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Gender and Choice of Pension Product*

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December 2021

Abstract

We use individual-investor data from Denmark to study whether women prefer pension schemes with lower financial risk due to a guaranteed return over those offering more uncertain market-based return. Guaranteed-return schemes provide less risky but also lower expected returns. We study both the extensive (whether women have lower tendency to invest in market-based schemes) and the intensive margin (how much more women invest in schemes with guaranteed return). We find women less likely to invest in riskier pension schemes, and those women who do, invest lower amounts compared to men. This contributes to inequality between men and women during retirement.

Key words: Pension savings, guaranteed and market-based returns, gender differences.

JEL classification: D14, G11, G20

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1. Introduction

Gender matters for individuals' risk aversion. Literature shows that women are more risk averse than men (see e.g. Barsky, Juster, Kimball, and Shapiro, 1998; Barber and Odean, 2001; Charness and Gneezy 2012; Eckel and Füllbrunn, 2015; Baeckström, Marsh and Silvester, 2021). Studies also show that women are more prone to invest their pension savings in less risky assets compared to men (e.g. Sundén and Surette, 1998; Bernasek and Shwiff, 2001; Agnew, Balduzzi, and Sundén, 2003; and Watson and McNaughton, 2007). If women allocate lower fractions of their pension savings to equities, they should expect lower, but also less risky, pension income, as equities generate higher returns than bonds in the long run (Mehra and Prescott, 1985; Jorda, Schularick, and Taylor, 2019) and pension savings are long-term. Existing studies on the relation between gender and pension savings investigate the extensive margin, i.e. *whether* women invest less risky or not, but do not study the intensive margin, i.e. *how much* less do women invest in risky assets. The portfolio shares and associated economic magnitudes are important to know, however. If women hold an economically significant lower fraction of risky assets in their pension savings, this can contribute to inequalities between pension incomes of men and women.

This paper studies unique and detailed data, covering the total pension savings of all investors in a country (Denmark), to examine both the question of whether women invest less in risky assets in their pension savings (the extensive margin), *and* how much less (the intensive margin).¹ In other words, our main contribution is to provide an estimate of the economic importance of women's tendency to invest less risky in their pension savings. In doing so we employ comprehensive register-based data covering the full population of Denmark, eliminating the reliance on survey data in existing studies (e.g., Sundén and Surette, 1998).

As in several other countries, the Danish pension system is based on three “pillars”. The first pillar consists primarily of public old-age pensions. It is financed by general taxes and

¹ The terminology extensive vs. intensive margin is used in the finance and economics literature to describe binary choices vs. the depthness/intensity of those choices (e.g., Besedes and Prusa, 2011; Chetty, 2012; He et al., 2014).

ensures that all pensioners, regardless of their labor-market history, will have a decent basic income during retirement. The second pillar consists of labour market pension schemes, which are contribution-defined. These are often organized through collective agreements between labor-market partners providing compulsory coverage for the employees concerned. The second pillar ensures that employees in the labor market receive adequate pension coverage relative to their income when working. The third pillar is fully private. It consists of individual pension plans that are flexible and voluntary. The third pillar consists of a wide range of voluntary personal life insurance and pension saving plans typically organized through banks or insurance companies. Our focus is on the second pillar. Approximately eighty percent of the Danish work force pays into a labour-related pension scheme (Danish Ministry of Finance, 2017). Historically, these schemes came with a guaranteed minimum return.² Due to increased capital requirements from Solvency II regulation as well as the low interest rate environment, market-based (non-guaranteed) pension schemes have been added to the menu of pension schemes (Danish FSA, 2017). A guaranteed pension scheme means that the pension provider is obliged to guarantee a pre-determined average annual return on pension savings. To ensure that return guarantees are met, pension providers of guaranteed products invest primarily in safe assets, yielding less risky but also lower expected returns, compared to market-based (non-guaranteed) pension savings.

If women have a higher tendency to invest in guaranteed pensions, they will miss out on the equity premium. This will cause lower expected pension wealth and income during retirement. We find that women have a 13% lower probability of choosing a non-guaranteed pension plan, controlling for income, education, etc. This is in line with previous results studying the extensive margin. As our main contribution, we study the intensive margin. We find that women on average hold 25.9% more in guaranteed pension schemes compared to men. This is an economically large effect. In the presence of an equity premium this can translate into large differences in the accumulation of retirement wealth.

² A general description of the Danish pension system can be seen in e.g., Bovenberg (2012) and Balter, Kallestrup-Lamb and Rangvid (2020).

Consistent with this, our data show that women on average hold far less (26.4%) in accumulated pension savings, compared to men. The choice of pension scheme – guaranteed versus market-based – thus contribute to inequalities between expected pension incomes of men and women. Given the stylized fact that Denmark is one of the countries with the lowest gender gap in pensions according to OECD (2019), our results provide a lower bound on the general effect of risk aversion on pension savings of men and women.

2. Data

The data are detailed individual-investor register-based data from Statistics Denmark. We examine all individuals aged 18 and above residing in Denmark in 2015. The data include end-of-year information on individuals' pension savings, wealth, income, stock market participation, age, gender, level of education, etc. Table 1 shows that there are 4,241,248 individuals in total, 50.3% of which are female. The genders are similar in age, marital status and education. On average, females have lower salaries, wealth, house ownership, and are more often publicly employed.

We want to investigate if there is a gender difference in individuals' choice of pension scheme. The variable of interest is the pension wealth of each individual, which can be placed into either a market-based or a guaranteed pension scheme. A market-based pension scheme implies that the pension provider is obliged to pay out the a priori unknown return earned on the investments. A guaranteed pension scheme means that the pension provider is obliged to guarantee a pre-determined average annual return on pension savings.³ To secure that return guarantees can be honoured, pension providers of guaranteed products cannot take as much risk in their investments as pension providers of market-based products. Given a positive long-run risk premium, i.e. that safe investments generate lower return in the long run, cf. Mehra & Prescott (1985), this implies that the expected return on pension savings is lower on guaranteed products. Non-surprisingly, this is confirmed in

³ The size of the guaranteed return is based on an initial rate set at the subscription date. Some pension schemes come with an unconditional guarantee, whereas others come with a condition guarantee. It is not possible to distinguish between the two in the data. See Plum, Møller, and Bech (2016) for a detailed description of the pension variables.

aggregate statistics, where market-based pension schemes have historically invested relatively more in equity and thereby yielded higher, albeit more volatile, returns (Danish FSA, 2017).

Table 2 presents the average pension wealth of all women and men in our sample. Columns (1) and (2) display the average pension wealth across all individuals, whereas columns (4) and (5) show average pension wealth only for those individuals who have positive pension savings in the respective category, and finally columns (3) and (6) show the female-to-male ratios of the means.

Table 2 shows that females on average have 126,663 DKK (\approx 19,000 USD) in market-based pension savings, but 347,302 DKK (51,600 USD) when conditioning on females that have positive market-based savings (i.e., excluding those with zero market-based savings). This average pension wealth in market-based schemes is lower for females (both unconditional and conditional). On the other hand, females have more in guaranteed pension schemes (unconditionally), and more females hold guaranteed schemes (conditionally) compared to males. Indeed, females on average have 292,640 DKK (\approx 44,000 USD) in guaranteed pension savings (569,552 DKK conditional on having a guaranteed scheme). Also, conditional on having positive pension wealth, there are fewer females (i.e. less observations) choosing a market-based pension scheme compared to males. Overall, this suggests that women are more prone to choosing relatively save pension schemes compared to men. Only for guaranteed amounts (conditionally) do females hold less in guaranteed schemes, contrasting the overall pattern that females seems to prefer guaranteed over market-based pension schemes. However, in Table 2 we do not control for e.g. income and wealth, which we turn to in the next section.

“Other savings“ includes other pension savings of the individuals. This consists mainly of compulsory public pensions to which all wage earners contribute and by design can only vary with income. The last row of Table 2 shows that women have far lower total pension wealth compared to men (26.4% less).

3. Regression results

First, we study the choice to invest in guaranteed and/or market-based pension schemes across genders (the extensive margin). Next, we investigate the choice of how much to save in guaranteed and/or market-based pension schemes (the intensive margin).

To investigate the extensive margin, we run three different regression specifications. The three different specifications help determine if our results are robust to the chosen methodology. First, we run an OLS regression

$$y_i = \beta_0 + \beta_1 D_i + \delta' C_i + u_i, \quad (1)$$

where the dependent variable y_i is a binary dummy equal to one if individual i has positive amounts in guaranteed pension, zero otherwise. The gender differences are picked up with a female dummy, D_i , equal to one if individual i is a female, zero otherwise. C_i is a vector of control variables including the individual characteristics presented in Table 1. Second, we run the probit regression

$$P(D_i = 1 | X_i, C_i) = \Phi(\beta X_i + \delta' C_i + u_i). \quad (2)$$

Again, D_i is a dummy picking up the gender of individual i . X_i is a dummy equal to one if the individual has positive amounts in a guaranteed pension scheme, zero otherwise, and C_i is the vector of standard control variables. Finally, for further robustness, we also run a logit regression.

Columns (1)-(3) in Table 3 show the results for the three regressions: OLS, probit, and logit. It follows that females have a higher tendency to invest in guaranteed pension schemes relative to men, after controlling for observable characteristics. For example, holding everything else constant, the probit model in column (2) shows that females are 13.4% more likely to have guaranteed pension savings compared to men. The OLS regression and logit regression reveal similar results, illustrating the robustness of the results.

In columns (4)-(6) we run the opposite regressions, where the dependent variable is a binary dummy equal to one if an individual has positive amounts in market-based pension schemes, zero otherwise. In all three regressions, females are less likely to invest in market-based pension schemes compared to men.

In sum, when choosing to invest in a particular pension scheme, our results show that women are more likely to hold guaranteed savings, and less likely to hold market-based savings, compared to men. This indicates that women are more risk averse in their pension savings decisions.

3.1 Intensive margin

Next, we investigate if there is a gender difference in the intensive margin, i.e. not in terms of whether to invest, but how much to invest in the two different pension products. We run the OLS regressions:

$$z_i = \beta_0 + \beta_1 D_i + \delta' C_i + u_i \quad (3)$$

where the dependent variable z_i is the log-amount saved in a given pension scheme, and other variables are as defined above.

Table 4 presents the results from the regressions. In columns (1)-(3), the dependent variable is the log-amount saved in the guaranteed pension scheme, and in columns (4)-(6) the dependent variable is the log-amount saved in the market-based pension scheme. The results show that the gender relation is relatively large compared to most other regressors. Controlling for individual characteristics, column (1) shows that females on average hold 25.9% more in guaranteed pension schemes compared to men. Using fitted values from the regression, estimated at the means of the explanatory variables, this translates into an approximately DKK 100,000 difference at retirement (USD 15,000), which is economically very large, cf. Table 2. Column (4) consistently shows that women hold considerably less in market-based pension schemes.⁴

⁴ Note the importance of controlling for individual characteristics. The summary statistics in Table 2 indicated the opposite result, i.e. that females hold less in guaranteed savings relative to men.

It follows from Table 1 that more women are employed in the public sector. In unreported results (omitted for brevity, but readily available upon request), we break down public employment into government, municipal, and regional employment, and find that the gender difference is robust. Similarly, the choice between guaranteed or market-based pension schemes may systematically differ for individuals who are self-employed. As men are more likely to be self-employed (cf. Table 1), this might in principle affect our results. In columns (2) and (5), we exclude all self-employed individuals. Our results are unchanged, with women saving more in guaranteed schemes and less in market-based schemes compared to men.

Finally, in columns (3) and (6), we exclude individuals who save in both guaranteed and market-based schemes, thereby only including individuals with all their savings in either of the respective category. The motivation for this analysis is drawn from the literature, where several studies (mentioned in the Introduction) have shown that females are generally more risk averse than men. By only looking at those with guaranteed schemes in column (3), we are effectively comparing risk averse females to risk averse men. The results are unchanged, albeit the female coefficient drops slightly in magnitude, consistent with the selected sample having more comparable risk attitudes across genders. Intuitively, column (6) produces comparable results when only including individuals with all their savings in market-based products.

3.2 Single individuals

Our analysis is at the individual level, whereas pension savings decisions can be carried out at the household level. Households tend to pool resources and risk. For example, less risk-taking in women's savings may be counterbalanced by more risk tolerance of their male partners. Our results so far do not disentangle household optimization of overall pension savings from genuine gender characteristics. To verify that our results are indeed gender driven we rerun our analysis of both the extensive (Table 3) and intensive (Table 4) margin after restricting the sample to individuals classified as single. This eliminates the issue of optimizing across more than one person. Table 5 documents the results, showing that single

women are more likely to choose guaranteed pension schemes (column 1) and less likely to choose market-based schemes (column 2) compared to single men.⁵ Furthermore, single women hold larger amounts in guaranteed pension schemes (column 3) and lower amounts in market-based pension schemes (column 4) compared to single men. These patterns fully align with those already presented in Tables 3 and 4, confirming that gender differences in pension savings are not driven by savings optimization at the household level.

4. Conclusions

We find that women prefer guaranteed pension savings over market-based. We study both the extensive margin (whether women prefer guaranteed pension savings) and the intensive margin (how much less women have in market-based pension savings).

Guaranteed pension schemes provide lower risk, but also lower expected returns. When women tend to save in low-return pension schemes, they will to a larger extent than men miss out on the risk premium. This effect will imply, all else equal, that women will on average end up with lower pension income during retirement. Given that women in addition have lower incomes compared to men and live longer, this will increase inequality between men and women during retirement.

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⁵ For brevity, we only report probit results, as results are robust across estimation methods. Results from logit and OLS regressions are available upon request.

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Table 1. Summary statistics

The table shows the number of females and males in our sample, along with means of individual characteristics. The sample consists of all individuals aged 18 and above residing in Denmark in 2015. All continuous variables have been winsorized at the top and bottom 0.1%.

	Female	Male
Number of individuals	2,133,783	2,107,465
Age	49.01	48.00
Income (DKK)	212,774	252,569
Gross Wealth (DKK)	716,580	1,069,799
House Owner %	43.3%	53.3%
Public Employment %	27.4%	13.1%
Self Employed %	2.5%	6.1%
Stock mkt. participation %	24.2%	27.9%
Immigrant %	9.3%	9.7%
Higher Education %	7.5%	8.7%
Single %	36.2%	34.0%

Table 2. Unconditional and Conditional Pension Wealth

The table presents mean pension wealth (DKK) in Denmark of individuals aged 18 and above by gender for the year 2015. The means are derived based on the full sample in columns (1) and (2) and conditional on having positive savings in the respective category in columns (4) and (5). Columns (3) and (6) show the female-to-male ratios of the means (e.g., 126,663 / 258,237 = 0.49).

	Unconditional			Conditional		
	Female (1)	Male (2)	Ratio (3)	Female (4)	Male (5)	Ratio (6)
Market-based	126,663	258,237	0.49	347,302	475,351	0.73
No. of obs.	2,133,783	2,107,465	1.01	778,206	1,144,891	0.68
Guaranteed	292,640	273,632	1.07	569,552	723,693	0.79
No. of obs.	2,133,783	2,107,465	1.01	1,096,353	796,842	1.38
Other pension savings	230,342	351,986	0.65	231,859	359,623	0.64
No. of obs.	2,133,783	2,107,465	1.01	2,123,845	2,100,175	1.01
Total Pension Wealth	649,703	882,491	0.74	649,727	882,512	0.74
No. of obs.	2,133,783	2,107,465	1.01	2,133,703	2,107,413	1.01

Table 3. Extensive Margin: The Decision to Save in Guaranteed/Market-based

The dependent variable is a dummy equal to one if an individual has positive amounts in guaranteed pension savings (columns 1-3) or market-based savings (columns 4-6), zero otherwise. Columns 1 and 4 present results from an OLS regression, columns 2 and 5 from a probit regression, and columns 4 and 6 from a logit regression. For the probit and logit, we report the marginal effect at the mean. Standard errors in parentheses with significance reported at the 1% (***) , 5% (**) and 10% (*) level.

	Guaranteed			Market-based		
	OLS (1)	Probit (2)	Logit (3)	OLS (4)	Probit (5)	Logit (6)
Female	0.112*** (0.000457)	0.134*** (0.000542)	0.142*** (0.000563)	-0.126*** (0.000460)	-0.144*** (0.000532)	-0.146*** (0.000547)
Age	0.00193*** (1.28e-05)	0.00241*** (1.52e-05)	0.00249*** (1.56e-05)	-0.00892*** (1.19e-05)	-0.0106*** (1.59e-05)	-0.0109*** (1.66e-05)
Ln(Income)	0.0989*** (0.000421)	0.138*** (0.000719)	0.163*** (0.000753)	0.192*** (0.000505)	0.247*** (0.000886)	0.296*** (0.000843)
Ln(Gross Wealth)	0.00378*** (0.000121)	0.00543*** (0.000161)	0.00564*** (0.000171)	-0.00270*** (0.000130)	-0.00441*** (0.000157)	-0.00544*** (0.000160)
House Owner	0.0537*** (0.000664)	0.0458*** (0.000820)	0.0392*** (0.000851)	0.0931*** (0.000664)	0.108*** (0.000838)	0.0989*** (0.000859)
Public Employment	0.316*** (0.000569)	0.353*** (0.000703)	0.359*** (0.000742)	-0.144*** (0.000631)	-0.155*** (0.000701)	-0.170*** (0.000732)
Self Employed	0.0444*** (0.00119)	0.0487*** (0.00133)	0.0477*** (0.00139)	-0.132*** (0.00120)	-0.146*** (0.00144)	-0.161*** (0.00154)
Stock mkt. particip.	0.0493*** (0.000553)	0.0486*** (0.000631)	0.0487*** (0.000652)	-0.0265*** (0.000526)	-0.0324*** (0.000635)	-0.0367*** (0.000657)
Immigrant	-0.0853*** (0.000697)	-0.116*** (0.000950)	-0.123*** (0.000994)	-0.0219*** (0.000812)	-0.0288*** (0.000947)	-0.0339*** (0.000979)
Higher Education	0.197*** (0.000774)	0.238*** (0.00107)	0.236*** (0.00114)	-0.156*** (0.000851)	-0.193*** (0.00105)	-0.218*** (0.00107)
Single	-0.0383*** (0.000480)	-0.0478*** (0.000571)	-0.0533*** (0.000592)	-0.0516*** (0.000480)	-0.0607*** (0.000574)	-0.0634*** (0.000594)
Constant	-1.052*** (0.00478)			-1.326*** (0.00586)		
Observations	4,220,129	4,220,129	4,220,129	4,220,129	4,220,129	4,220,129
Fraction of Females	0.504	0.504	0.504	0.504	0.504	0.504
R-squared	0.184			0.186		
Pseudo R-squared		0.1481	0.1493		0.1515	0.1552

Table 4. Intensive Margin: The Decision on How Much to Save in Guaranteed/Market-based

The table presents OLS results from running the amount in guaranteed savings (columns 1-3) and market-based savings (columns 4-6) on individual characteristics. The dependent variable is log-transformed, implying that the estimated coefficients are elasticities. Column (2) and (5) exclude self-employed individuals, whereas column (3) and (6) exclude individuals who save in both guaranteed and market-based schemes, thereby only including individuals with all their savings in either of the respective category. Standard errors in parentheses with significance reported at the 1% (***) , 5% (**) and 10% (*) level.

	Guaranteed			Market-based		
	(1)	(2)	(3)	(4)	(5)	(6)
Female	0.259*** (0.00246)	0.269*** (0.00252)	0.214*** (0.00312)	-0.241*** (0.00219)	-0.232*** (0.00222)	-0.156*** (0.00265)
Age	0.0499*** (9.00e-05)	0.0499*** (9.12e-05)	0.0381*** (0.000108)	0.0482*** (8.63e-05)	0.0484*** (8.70e-05)	0.0536*** (0.000100)
Ln(Income)	0.826*** (0.00383)	0.896*** (0.00430)	0.963*** (0.00538)	0.971*** (0.00395)	1.055*** (0.00438)	1.095*** (0.00553)
Ln(Gross Wealth)	0.0333*** (0.000779)	0.0298*** (0.000796)	0.0290*** (0.000961)	0.00921*** (0.000703)	0.00594*** (0.000715)	0.00338*** (0.000847)
House Owner	0.157*** (0.00361)	0.146*** (0.00369)	0.203*** (0.00427)	0.364*** (0.00343)	0.353*** (0.00350)	0.481*** (0.00413)
Public Employment	0.590*** (0.00253)	0.578*** (0.00255)	0.463*** (0.00332)	-0.292*** (0.00290)	-0.299*** (0.00290)	0.0296*** (0.00379)
Self Employed	-0.00546 (0.00591)		-0.169*** (0.00742)	-0.469*** (0.00639)		-0.426*** (0.00791)
Stock mkt. particip.	0.0848*** (0.00268)	0.0810*** (0.00274)	0.0172*** (0.00319)	-0.0164*** (0.00248)	-0.0212*** (0.00251)	-0.0199*** (0.00296)
Immigrant	-0.177*** (0.00467)	-0.174*** (0.00475)	-0.241*** (0.00546)	-0.182*** (0.00358)	-0.178*** (0.00362)	-0.237*** (0.00399)
Higher Education	0.588*** (0.00337)	0.551*** (0.00350)	0.554*** (0.00383)	-0.0879*** (0.00415)	-0.124*** (0.00426)	0.117*** (0.00535)
Single	-0.253*** (0.00263)	-0.258*** (0.00268)	-0.354*** (0.00317)	-0.126*** (0.00236)	-0.126*** (0.00239)	-0.118*** (0.00279)
Constant	-1.368*** (0.0457)	-2.182*** (0.0514)	-2.054*** (0.0634)	-2.124*** (0.0469)	-3.118*** (0.0520)	-3.720*** (0.0656)
Observations	1,886,088	1,808,016	1,144,502	1,915,945	1,848,022	1,174,359
Fraction of Females	0.580	0.590	0.649	0.405	0.410	0.362
R-squared	0.325	0.328	0.344	0.372	0.384	0.479

Table 5. Single individuals only

This table reruns the main regressions of Table 3 and 4, but only using the subsample of people who are single and therefore do not share a household with a partner. The first half of the table investigates the extensive margin (decision to save or not), where the dependent variable is a dummy equal to one if an individual has positive amounts in guaranteed pension savings (column 1) or market-based savings (column 2), zero otherwise. These are probit regressions where we report the marginal effect at the mean. The second half of the table investigates the intensive margin (decision on how much to save) by presenting OLS results from running the amount in guaranteed savings (column 3) and market-based savings (column 4) on individual characteristics. The dependent variable is log-transformed, implying that the estimated coefficients are elasticities. Standard errors in parentheses with significance reported at the 1% (***) , 5% (**) and 10% (*) level.

	Extensive margin		Intensive margin	
	Guaranteed (1)	Market-based (2)	Guaranteed (3)	Market-based (4)
Female	0.119*** (0.001)	-0.165*** (0.001)	0.149*** (0.005)	-0.367*** (0.004)
Age	0.001*** (0.000)	-0.010*** (0.000)	0.046*** (0.000)	0.054*** (0.000)
Ln(Income)	0.120*** (0.001)	0.224*** (0.002)	0.844*** (0.008)	0.909*** (0.007)
Ln(Gr. Wealth)	0.004*** (0.000)	-0.002*** (0.000)	0.032*** (0.001)	0.021*** (0.001)
House Owner	0.059*** (0.001)	0.096*** (0.001)	0.182*** (0.006)	0.263*** (0.006)
Public Empl.	0.357*** (0.001)	-0.067*** (0.001)	0.661*** (0.005)	-0.233*** (0.006)
Self Empl.	0.056*** (0.003)	-0.082*** (0.003)	0.084*** (0.013)	-0.331*** (0.013)
Stk mkt. part.	0.062*** (0.001)	-0.028*** (0.001)	0.022*** (0.005)	-0.007 (0.005)
Immigrant	-0.096*** (0.001)	-0.045*** (0.001)	-0.128*** (0.009)	-0.194*** (0.006)
Higher Educ.	0.277*** (0.002)	-0.126*** (0.002)	0.665*** (0.007)	-0.032*** (0.009)
Constant			-1.610*** (0.091)	-1.797*** (0.084)
Observations	1,480,223	1,480,223	558,706	586,166
R-squared			0.349	0.376
Pseudo R-sq.	0.1404	0.1420		