan), we obtain information such as the number of employees, industry, the location of the main office, and number of offered products. For each participant, our data set provides relevant

socio-economic information such as employment status, gender, age, plan entry date, contribution amount, gross investment income⁷⁾, and account balance. In addition, this dataset includes investment behavior such as choice of offered products and the number of product changes. However, this dataset has drawbacks in that there are no important variables required to analyze individual investors' investment performance such as real and financial assets, National Pension Service, education, marital status, and so on.

We exclude some observations from the analyses. First, we exclude observations from executive members because they have different retirement benefit formulas from those of general employees. Next, we eliminate participants who have accounts with a value below KRW 1 million or more than KRW 100 million because we consider these to be outliers. According to the ERBSA, employees with more than one year of service are entitled to retirement benefits, so we exclude participants with less than one year of service. Finally, we drop workers above 65 years old, as this is the legal retirement age in Korea in a workplace with 30 or fewer employees.

Table 1 presents the summary statistics for the final sample by year. The first two columns report the total number of workplaces in the sample and the total number of participants. The third column shows the average number of participants per firm. The next three columns provide the total amount of assets under management, the average amount of assets per workplace, and the average amount of assets per participant. Finally, the last two columns report the average number of investment options in the provider's menu and the average number of investment options that participants choose. As is evident from Table 1, the number of plan sponsors, participants, and total assets dramatically increased during the sample period. In particular, KCOMWEL offers occupational pension services to 135,053 participants in 9,898 sponsor firms and manages KRW 1 trillion in assets as of 2017. Interestingly, the average number of investment options steadily increased from

7) Gross investment income is available only for the year 2017.

Table 1. Summary statistics by year

Year-end	Total number of workplaces	Total number of participants	Avg. number of participants per workplace	Total amount of assets (KRW billion)	Avg. assets per workplace (KRW million)	Avg. assets per participant (KRW million)	Avg. number of investment options	Avg. number of choices per participant
2012	4,297	7,888	2	23	5	3	9.2	2.7
2013	9,673	34,831	4	130	13	4	9.5	3.1
2014	7,568	57,906	8	306	40	5	10.6	2.7
2015	7,591	80,620	11	523	69	6	11.2	2.1
2016	8,418	104,541	12	763	91	7	11.6	1.9
2017	9,895	135,053	14	1,066	108	8	11.7	1.8

Table 2. Distribution of sample firms by the number of employees

Firm size	Percent (%)	Cumulative (%)
1~5 or less	19.5	19.5
6~10 or less	27.2	46.7
11~15 or less	21.9	68.6
16~20 or less	15.3	83.8
21~25 or less	10.1	94.0
Less than 30	6.0	100.0

9.2 in 2012 to 11.7 in 2017, while the actual number of chosen products decreased from 2.7 to 1.8. Table 2 presents the distribution of the sample firms by the number of employees. Of the total sample, 46.7 percent of the sample firms have less than 10 employees.

B. Participant investment behavior

KCOMWEL offers management and administration services to small firms, and entrusts asset management related services to one insurance company (Provider A) and one bank (Provider B). The Korean Financial Supervisory Service (Korea's financial industry regulatory body) classifies investment options for corporate pension schemes into two broad categories: safe products and risky products. Safe products carry guaranteed principal and interest, such as bank deposits, interest-rate-linked insurance, and GICs. Risky products include bonds and mutual funds, which have some risk of losing the principal and interest.⁸⁾

Table 3 outlines the investment options offered to sponsors (and therefore delivered to participants) by service providers as of the end of December 2017. Starting with safe products, Provider A offers five investment options (interest-rate-linked insurance and GICs with one-, two-, and three-year maturities), and Provider B offers six options (bank deposits with one-, two-, and three-year maturities). Regarding risky investment products, Provider A offers three investment products (bond-balanced funds), while Provider B offers eight products (government bonds, bond-balanced funds, and equity funds).

Given that prior studies find that participants' overall portfolio choices are largely affected by the plan menu (Benartzi and Thaler 2001; Brown, Liang, and Weisbenner 2007), we are interested in how service providers affect participants' investment performance. Unfortunately, our sample data has information on investment returns only for safe products as of 2017. Accordingly, we compare the rates of return for all

8) Regulations prohibit direct investment in equity in DC plans.

safe investment products offered by both providers in Figure 5.

On average, the investment products from Provider A outperform those from Provider B. This is because insurance companies, in general, offer slightly higher interest rates than bank deposits in order to make up for their weak competitive positions due to lower brand recognition and lower market share. Nevertheless, almost half of the sponsors in this sample choose the bank as their asset manager because banks are

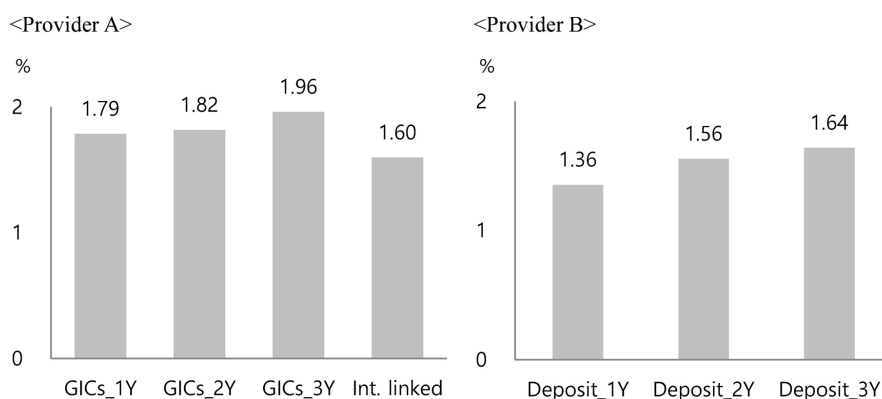
in a relatively favorable position in this regard compared to other business interests. In addition, employers rather than employees select the pension providers. Accordingly, a non-trivial number of participants end up with lower risk-free investment products for their retirement savings.

To document participants' investment behavior, we examine the number of investment options they choose. As Figure 6 shows, more than half of the participants in the sample hold one investment product

Table 3. Investment profile of plan options by service provider

	Provider A		Provider B	
	Investment options	Number	Investment options	Number
Safe	Interest rate linked insurance	1	1-year maturity deposit	2
	1-year maturity GIC	1	2-year maturity deposit	2
	2-year maturity GIC	1	3-year maturity deposit	2
	3-year maturity GIC	2		
Subtotal		5		6
Risky	Bond balanced fund	3	Government fund	2
			Bond balanced fund	4
			Equity fund	2
Subtotal		3		8
Total (Safe & Risky)		8		14
Share of safe menu (%)		62.5		42.9

Notes: 1) Bond balanced is the equity ratio range above 0% and under 40%.
 2) Equity fund is the equity ratio of 60% or more.



Note: 1) The horizontal axis indicates the menu options offered by Providers A and B, respectively.
 2) The vertical axis shows the average annual investment returns for products with the same maturity for 2017.
 3) Provider A offers 1-year, 2-year, and 3-year GICs, and interest rate linked insurance.
 4) Provider B offers deposits with 1-year, 2-year, and 3-year maturities.

Figure 5. Annual rates of return for principal-guaranteed products (2017)

only. On average, employees own 2.1 investment products. This is consistent with Huberman and Jiang (2006), who show that 401(k) participants tend to use three to four products, which is not related to the number of funds offered by the plans.

Figure 7 presents the proportion of risky products in participants' account balances. Surprisingly, because more than 99 percent of assets are invested in risk-free products, the proportion of risky products remains only under 0.5–1 percent for the overall sample period. We conduct the similar analysis using recent data from 2018 to 2019, and find the similar results. Therefore, our findings seem to be a long-lasting phenomenon rather than short-lived one. Compared to previous studies (Agnew et al. 2003; Benartzi and Thaler 2001; Brown et al. 2007), the participants in our sample show extremely excessive investment in safe products. This is mainly attributable to the default options of risk-free assets and strict investment

regulation in Korea. As Choi et al. (2002) and Gallery, Netwon, and Palm (2011) find, employees perceive that the default options are an implicit recommendation by employers and pension service providers. Further, the sample data consists of low-wage workers in small-scale workplaces, which is another reason for the extremely conservative asset allocation. This is consistent with evidence that income and wealth are negatively related to risk aversion (Riley and Chow 1992). The relatively higher employment instability of lower income workers, shorter investment time horizon, smaller account balances, and lower financial literacy could work together to generate extreme risk aversion in pension investment.

To assess the participants' trading behavior, we measure the change in the number of investment products. This includes cases in which participants change their investment options for the all of their accumulated assets or only for the future contributions.

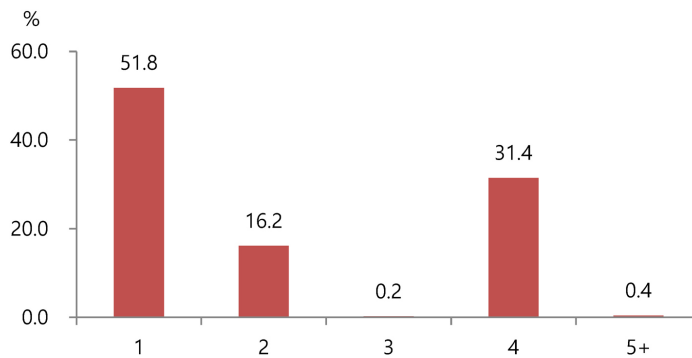


Figure 6. Number of investment options chosen by participants

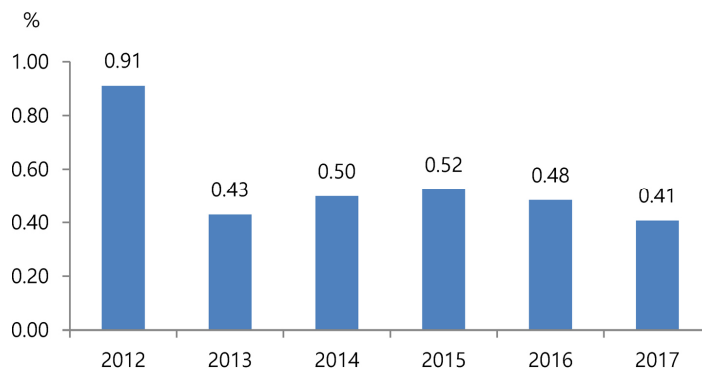


Figure 7. Proportion of risky products in participants' account balances

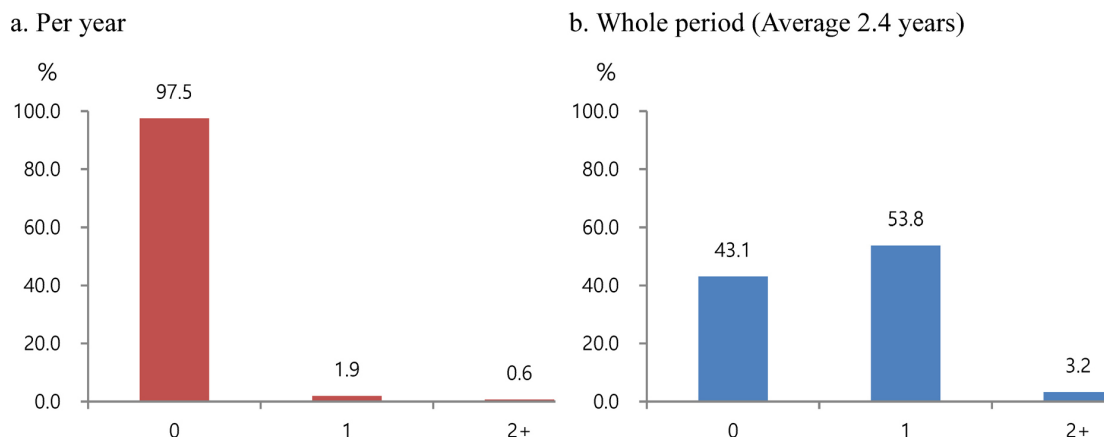


Figure 8. Number of product changes by participants

The left graph in Figure 8 shows the number of product changes per year, while the right graph shows the number of product changes for the entire employment period.⁹⁾

As Figure 8 indicates, we find strong evidence of inertia in investment product changes. Almost all (97.5 percent) of the participants in our sample make no product changes over a year. In other words, only 2.5 percent of the participants execute at least one trade per year. On the other hand, a higher proportion of participants changed their investment product at least once compared to the proportion who did change their investment product when looking at the entire sample period. However, this is largely because a considerable number of employees choose one-year maturity risk-free investment products and they need to rebalance their assets with new one-year maturity risk-free products one year later.

Our results are consistent with earlier studies on investor inertia in pension investment. For example, Agnew et al. (2003) show that over 87.6 percent of participants show no trades and only 7 percent of participants trade more than once per year. Similarly, Mitchell et al. (2006) document that about 10 percent of 401(k) accounts had at least one trade during a year. Due to the unique sample characteristics, specifically, small workplaces of less than 30 employees

with a high degree of risk aversion, we can observe much greater investment inertia than that reported in previous studies.

Our research aims to investigate how service providers affect participants' investment performance in the contract-based Korean defined contribution plans. In particular, we predict that investment performance on employees belonging to Provider B (bank) would be lower than that of Provider A (insurance company). In addition, we explore how participants' risk attitude determines investment performance. It is based on the theory that absolute risk aversion is positively affected by background risk (Guiso and Paiella, 2008). To support this, the previous studies have shown that females are more risk averse than males, the older are more risk averse than the younger, and the poor are more risk averse than the wealthier (Clark and Strauss, 2008; Collard, 2009; Wong et al., 2019). Accordingly, we test the following hypotheses.

Hypothesis 1: The investment performance of participants with Provider B (bank) is lower than that of participants with Provider A (insurance company).

Hypothesis 2: The investment performance of a group with a higher risk aversion tendency (females, the aged, and the poor) is lower than that a group with lower risk aversion tendency (males, the younger, and the wealthier).

9) Due to the shorter employment period, the average duration of service for the sample data is only 2.4 years.

C. Variables

Given that information on investment options by pension providers and investment returns for each participant for principal-guaranteed options are available only in 2017, our analysis focuses on observations of investments in safe products only. To examine the investment performance of individual participants, we first measure the nominal rate of return (R_i) in 2017. Since we can only observe snapshots of participants' assets at the end of the year, we cannot estimate the exact flow of investment income and the sponsors' contributions. We address the limitations of our dataset by using Hardy's formula to calculate participants' investment returns on an individual account balance, as follows:

$$R_{i,2017} = \frac{2 \times I_{i,2017}}{V_{i,2016} + V_{i,2017} - I_{i,2017}} \times 100, \quad (1)$$

where $R_{i,2017}$ is the net return on the account of participant i in 2017, $V_{i,2016}$ is the account value

of participant i at the end of 2016, $V_{i,2017}$ is the account value of participant i at the end of 2017, and $I_{i,2017}$ is the investment income of participant i during 2017. By deriving returns on the account values from the beginning of 2016 to the end of 2017, we implicitly calculate the value-weighted returns (Bauer, Cosemans, and Eichholtz, 2007).

In our regression model, the dependent variable is a participant's annual investment excess return (ER_i), which is a participant i 's investment return from an account value that exceeds the risk-free rate. In other words, this is the difference between the nominal rate of return and (R_i) minus the 1-year maturity deposit rate (R_f), as follows:

$$ER_i = R_i - R_f, \quad (2)$$

where ER_i is the excess return of participant i and R_i is the nominal rate of return for participant i , and R_f is the one-year maturity deposit rate. We define all other variables in Table 4.

In this study, we explore the factors that affect

Table 4. Variable Description

Variable	Definition
<i>ER</i>	Participant's annual excess returns
Sponsor-level	
<i>Provider</i>	One if the service provider is the bank (provider B), and zero otherwise (provider A: insurance company).
<i>PlanType</i>	One if the type of pension is corporate IRP, and zero otherwise (DC)
<i>Industry</i>	One if business area of the workplace is service, and zero otherwise (manufacturing)
<i>Size</i>	The total number of employees in a workplace
<i>Region</i>	One if the workplace is located in a metropolitan area, and zero otherwise
Participant-level	
<i>Gender</i>	One if a participant is female, and zero otherwise.
<i>Age</i>	Participant's age.
<i>Tenure</i>	The number of years for which a participant was employed in his/her current job (years)
<i>PlanTenure</i>	The number of years for which a participant is enrolled in his/her current DC plan (years)
<i>Ln(Asset)</i>	The natural log of the total amount of assets in a participant's account (KRW 1,000)
<i>Ln(Asset)²</i>	The squared value of <i>Ln(Asset)</i> .
<i>Trade</i>	The total number of a participant's product changes.
<i>Trade²</i>	The squared value of <i>Trade</i>

All variables are measured as of the end of 2017.

individual participants' investment returns in terms of the type of service provider and trading activity. In DC plans, sponsors and service providers play greater roles. Specifically, service providers that administer plans and manage assets have great discretion in that they design the investment menus in DC plans. Brown and Harlow (2012) document that 401(k) plan options produce greater risk-adjusted annual returns that exceed those of non-plan options by as much as 120 basis points. The authors argue that this is largely due to actively managed plan options and conclude that plan sponsors seem to have superior selection skills in designing the investment menus.

Taking this into account, we use the following variables at the sponsor-level. Service provider (*Provider*) equals to one if the asset manager is the bank (Provider B), and zero for Provider A. We create an indicator variable (*PlanType*) equal to one if the plan is a corporate IRP and zero for DC. *Industry* equals one if a sponsor belongs to the service industry, and zero otherwise. *Size* is the total number of employees in a workplace. *Region* is one if a workplace is located in a metropolitan area, and zero otherwise.

Next, we create variables at the participant-level in terms of gender, age, job tenure, DC plan tenure, account balance, and trading activity.¹⁰⁾ *Gender* is a dummy variable equal to one for females and zero for males. *Tenure* is measured by the employment period in the participant's current job, and *PlanTenure* refers to duration of the current DC plan (i.e., years of contribution). We take the natural log of account balances for $\ln(\text{Asset})$. To explore the non-linear relationship between account size and investment performance, we add the square of the asset size variable, $\ln(\text{Asset})^2$. Finally, *Trade* and Trade^2 are the participant's total number of product changes and the squared value of *Trade*, respectively.

10) Our dataset is limited in that it does not contain some critical factors that affect investment decisions, such as marital status, total household asset size, composition of asset classes (financial vs. real estate), three-tier pension asset (public-corporate-individual pension scheme) holding, total household income, years of education, and so on.

IV. Empirical Results

A. Descriptive analysis

Table 5 provides the descriptive statistics for the variables used in our analysis. Starting with the sponsor-level results in Panel A, slightly more sponsors select the bank as their service provider compared to the insurance company (52.1 percent versus 47.9 percent). Almost all sponsors provide DC-type (*PlanType*) occupation pensions. About 87.9 percent of the sample firms belong to service industries. Looking at the service industries in more detail, the social welfare sector occupies the highest proportion and the health sector occupies the second highest proportion. The average number of employees (*Size*) in our sample is 9.5. Over half of the workplaces (53 percent) are located (*Region*) in a metropolitan area.

At the participant-level in Panel B of Table 5, the average excess return of a participant (*ER*) is -0.02 percent, with a standard deviation of 0.217 percent. Over 60 percent of participants (*Gender*) in the sample are female, since females are more likely to work at small social welfare businesses. The age of participants (*Age*) ranges from 19 to 65 (due to the exclusion of above employees above 65 years old) and the participant's average age is 48.3. The average number of years a participant was employed by his/her current employer (*Tenure*) is 6.0, while the average number of years an employee participated in the plan (*PlanTenure*) is 3.3 years. The investment performance of participants would differ based not only on the chosen investment products, but also by the selected service providers. Accordingly, we compare the descriptive statistics for providers as well in Table 5. Consistent with the results for nominal returns in Figure 5, the excess return on the safe investment products from the insurance company are greater than those from the bank are.

Table 5. Descriptive statistics for sponsors and participants

	Total		Provider A (insurance company)		Provider B (bank)		Difference between (3) and (5)
	Mean (1)	SD (2)	Mean (3)	SD (4)	Mean (5)	SD (6)	T-stat (7)
<i>Panel A: Sponsor-level</i>							
Provider	0.521	0.499					-0.306***
Plantype	0.003	0.059	0.004	0.065	0.002	0.041	-0.003***
Industry	0.879	0.360	0.873	0.333	0.844	0.362	-0.029***
Size	9.493	6.725	12.5	7.274	12.9	7.444	0.347***
Region	0.531	0.499	0.433	0.495	0.608	0.488	0.175***
<i>Panel B: participant-level</i>							
Excess returns	-0.020	0.217	0.153	0.197	-0.153	0.113	-0.306***
Gender	0.608	0.488	0.647	0.478	0.617	0.486	-0.030***
Age	43.8	9.7	44.1	9.7	43.6	9.7	-0.549***
Age2	2015	859	1995	858	1995	858	-47.30***
Tenure	6.0	4.1	6.2	4.3	5.8	3.978	-0.474***
PlanTenure	3.3	1.4	3.7	1.63	3.0	1.123	-0.720***
Ln(Asset)	8.9	0.76	8.93	0.66	8.94	0.682	0.016***
(Ln(Asset))2	80.3	12.1	80.1	11.8	80.4	12.4	0.311***
Trade	0.001	0.071	0.000	0.021	0.002	0.093	0.002***
Trade2	0.005	0.379	0.000	0.057	0.009	0.502	0.008***
Observations	69,274		30,298		38,976		

*** indicates significance at the 0.01 level.

B. Regression results

In this section, we explore the relationship between the rate of return for a participant and asset management service providers, and turnover activity with controls for the sponsor and participant characteristics. We perform the regression analysis with observations available for annual excess returns as of the end of December 2017. We conduct a cross-sectional regression for an individual's excess return, as follows:

$$ER_i = \alpha + \beta X_i + \gamma' Y_i + \epsilon_i, \quad (3)$$

where i denotes a participant observation. The dependent variable is annual excess return for each participant, while the independent variables are the vector of variables at the sponsor level (X_i) and the

vector of variables at the participant level (Y_i). Table 6 reports the OLS regression results estimated from equation (3).¹¹⁾

We first examine whether employees' investment performance differs by service provider. As Table 6 shows, participants employed by sponsors who select Provider B (bank) earn lower returns than participants contracted with Provider A (insurance company). This finding is interesting in light of the decision architecture within DC plans. This result emphasizes the importance of a sponsor's responsibility in selecting service providers, which is supported by previous research (Brown and Harlow 2012; Elton et al. 2006; Tang et al., 2009). Other participant-side factors are also associated with excess returns. With regard to gender, our sample shows that the average

11) After confirming that there is no heteroscedasticity among the residuals, we apply robust standard errors.

Table 6. Cross-sectional regression results

	Coefficient	Std. Err.	t-value
Constant	-0.578 ***	0.085	-6.81
Provider	-0.269 ***	0.001	-201.05
PlanType	-0.037 ***	0.009	-4.11
Industry	-0.006 ***	0.001	-4.40
Size	0.002 ***	0.000	34.52
Region	0.000	0.001	-0.34
Gender	-0.013 ***	0.001	-10.73
Age	0.001 ***	0.000	3.03
Age ²	-0.000 ***	0.000	-2.76
Tenure	-0.002 ***	0.000	-12.19
PlanTenure	0.055 ***	0.001	107.41
Ln(Asset)	0.067 ***	0.018	3.64
Ln(Asset) ²	-0.005 ***	0.001	-4.67
Trade	0.067 ***	0.024	2.85
Trade ²	-0.008 **	0.004	-2.10
F-statistic	14810.35		
Prob > F	0.0000		
R ²	0.6124		
Adj R ²	0.6123		
Observations	69,271		

***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively. 0.05 level.

returns for female participants (*Gender*) are lower than those for male participants are. Consistent with this result, the previous literature shows that females display lower financial literacy and confidence than males do, leaving them at a potential disadvantage (Hasler and Lusardi 2017). Regarding the tenure variables, length of employment (*Tenure*) has a negative effect. However, the length of plan participation (*PlanTenure*) has a greater effect on the rate of excess return. As expected, there is a strong hump-shaped relationship between accumulated asset size and excess returns.

The coefficient of the total number of product changes (*Trade*) is positive and the coefficient of the squared number of product changes (*Trade*²) is negative, implying a non-linear relationship with the rate of excess return. Consistent with this finding, Dahlquist, Martinez, and Soderlind (2017) examine

the performance of individual investors in Sweden's Premium Pension System and find that active investors earn higher returns than inactive investors do. The authors argue that that most of the outperformance of active investors is due to market timing and the asset classes from the performance decomposition. In contrast, the change in products among the safe product options in our sample would have a positive impact on the rate of excess return: investment performance improves by changing from low interest-bearing products to high interest-bearing products. Our results suggest that the influence of the selection of service providers and trading activity are important for participants holding all assets with principal guaranteed products.

V. Discussion and Conclusions

In this study, we examine participant investment behavior and the investment performance of DC plans in small firms operated by KCOMWEL. We find that that participants with relatively low incomes and low wealth exhibit extreme risk avoidance in their pension management. This conservative asset allocation leads to lower investment returns. In addition, we find that approximately 97.5 percent of participants initiate no trades, and thus, show a high level of inertia. To summarize, these findings provide evidence that participants do not make rational financial decisions, thereby threatening their retirement security. Further, this study shows that participants' savings outcomes are partially determined by the way pension providers design investment options in plan menus.

The results of this study provide valuable insights to policymakers, which may help them better understand participant investment behaviors, especially for DC plans in small firms. Considering their tendencies toward inertia and extreme risk avoidance, corporate pension plans for low-income employees should avoid providing too many choices. For example, regulators could consider establishing a minimum return guaran-

teed DC scheme that restricts a participant's portfolio composition while providing economies of scale by pooling the plan assets of all participants. Another solution could be to introduce default options with a life-cycle investment strategy, in which the proportion of risky assets varies by a participant's age.

There seems to be a general consensus on the need for a government-supported pension system for vulnerable groups on the labor market such as low-wage in small workplace or platform workers. In line with this demand, the U.K. government established National Employment Savings Trust (NEST) under the UK pension Act in 2008 to facilitate high-quality and low-cost retirement pension plans for low-wage workers and small employers. The scheme is completely free for employers to set up and to use while participants pay a 1.8% charge on contribution and 0.3% annual management charge regardless of which investment option they choose. Like other qualified retirement pension plans, workers in NEST are automatically enrolled into the default investment vehicles unless they specify one or more investment options from the menu (John and Gale, 2015). 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 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981. 982. 983. 984. 985. 986. 987. 988. 989. 990. 991. 992. 993. 994. 995. 996. 997. 998. 999. 1000.

Another implication of this study is that there is no incentive for employer-chosen pension providers to offer a menu of investment products that prioritizes the employees' interests, given that employees do not select pension providers under the contract-based governance structure. This is because there is no mechanism to represent the participants' interests and thus, they are always in a weaker position than providers are. To resolve this issue, the labor department started evaluating occupational pension providers and announcing the best providers to the public in 2017.

To improve workplace pension schemes for employees in small firms, the Department of Employment and Labor submitted a proposal for legislation to establish trust-based workplace pension schemes set by KCOMWEL to the government, and this is now pending in the National Assembly. The main purpose of this legislation is to achieve economies of scale, and improve efficiency and investment performance

by pooling assets and resources. The other objective of introducing trust-based workplace pension schemes is to provide more options to employers and employees. This will create better service through market competition between existing service providers and entities trying to enter the corporate pension market. For example, it is assumed that market competition will naturally decrease the proportion of employers choosing a service provider based on its own interests rather than the interests of its employees.

This study contributes to a large body of corporate pension research by showing the unique features of the DC plans of small firms in Korea. Given that our sample only covers the DC plans of firms with fewer than 30 employees, our findings may not be generalized to larger firms. However, the pattern in which most pension assets are invested in principal-guaranteed products begs the questions of why Koreans show extreme risk avoidance in pension investment, a question we leave for future research.

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